REFERENCE ONLY

THEORETICAL FRAMEWORK FOR AUTHORING HYPERMEDIA FOR LANGUAGE LEARNING

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1 Abstract

This thesis represents the culmination of work carried out as part of an ongoing research into hypermedia authoring for Computer Assisted Language Learning (CALL). It originates from, and is the natural continuation of previous research activities in user interface design, which addressed the problem of transferring existing human factors expertise derived from the field of human-computer interaction (HCI) to the hypermedia CALL authoring process. Problems identified with the development of specific design guidelines for authoring hypermedia CALL led to a need for a thorough examination of the usability field with a view to creating a coherent and exhaustive theoretical framework providing a comprehensive contextual and conceptual design support. At the conceptual level, emphasis is placed on defining the design process from an HCI perspective, on delineating the authoring input and explicating the potential of the hypermedia CALL platform, in terms of specificity, scope and limitations. At the contextual level, this research presents an in-depth study of mental models and user requirements elicited and formulated by students as targeted users on the basis of a selection of relevant applications. The resulting usability field is central to the design of the theoretical framework, inasmuch as it feeds into conceptual design considerations and is instrumental in facilitating and validating a realistic transition from theory into practice. Ultimately, the theoretical framework provides a comprehensive design support encapsulating design guidelines and generating design solutions.

The main contribution made to hypermedia CALL rests on providing an extensive contextualized design support in the form of a practical and applicable framework with a sound theoretical underpinning designed to stimulate a conceptual approach to authoring hypermedia CALL environments. Therefore, it is designed to develop a much greater awareness of the design process and the role authors must play within it, as well as to provide a methodology and an approach to further identify and understand student requirements. Last but not least, it is conceived to promote and facilitate the use of design guidelines to turn a complex process into a successful, student-centred design outcome.

2 Statement of Objectives

The main aim of this research is to widen and structure the hypermedia CALL authoring space into a theoretical framework by encouraging a conceptual, holistic approach to authoring whilst supporting and promoting practical, discrete design solutions with the contextualized use of previously developed design guidelines.

Its objectives are:

- to show that these design guidelines represent an effective design support when they can be related to specific design considerations and specific user requirements,
- to circumscribe the conceptual input authoring must generate within the overall design process,
- to provide a theoretical underpinning for the consideration and appreciation of mental models within the authoring process with a view to creating a greater match between conceptual and mental models.

Therefore the proposed theoretical framework provides a valuable insight into a structured approach to designing a hypermedia CALL user interface by:

- helping authors concentrate on their role as academic authors within the design process,
- looking at critical design considerations,
- focusing on design features which can inform and influence their conceptual model,
- relating student requirements to the elaboration of a system image,
- promoting the use of design tools with a view to designing a novel but, similarly, valid and applicable user interface,
- using design guidelines by providing a contextualized as well as a manageable and

focused approach,

- providing a useful checklist for evaluation purposes.

The objectives of the framework are to provide:

- A design support for authors to help them think in terms of design informed by instructional theories but also, and more critically, user-interface design considerations, criteria and relevant design features.
- A practical and adjustable set of pointers enabling authors to elaborate and refine on their conceptual model of the system to be designed.
- An appropriate design context for integrating and implementing design guidelines within the process itself.
- A manageable duality combining a high level theoretical point of departure as well as a practical design tool.
- A paper-based reference as well as an html version for easier reference, orientation and use.
- A useful checklist for formative and summative evaluations.
- A structure and valuable multi-disciplinary material to generate discussions at the conceptual level of design.

3 Introduction

3.1 Background

In recent years, considerable technological achievements in information technology have led to the development of *hypertext / hypermedia* environments supporting non-linear modes of reading, writing and textuality (ex: Landow, 1992; Nielsen, 1995; Shneiderman, 1992; Woodhead, 1991). Used primarily and extensively as applications for on-line databases, information retrieval and help systems, these versatile hypermedia platforms are now accessible to a much wider but particularly ill-defined group of designers in the form of authoring tools.

These authoring tools such as *Multimedia ToolBook* and *Authorware Professional* (see for instance: Deegan *et al.*, 1992; Hardman, 1990; Barker, 1993; Boyle, 1997) enable authors / users to assemble multimedia components, including text, graphics, animation, sound, video, by means of links in order to create interactive hypermedia applications. In essence, it involves these authors in conceptualizing, designing and developing a multi-faceted computer-based environment providing access, in the form of a screen display and commands, and a structure for this information base, on the basis of interactive links, enabling end-users to navigate through it.

The interactive potential generated by hypermedia systems was quickly seen as being ideally suited to learning, encompassing learning approaches and styles such as tailored comprehension and digestion of information, use of recall, recognition and application. Therefore, the hypermedia environment came to be used to develop and implement new applications for learning designed to provide more efficient and cost effective learning methods. In turn this new concept of hypermedia for learning led to the parallel development of basic in-house materials authored by academics and more ambitious commercially based packages produced by professional designers. Whereas, objectives set out by academic authors were often task based and targeted for teaching use, the commercial sector was, principally, attracted by a promising educational market, adopting in the process more market-driven design objectives (ex: Harland, 1991; Jonassen, 1992; Marcus, 1992; McKnight *et al.*, 1993; Nielsen, 1990).

However, designing learning applications within their intrinsic programming environment places severe demands on academic authors. Indeed, the complexity of the design process and output can be identified at several levels. Firstly, authoring is still essentially technology-driven and authors have limited or non-existent skills in user-interface design. Secondly, the lack of research in this field has led to a poor understanding and subsequent exploitation of the educational use and potential of hypermedia technology (ex: Dix *et al.*, 1993; Levy, 1997; Nielsen, 1995; Preece *et al.*, 1994). This general problem is compounded by the dearth of manuals and the lack of practical and strategic help authors seriously need (ex: Marshall *et al.*, 1987; Norman, 1986; Shneiderman, 1992). Indeed, authors do not know how to structure information in hypertext networks (Nielsen, 1995) and often simply transpose their traditional linear models as well as existing learning strategies into hypermedia (ex: Davis & Deegan, 1992; McKnight *et al.*, 1993; Nielsen, 1990).

Therefore, it is not surprising to realize that progress in the field of hypermedia-based Computer Assisted Language Learning (hypermedia CALL) is slow and limited by its intrinsic empirical design approach. Unfortunately, this widespread empiricism is not helped by the fact that few studies of hypermedia authoring usability exist making it difficult to build on good practices. In order to support Nielsen's statement (1995) that "our knowledge of what constitutes good hypertexts will build as we see more examples of what works or does not work", efforts must be made to facilitate the authoring process and provide appropriate design supports. This is all the more important since academic authors, as language specialists, have a crucial role to play in determining the conceptual boundaries, learning objectives and context of use of the user interface to be designed.

It is within this context, albeit narrowed down to the more finite parameters of hypermedia CALL in higher education, that the present thesis must be considered. This ongoing research stems from and should be seen as the natural continuation of personal research activities spanning several years and combining a long standing expertise in language teaching in higher education, practical, hands-on, experience in hypermedia authoring, post-graduate studies in user-interface design (MSc in User Interface Design, with Distinction) as well as evaluation expertise.

3.2 *Work previously undertaken*

Previous research carried out in hypermedia authoring for language learning addressed the problem of transferring existing human factors knowledge derived from the field of human-computer interaction (HCI) to the authoring process and presented a customized design support in the form of specific design guidelines for authoring hypermedia CALL (ex: Brown, 1991; Davis *et al.*, 1994; Deegan *et al.* 1992; Harland, 1991; McAleese & Green, 1990; Woodhead, 1991). It initially focused on the identification of the relevant academic authors as well as their ultimate end-users, in this case language students in higher education, and design problems experienced during the design process. The analysis provided data on the author's profile, the potential of hypermedia as an authoring and learning tool, language teaching methodologies and student requirements and finally the student's profile. These findings, which encompassed authors' characteristics and considerations of the design process as well as authoring requirements, formed the basis of a usability field within which guidelines were to apply (Hémard, 1995).

The usability field was delineated by the identification of authoring requirements: from pre-design considerations (technical, practical, conceptual etc.) to application of design knowledge to the user interface and evaluation of design; User and data requirements: circumscribed by levels of proficiency, learning and teaching modes and methodologies; Functionality and usability requirements: identified system features necessary to achieve required tasks (orientation, navigation, interaction).

3.3 Statement of problem

3.3.1 Use of Guidelines

- Although design guidelines are generally considered an important and valuable source of specialist knowledge, their intrinsic nature and formulation prevent them from providing ready-made solutions to specific design problems.

- Whilst making complex human factors principles more explicit (Marshall *et al.*, 1987), guidelines are, by their very nature, extracted from empirical evidence. However, this experiential dimension can easily be concealed by a formal presentation which tends to promote the authoritativeness of what should really be "an informal collection of suggestions" (Gould and Lewis, 1985). In the absence of contextual and conceptual data related to guidelines themselves, it can be difficult to use or even interpret them.

- Even though the original set of guidelines was fully evaluated to ensure its usability and general acceptability, its practical use, as main design support, in the authoring of a hypermedia application highlighted the problems related to their direct implementation into a design and the repercussions design choices could have on the user-interface.

3.3.2 Perceived Weaknesses within the Design Process

- The authoring process in CALL, and hypermedia CALL in particular, is still, essentially, a bottom-up, task-based exercise, adopting a discrete approach (Levy, 1998) relying on the application of language learning theories to identified sub-components to be designed. In so doing, this process similarly tends to rest on the overall assumption that the resulting interface will be greater than the sum of its isolated parts. Whilst design solutions can rightly be found, there is a definite need to integrate these narrow design foci into a wider authoring space.

- The complexity of the hypermedia CALL information base, the need to harness language teaching and learning strategies within existing technological boundaries as well as the difficulty to relate to the potential of such a new and different interface, imply that the authoring process must be clearly identified.

- A design support, such as guidelines, cannot be satisfactorily used in isolation. "Cookbook-style" guidelines (Preece *et al.*, 1994: 488) simply do not work either as a quick design expedient or as a substitute for design expertise. Conversely, it becomes a valuable asset, at authors' level, as a vehicle to translate theory into practice and, therefore, in visualizing, shaping and evaluating a conceptual model of a system.

- Evidence suggests that the user interaction is often undermined by the poor mapping between the author's original conception (conceptual model) and the user's perception of it (mental model of the application).

- In the hypermedia authoring environment, too little emphasis is placed on the dual role played by the author as a language specialist and designer but equally the role, which the end-user of the authored application will play in his/her interactive capacity.

- Finally, beyond the mechanistic dimension of authoring, there is a need to redefine the role of authors within a properly identified design context and process, in the form of a framework, with a view to providing an appropriate theoretical support.

3.4 Approach

Given the nature of the above identified problems, a coherent and exhaustive design support has been conceived in the form of a theoretical framework encapsulating the guidelines within a comprehensive contextual and conceptual environment based on a thorough examination of the usability field.

The aim of such a framework is essentially fourfold. Firstly, it is created to help authors focus on the important role they must play within the design process, emphasizing the necessity to consider the conceptual dimension of design, as well as identifying such an input within the design process as a whole. Secondly, it seeks to provide authors with a comprehensive support enabling them to better relate to and circumscribe not only their own conceptual model of the hypermedia environment to be designed but also mental models and requirements of targeted users. Thirdly, it is made to facilitate the integration, and therefore the contextualization, of design guidelines. However, last but not least, it is also conceived to encourage and generate the adoption of a different design approach on the part of authors with a view to looking at a hypermedia CALL application as a new entity with its own specific interface, interactive potential and inherent design characteristics.

3.4.1 Area of Application

The central area of application has been circumscribed to the field of hypermedia CALL, comprising hypermedia and interactive multimedia CALL applications on CD-Rom. Furthermore, by dint of its conceptual dimension (refer to Section 5.1 Definition and Concepts), the theoretical approach and subsequent framework are similarly applicable to hypertext and, thus, by extension, the Web environment, as design considerations and necessary design supports are perfectly valid within the design process of a Web-based interface. Nevertheless, as the research undertaken focuses on the authoring aspects of hypermedia CALL, no explicit references to the Web have been made as it falls outside the remit of this thesis. Firstly, because Web authoring was not an acceptable proposition and authoring option in the initial stages of this research. Secondly, because current Web authoring would present a range of additional problems as well as design considerations pertaining to the specificity of the Web environment, which would fall outside the remit and objectives of this thesis.

3.5 Synopsis

The Design Process: a HCI Perspective

This chapter concentrates on defining and, therefore, delineating the adopted design process, in order to shed light on the chosen design approach, clarify the terminology used as well as situate and explicate the role and input of authors within the process itself. This highlighted authoring process is central to the design of the subsequent framework for authoring hypermedia for language learning.

The Hypermedia Environment: An Authoring Approach

This chapter introduces the context and concept of the hypermedia environment, defining the platform, relevant elements and appropriate authoring features as well as identified problems and limitations.

Hypermedia CALL

This chapter comprises an explication of appropriate learning processes and acquisition within hypermedia CALL, highlighting the language learning dimension and potential presented by such an interactive platform from a cognitive and design approach. As such, it forms part of the conceptual basis of the domain's contextualization and actualization with a view to further defining its domain-specific requirements and usability. Special attention is paid to design features pertaining to the design process of hypermedia platforms for language learning, including the specificity of the authoring tool and teaching and learning methodologies in Second Language Acquisition.

Models

This chapter specifically covers conceptual and mental models developed by both authors and users, providing a theoretical underpinning (ex: Carroll, 1991; Gugerty, 1993;

Johnson-Laird, 1989; Norman, 1986; Staggers & Norcio, 1993) as well as contextualized projections. Authoring hypermedia for language learning is further examined by an assessment of language learning theories and processes.

Elucidation of Mental Models in Hypermedia CALL

This chapter presents both quantitative and qualitative analyses of verbal protocols from user walkthroughs based on *Télé-Texte*, *Up to Standard in French*, *A la Recherche d'un Emploi* and *France InterActive* involving students of French in higher education and identifies mental models elicited by them.

Towards a Taxonomy of Mental Models

This chapter groups the above mentioned mental models into three clearly recognizable and manageable categories with a view to better exploit this rich data as a design oriented resource. The three identified taxonomies are: The computer as a physical construct; the learning environment and the system as an interactive construct.

Audit Analysis

This chapter sets the ground for user requirements inasmuch as audit sessions were designed to enable students to look back at the software interacted with and cast a critical eye over the relevant interfaces, in terms of strength and weaknesses, on the basis of a checklist of selected evaluation criteria.

Student Requirements

This chapter provides first-hand student requirements, specific as well as generic to the hypermedia CALL environments interacted with. Student requirements form an important referential and evaluative element of the main User Interface Requirement part of the framework. Therefore, the resulting usability field within which the framework applies is fully contextualized on the strength of the new data obtained. This approach provides a detailed list of all the elements constituting the identified requirements.

Usability Field

This chapter presents a list of usability features proposed by students on the basis of their interaction and critical evaluation of the chosen software. Its purpose is to provide a concise reminder and a useful checklist of design features, which require design attention and appropriate considerations.

Design Guidelines

This chapter focuses on design guidelines in order to analyse their role as design support within the design process. In particular, it concentrates on their underestimated design potential when translating theory into practice. Furthermore, it presents a summarized background to the previously established set of design guidelines, which is used as part of the theoretical framework.

Theoretical framework

This chapter centres on the elaboration of the theoretical framework. Emphasis is placed on both the overall authoring dimension at the pre-design stage of the design process as well as design considerations and support provided for the elaboration of an adequate system image based on detailed interface requirements. It presents the widest possible combination of identified elements in the usability field and is conceived to answer real and manageable design issues. These are linked to all appropriate student requirements, guidelines, themselves linked to specific instructions regarding their implementation and likely repercussions, such as trade-offs. Finally, the framework in its entirety is evaluated as valid design support on the basis of the satisfactory delivery of student-centred design considerations and resulting match between the conceptual and mental models.

Discussion

This chapter discusses the outcome of the adopted methodology, the resulting framework as well as its validity and usability and potential future contribution in the field of hypermedia CALL authoring.

3.6 Nature of Contribution:

The research outcome should provide the following contribution:

Authors of hypermedia CALL applications will gain access to a comprehensive, customized design support presenting a practical, concise and applicable framework with sound theoretical underpinning designed to provide both a necessary overview but also a precise contextualization of the design process in addition to built-in, customized design tools. In so doing it will:

- Facilitate recognition of and improve the underlying design process of hypermedia CALL authoring.
- Help authors to better appreciate their role within the design process.
- Provide authors with a methodology and an approach to identify and better understand student requirements.
- Enable authors to seek, identify and select context-specific design guidelines appropriately within the design process.
- Develop a much greater awareness of the user-interface as a specific entity, in terms of functionality, usability and validity, in conjunction with the pedagogical aims and objectives initially set out and the identified interactive role it has been designed for.

- Capitalize on existing hypermedia CALL platforms through the use of formative but also summative evaluations.

- Facilitate further research and help authors to rethink the potential and limitations of the information source and environment.

- Finally, enable authors as language specialists but also students as end users to better adapt to new means of delivery and receptivity affecting the educational environment.

4 The Design Process: A HCI Perspective

4.1 Introduction

The decision to adopt a broad base introduction to the design process and concentrate on general design considerations relevant to hypermedia CALL authoring stems from the hybrid nature of the chosen field, placed very much astride two distinct but overlapping disciplines such as CALL and HCI. Therefore, the aim of this initial approach is fourfold inasmuch as it intends to clarify the meaning of the terminology, starting with the notion of author, present and justify the selected design process, highlight the authoring input within the process, and finally, present and explicate key design considerations.

4.1.1 Authoring

The expression 'author' and, by extension, the process of 'authoring', has been deliberately chosen and systematically used in this thesis as opposed to the more ubiquitous term of 'practitioner' or even 'designer' as it implies, even symbolizes, a typical design approach. Indeed, the term 'author' neatly encapsulates design perceptions and positions within CALL, and its development, in terms of traditions, idiosyncrasies and characteristics. Even if the image is rather *cliché* and prone to exceptions, evidence from surveys (Hémard, 1995; Levy, 1997) suggests that CALL development is still, largely, undervalued, marginalized and poorly supported by academic institutions. As a result, authoring developments have been piecemeal and under funded. Consequently, the language specialist-turned-author was and still is to an extent, by default or necessity, the archetypal self-taught and enthusiastic stakhanovist driven by the attractive potential of technology but also by technology itself. Such a general description hardly fits that of the practitioner, *a fortiori* that of the designer, whose meaning and usage are linked to a recognized, professional and sustained practice in an income-generating field. Furthermore, the term 'author' particularly befits the intended description as it evokes the notion of originator, founder and creator. Therefore, s/he is responsible and in charge of the creative development in an attempt to leave a personal mark or signature on the finished product, like some film directors or *auteurs*. Finally and ironically perhaps, the term 'author' is still generally associated with or even synonymous with 'writer'. This could also be appropriate, in some ways, since, thus far, the hypermedia interface design in CALL is still, too often, influenced by the overwhelming book form or is simply and conventionally text-based or text-driven.

4.2 The Design Process

4.2.1 A Structured Approach to Design

The process of designing human-computer interfaces often differs and adopts cycles tailor-made to the particularities of given requirements or adapted to better user-oriented design practices (see for example: Foley, 1983; Henderson, 1991; Karat and Bennett, 1991; Pylyshyn, 1991).

For instance, Henderson (1991) emphasizes the need for greater collaboration between designers and users generally felt to be necessary towards the achievement of more accurately defined designs, best suited to their respective end-user groups. Pylyshyn (1991), on the other hand, argues that designers are all too often driven to design solution by requirement prerogatives and technological innovations affecting the nature and quality of design tasks.

Such a range of differing considerations is, in many respects, indicative of the interest shown in adopting a design structure best suited to produce the required design solution but also, and more to the point, it emphasizes the problems and shortcomings encountered by designers and HCI specialists when predicting, assessing and translating users' needs into tasks and accurate user models.

The basic and fundamental difficulty arises out of the inherent discrepancy between "the language of the requirements and the language of the design" (Dix *et al.*, 1993). Therefore, a principled approach to design will strive to best match the design architecture, encapsulating the information input in the form of design specifications, and what it should output to satisfy users' requirements.

The narrowing or bridging of this "formality gap" (Dix *et al.*, 1993) has tended to be achieved by the establishment of a *rapprochement* between a more applied and generally applicable theoretical cognitive psychology in the form of guidelines, the greater reliability of and reliance on formal methods and technological advances in software development and design providing new evaluation techniques such as prototyping.

Notwithstanding the need to further discuss HCI considerations related to the chosen methodological framework, a more conceptual and generally applicable approach (Foley, 1983) is adopted here with a view to concentrating on an appropriate and adaptable design cycle capable of presenting user-interface solutions to identified design problems.

4.2.2 Model of the Adopted Design Cycle

Foley (1983) identifies five stages in the design process, from the pre-design information gathering, the design stage, the design review, the design implementation to the final tuning stage. The process itself, though naturally progressing from one stage to the next, is intrinsically iterative at any point in the proceedings.

Phase 1: Pre-Design Information Gathering

This initial phase is concerned with a study of the system to be performed. Its main activity is the Task Analysis but, equally important, is the need to identify design objectives, user characteristics and design constraints. Therefore, the pre-design stage consists of determining and circumscribing the required *functionality* of the product to be designed on the strength of the users' characteristics in addition to assessing and analysing the tasks involved in achieving the proposed design goals. The early identification of functional specifications provides a useful point of evaluative reference as well as a basis for the setting of specific design objectives, often referred to as *usability goals*, and the subsequent recognition of identifiable design constraints (Christie and Gardiner, 1990).

Phase 2: Design

The design phase is concerned with the conceptual development and evaluation of design scenarios and alternatives on the strength of the task analysis, functional requirements, user characteristics and design constraints. Foley identifies four distinct design levels: the *Conceptual design*, focusing on the concepts behind the project; the *Semantic design*, dealing with functionality and semantic meaning of the information; the *Syntactic design*, covering the temporal sequence of the presentation of the information; the *Lexical design* concerned with the interaction for entering information and visual encoding for its presentation. Therefore, the product is conceived during this stage within well-defined conceptual parameters linked to the information output from the pre-design stage. The design work, considered from the conceptual, semantic, syntactic and lexical perspectives of the user (Foley, 1983; Christie and Gardiner, 1990), provides the basis for the actual design specifications of the interface to be implemented.

Phase 3: Design Review

This phase ensures that the system to be designed is adequately tested before its implementation with prototyping tools. Therefore, decisions related to the quality of the resulting design are made at this stage. Criteria used at the pre-design and design stages are reviewed according to modifications being considered at this stage prior to coding the design.

Phase 4: Implementation

The implementation phase consists of designing the system. Traditionally, the agreed design solution is coded at this stage. More recently, new software engineering tools, providing fast, efficient and integrated prototyping facilities, have tended to make this phase more perfunctory than previously. Iterative implementations of design proposals are realized as the design itself progresses through its own process of modifications and improvements.

Phase 5: Fine-tuning

This last phase is concerned with the evaluation of the designed system and its corrections. The fine tuning stage only applies when a version of the designed application exists and only when minor modifications have to be made.

4.2.3 Main Characteristics of Design Process

One of the main advantages provided by such a structured design process is that it helps designers, in this case authors, focus on the design of the interface and, therefore, on the conception and realization of the user interface as aims and objectives of the project. In so doing, it facilitates the problematic transition and translation from design considerations and requirements into solutions and specifications and, as such, sheds light on the link between concept and design, even if this junction point is essentially fictitious since the design process does not follow a linear progression (see Figure 4.1).

Whilst conveniently establishing a meeting point between both conceptual and design phases as Figure 4.1 suggests, it must be emphasized that the design process is neither structurally static nor coercive in its approach. Indeed, the process itself is iterative and "transformational" (Shneiderman, 1997) in its pursuit of a greater match between requirements and design towards an appropriate "design fit" (Levy,1997: 163) as it gathers its own design momentum. Ultimately, the design process is a balancing act between theory and practice, highlighting two important dimensions, which could be tagged the metaphysical gap and the physical gap. Firstly, the metaphysical dimension implies that user characteristics and requirements have to come into the design equation if the designed actions are to map intentions and expectations (Norman, 1988). Secondly, the physical gap suggests that designing can be compared to a balancing act between theories and technologies but also between theories and design solutions, encapsulating the concept of moving usability goal posts.

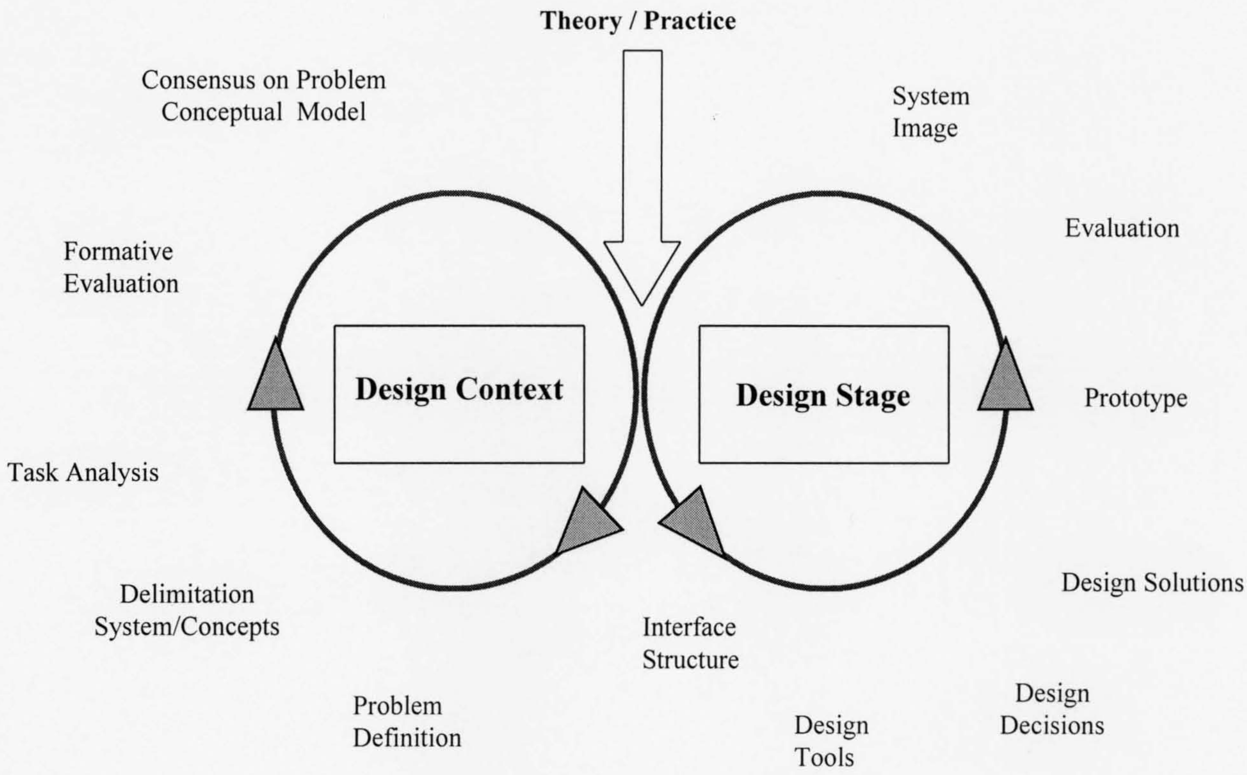


Figure 4-1 *Theory and practice within the design process*

4.2.4 Authoring Input within the Design Process

Against such a theoretical backdrop, the design challenge faced by authors of hypermedia CALL applications is particularly difficult and complex as it can be identified at different levels. Firstly, their expertise is, often, far too stretched across a wide spectrum of activities requiring different skills and support. Secondly, authoring platforms with their own design recommendations and scenarios play an influential part in establishing and shaping technological boundaries. Thirdly, points of departure (Levy, 1997), more often than not, tend to be related to practical, task-based goals better informed by instructional theories than by design considerations necessary to translate them into appropriately designed interactive hypermedia environments. Fourthly, the lack of reliable data on an albeit finite and targeted student population, means that authors still know relatively little about student characteristics and requirements in the field of hypermedia CALL. Finally, authors know relatively little of all the design tools at their disposal, and, as a result, are more likely to be attracted by design guidelines, often perceived as practical design expediencies and interpreted as convenient design rules, requiring no undue expertise and extra resources.

However, authors, as language specialists, can and must play an invaluable part within the design process as long as their role is defined. Their experience in language teaching and knowledge of learners and learning processes place them in a strategic position at the conceptual levels of the design context and design stage in the adopted design process. To facilitate this dovetailing of expertise, key design considerations have been selected according to their particular relevance to authors and the hypermedia CALL authoring process and their theoretical presentation conclude this broad introduction to the design process.

4.3 Key Design Considerations

To help clarify important design prerogatives for authors as well as introduce and define the relevant terminology, the following areas of interest and concern have been highlighted.

4.3.1 Technological Limitations

From slow and somewhat limited processors, computers have turned into more powerful, affordable PCs, desktops and highly versatile stand-alone workstations increasingly being linked by networks and distributed systems with new multiple access to super-processors. In addition to greater speed and memory storage, the computer configuration itself has also improved both at the level of interactive input devices with keyboard alternatives such as pointing and positioning devices but also at the level of output devices such as high resolution screens and LCD displays (Dix *et al.*, 1993). As a result of this technological revolution, the role and functions of the computer have changed from a data retrieving mechanism performing routine information tasks to a fully-fledged, yet accessible, dynamic interactive tool to process longer and more sophisticated applications. This new concept coupled with the range, diversity and compatibility of the available technology will obviously have to be given very serious considerations at the interface.

Exacerbated by the high profile research in hardware development and the supply and demand factor, there appears to be a marked duality between the growing range and functionality of systems on the market and the equally large spectrum of specific, yet largely unfathomed, user requirements. This is very much in evidence with software applications, which have evolved from the word processing facility, almost originally seen as synonymous with PCs, to a wide range of single, multi-frame and object-oriented applications. In tandem with these developments, the user interface has progressed from the Conventional User Interface (CUI) to, increasingly, Graphical User Interfaces (GUI) supporting the new, rich, hypermedia environment, benefiting from the added and more standardized features of the new generation of interactive input devices (Christie *et al.*, 1993). Similarly, authoring platforms have rapidly developed from basic linking mechanisms to sophisticated design tools providing their own design scenarios and recommendations. Therefore, the authoring process is unusually affected by a dual technological predicament created by the inherent limitations of the authoring tool combined with that of the author, himself / herself a user of the design tool in question. This last point is often overlooked in hypermedia CALL authoring.

4.3.2 Expertise

It is now widely accepted that advanced interactive systems, capitalizing on new computer technology, are potentially more usable than earlier, more basic, versions. By the same token, it is also acknowledged that the greater versatility and related impact of new computer systems coupled with powerful applications, as illustrated above, have noticeably improved the breadth of human-computer interaction at the user-interface. Paradigms for interaction are indeed conditioned by technological advances (Dix *et al.*, 1993) but technologically driven improvements, though capable of producing more usable systems, do not necessarily design and deliver the expected interface with enhanced usability and greater depth. This last point is particularly pertinent in the design minefield of hypermedia authoring.

A closer examination would even suggest that not only has the user-interface design remained relatively unattractive, considering the available tools and the on-going research, it is still viewed as a negligible selling factor of computer applications and as such given little prominence. Commercial and financial prerogatives all too often force designers and developers to rely too heavily on GUI at the expense of user-interactions (Wallace and Anderson, 1993). Therefore, greater efforts must be made, at this stage, to develop closer links between cognitive psychology, computer science (Landauer, 1991) with the technological potentiality of existing authoring platforms.

Notwithstanding the above considerations, it is generally agreed that the success of a good interface design will initially lie in the proper composition of the design team. To stand a greater chance, it should reflect, on the one hand, the need to appreciate, consider and master the range and scope of the available technology and, on the other, the need to understand the human dimension and adaptability to changes. This approach, as suggested by Dix *et al.* (1993), should enable system developers and evaluators to combine creativity, usability and ultimately performance in conjunction with the purpose and functions of the system to be designed. However, it ought to be stressed that much of the shortcomings of user-interface design initially lie in the very nature of its multi-discipline approach and process. Not only the all too convenient "problem formulation to solution implementation" (Jens Rasmussen, 1992) cannot apply in an area which, despite its own evolution, is fundamentally empirical and hypothetical but, above all, the ideal designer combining technological, HCI expertise and deep contextual knowledge is rare to find.

However, if indeed HCI expertise is a necessity, cognitive psychology, as explained by Landauer (1991), is still handicapped by a lack of recognition by computer technologists which, in turn, help explain the relatively few in-roads and benefits made in the area of mental processes. Furthermore, the lack of a linked applied discipline, which could channel the research input into a clearer and more quantifiable output, is similarly being felt. Acknowledging these new trends in the context of existing practices and the need to adjust to new changes, it is felt that any expertise should encapsulate knowledge of the design process itself, focusing on closing the gap between functionality and usability.

This "fruitful interconnection between the science of cognitive psychology and the science, art and engineering of computer systems" (Landauer, 1991) must be of paramount importance when considering any future design development. In parallel with technological progress, great advances are being made in the understanding of the human information process and in human mental processing in general, shedding new light into its intricate mental webs of information acquisition, retention, retrieving and processing limitations (Lansdale, 1985; Sperber, 1993). One of the aims of this research is to strengthen this theoretical knowledge and empirical expertise so as to bridge the gap between theory and practice and provide a supporting framework to solve design problems.

4.3.3 A User-Centred Approach to Design

In a user-centred approach the two most important requirements to be addressed in the design process are specificity and applicability (Carroll, 1991). In other words, the design process stems from the initial identification of the user-group with its specific requirements and the subsequent translation, implementation and iterative verifications of the data into the user-interface design. Axiomatically, a successful user-interface design should be seen to stimulate users to apply and develop their existing mental models enabling them, through a process of interactive identification, to understand and construct a system image as closely related to the proposed designer's conceptualized design model as possible (Norman, 1986). In this respect, pre-design considerations within a user-centred interface design approach support the constructivist notion that learners are, to quote Boyle (1997: 11), "viewed as active constructors of their knowledge of the world" who develop an understanding of a given environment through meaningful inter-personal interaction.

However, whilst such a dual approach would appear to be acknowledged in theory, it does not necessarily bear fruit in practice. On the one hand, difficulties lie in the nature of the information to be gathered which, tends to lead to a poorly accurate capture of both users' requirements (Dix *et al.*, 1993) and the all too elusive and, at times, conflicting concepts of users' models (Staggers and Norcio, 1993). On the other hand, the sheer lack of cross-pollination and collaborative participation between the psychological and technological domains has hampered progress towards the mutual and beneficial provision of a "science of design" (Carroll, 1991).

4.3.4 User Identification and Requirements

Much research in HCI and cognitive psychology have, in recent years, played an important part in transforming what was often considered an ineffective and poorly regarded assessment of interactive systems into better adapted, more accurate and scientific evaluation practices. Moreover, developments in mathematics and neuroscience have enabled a closer examination and identification of mental mechanisms helping towards a better understanding of mental processes. A clearer, less hermeneutic approach to comprehending the formation and process of human mental models can only generate, if appropriately analysed, an improved user interaction and interface design (Sperber, 1993).

Early consideration and evaluation of user requirements, which according to Clarke (1992) was narrowly focused, very specific and empirical or shallow (Landauer, 1991), was initially very much based on iterative and experimental methods for developing interfaces, primarily emphasizing the quantitative, behaviourist aspects of operational factors like effectiveness and learnability. Usability goals would be set, tried, tested and redesigned through iterative design taking little or no account of the less quantifiable behavioural and physiological human factors affecting performance within the given user environment (Whitefield *et al.*, 1991). Similarly, psychologists, who had successfully managed to highlight deficiencies at the user-interface, often found themselves incapable of providing remedies, which would have improved design methods. More useful information allowing greater scope for objective diagnostic assessment are now coming into the evaluating equation, providing better guidelines and more cogent sets of principles than previously (Dix *et al.*, 1993). Equally, a greater understanding of computer behaviour in conjunction with user behaviour is enabling designers to make greater use of observations (Jorgensen, 1990) ultimately leading to an improved user-interface design.

Although the emergence of advanced automated tools has generally improved human computer interaction, much remains to be done at the user-interface level (Dix *et al.*, 1993). Paradoxically, the greater the success of computers, the more undetermined their impact seems to have been on end-user groups. Whereas, initially, software developers tended to design systems for a known, quantifiable expert group, the present widespread appeal enjoyed by computers has, logically, broadened the spectrum of users' characteristics, from the neophyte to the skilled user and expert. Therefore, an important factor in the pre-design context is one of identification, since the performance and success of the interface design will be conditional upon its precise targeting and ensuing satisfactory usability, matching skills, needs and achievements (Foley, 1983).

The problem of accuracy is compounded by difficulties brought by modern trends, affecting users' perceptions and learning skills. Firstly, given the user's general lack of IT expertise and poor adaptability to new models, there appears to be a need to consider and assess existing mental models and motivation factors in the user's work environment. Secondly, end-users, themselves, are quite naturally conditioned by the technologically oriented promotional stance adopted by manufacturers and swayed by the functional characteristics of computer systems. Therefore, greater emphasis must be placed on the duality between functionality and usability, adhering to human factors principles supporting usability and interaction, such as those described by, for example, Dix *et al.* (1993) and Preece *et al.* (1994). In addition, the available and, indeed requested, degree of sophistication and complexity of systems and their interface can have some adverse repercussions on the users' learning time. In other words, how reconcilable are high functionality, learning curves and productivity without having to resort to known standard models? Ironically, however, this predominant standardization process, designed to help users identify with and project their own mental models, can lead, in many ways, to a partial or ineffective use of the system by highlighting the user's limited knowledge and deeply ingrained idiosyncrasies.

To remedy this problem and rationalize complex interface designs, targets, such as input, output, impact and user characteristics, have to be met so as to develop a sound awareness of the constraints and structures at the origin of the needs and purposefulness of the system (Rasmussen, 1992). This becomes even more apparent when designing "non-deterministic" systems (Dix *et al.*, 1993), bringing in an additional informative and communicative dimension into the computer-user interaction.

4.3.5 Methodology

A crucial issue to be considered at the conceptual stage of the design context is to define the most relevant and appropriate approach to interface design in conjunction with its objectives. In other words, how to exploit the design expertise combining technological, HCI expertise and learning theories with a view to conceiving the best possible design. In the light of above-mentioned considerations, a broad, three-fold approach to methodology has to be adopted.

Firstly, it is to be determined by the main design prerogatives and conditions attached to the project. Wallace and Anderson (1993), through a process of weighing and assessing HCI and technological input, identify four such major approaches to the design method, from the customized craft method meeting specific conditions, software engineering with HCI techniques, applied cognitive psychology to the technology-centred approach based on automated development tools.

Secondly, it is to be informed by appropriate learning approaches and relevant theories to identify clearly what Jacobson (1994: 141) calls the "modalities for conveying knowledge with interactive multimedia and hypermedia technology". In turn, these pre-design considerations play a critical part in selecting and elaborating on the learning environment to be designed. They will range from the more prescriptive and structured, instructional design approach to the more minimalist, constructivist position with greater potential for learner control.

Thirdly, as it is becoming increasingly possible to produce accurate and reliable HCI data, it is equally crucial, once the targeted user group and the broad parameters within which it operates are identified, to select the most appropriate evaluation methods and scientific observations. These should yield the relevant data and as wide a range of user-interaction variables as possible. So, whilst recognizing the intrinsic values of design methods in specific design contexts, an early identification of a matching evaluation and design approach will best address potential design issues.

4.3.6 Design Objectives

The chosen methodology will, in many ways, be pre-empted by the aims of the design project primarily based on a needs analysis. Such an approach will identify the overriding rationale for the project, the main characteristics of the user-group, the required tasks to be performed by the system and the physical and organizational environment within which such system will operate (Booth, 1989). The initial investigative phase of the design context should, through an emphasis on human factors, yield a reasonably accurate assessment of user requirements and achievable user tasks measured against the possible system functionality within identified constraints such as technological limitations, users' existing mental models and known or projected resources. On such a hypothetical premise, this analysis will, in turn, produce a set of usability criteria (Dix *et al.*, 1993) within the specific environment resulting in the selection and development of the most appropriate design whose requirements must match user needs.

Therefore, the satisfactory meeting of design objectives must be predicated upon the proper progression through the above mentioned design considerations, accurately identifying the user group with its characteristics, own needs and interface conceptualization, as well as intrinsic interactive environment. These critical issues of the pre-design process are on the whole very well documented in HCI literature, by, for example, Benyon, *et al.* (1990); Booth (1989); Dix *et al.* (1993); Foley (1983); Newman & Lamming (1995) and Preece *et* *al.* (1994) to mention but a few.

4.3.7 User Interface Requirements

User interface requirements, in the form of a Statement, are established on the basis of both the data provided by the targeted users, such as their mental models of hypermedia and specific requirements as well as design objectives and relevant considerations adopted by authors. On the strength of this information, the User Interface Requirements Statement includes a broad conceptual description of the functionality of the user interface to be designed followed by identified usability features, which are to become the design hallmark of the new interface. In order to link user requirements with usability features, the Statement also includes important usability goals, stemming from the protracted consultation period with users, and agreed upon by both users and designers. In turn, these usability goals play a strategic role in the design process as they are used as referential measures against which the user interface is to be evaluated.

The Statement presenting user interface requirements, by encapsulating the necessary modelling knowledge, is the culmination of the pre-design consideration phase of the design process. As such, it carries a data analysis of user requirements and mental models established on the strength of brain-storming sessions, directed interviews, focus groups, user walkthroughs and general on-going discussions and a task analysis drawn up to highlight the sequential and logical nature of broadly identified tasks within the proposed user interface. Finally, it presents usability goals, conveying the dominant functionality as perceived by users and agreed by designers with a view to targeting the evaluation process more accurately.

4.3.7.1 Task Analysis

Whilst the study of task analyses, *per se*, does not fall within the remit of this thesis, mention must be made of the crucial design role which they play in assessing the necessary human task requirements and task behaviour of a computer-support system. Broadly, the task analysis provides information relevant to the identification of both the main goal of the project as well as the set of component subtasks needed to achieve such goal (see for example Dix *et al.*, 1993; Preece *et al.*, 1994). A wide range of methods, dependent upon the available data input, can be applied to provide this task information to aspects of the design of new systems such as its *functionality*, *the prioritization* of *tasks, the optimization of human-computer functions* and *optimal performance of the product* (Christie and Gardiner, 1990). The distinction made by Hammond *et al.* (1987) between task analysis tools meant to represent the task and tools designed to predict performance and select design solution emphasizes the difference between the *conceptual representation of the task domain* and *the user's required knowledge to perform a task.* Generally, a design will be considered good when both representations of the task and the user are adequately matched. The role of task analysis tools is twofold. It can help the design team to develop early task requirement specifications whilst, similarly, involve prospective users in the pre-design stage of the design process (Christie and Gardiner, 1990). Such early pre-design analysis can therefore help provide useful information relevant to the identification and specification of the system's functionality as well as establishing a basis for further evaluation.

4.3.7.2 Functionality

As previously mentioned, modern system designs are not contingent upon irremediable hardware limitations. It follows that an important part of the design context has to focus on and be determined by the appropriate platform for the interface, be it an existing authoring package, or a more dedicated in-house system. Assuming, therefore, the adequate capacity and capability of the equipment, it is crucial to ascertain if and how specific sets of tasks can be performed using known, or at least recognizable, and standardized processes. Within the context of an early, dual approach combining and adapting human factors with technological developments, the enhancing of existing software engineering processes as suggested by Wallace and Anderson (1993) could certainly improve the interface. The outcome of such an approach, were it to be successful, could be readily attractive in view of its recognized functionality, and ensuing usability with the targeted user-group, especially when resource constraints hamper the research process.

4.3.8 Resources

The quintessential time factor linked with HCI research, the wide ranging expertise coming from many disciplines and the sheer development costs often "accounting for more than half the total code in a system" (Bass and Coutaz, 1991), inevitably have serious resource ramifications. Whilst a good user-interface design is predicated upon the resources necessary to initiate, develop and implement it successfully, above mentioned trends and commercial prerogatives have, if anything, led to very real financial constraints. These, obviously, will be entered as a key factor in the pre-design equation.

4.3.9 Design Tools and Techniques

Emphasis, so far, as been placed on key considerations in interface design concentrating on the crucial interactive nature of the interface and the need to consider adopting a structured, principled approach to design best suited to accommodate design prerogatives and HCI research findings within the design process. Special attention must now be paid to specific design tools and techniques contributing towards both a better understanding of the user's and the designer's domains.

Design guidelines, in many ways, best illustrate the specialization process undertaken by psychological scientists in an attempt to transfer applicable and simplified knowledge to designers. This accessible applied cognitive psychology, by providing a better understanding of the user in relation to specific cognitive aspects of interface design enhances both its objectives as a broader science in the eyes of the designer and ultimately the applicability and richness of the user-interface design.

More than a mere design toolkit, human-factors guidelines derive from a conceptual methodology translating cognitive psychological theory into simple, legible guidelines (Marshall *et al.*, 1987). Although limited in their application and requiring a degree of interpretation on the part of the designer, such cognitive psychology guidelines can make a useful contribution and complement empirically supported interface design guidelines currently used by designers.

It is this research's main objective to try to facilitate the use and, therefore, the applicability of design principles and guidelines, highlighting in the process their unique and pivotal role in dovetailing the necessary theoretical underpinning of the design process to a practical and realistic design support.

4.3.10 Analytical Models

Whilst guidelines provide accessible and applicable HCI knowledge to the designer thus yielding useful points of reference and information, further steps are necessary to design the configuration of the interface for specific tasks and users (Gould & Lewis, 1985).

The qualitative approach to design can, at this stage, be complemented by a more quantitative and predictive analysis of requirements and tasks provided by computational models of the user, such as the GOMS (Goals, Operators, Methods) model (Card *et al.*, 1983). These are conceived to help designers realize task analyses by identifying the goals, the sequential actions and cyclical cognitive processes involved in human-computer interaction (Gugerty, 1993).

It is argued that greater considerations of user needs during the design cycle can be achieved by using analytical models to generate better designs through an iterative design process based on an analysis of goals, functions and requirements. The design takes into account such task analyses which have identified actions, sequences, operators to carry out the tasks and relevant information requirements linked to actions and procedures (Gugerty, 1993).

Similarly such models can be used to evaluate the user-computer interaction. However, analytical models based on sequential, error-free tasks, tend to be better suited to provide procedural as opposed to factual knowledge, thus limiting their applicability to the earlier phase of task analysis and design generation of applications such as help systems. Furthermore, these analytical methods, by dint of being procedural, are only appropriate to routine tasks and not to creative, problem-solving activities (Card *et al.*, 1983: 420), which, therefore, seriously limit their function and impact within a hypermedia environment. This last but important point helps explain the need for more qualitative and flexible methods, such as eliciting mental models in user walkthroughs for user-centred interface.

4.3.11 Relevance of HCI Literature

To conclude this chapter on an HCI approach to the design process, it is considered fitting to stress and clarify that the main HCI input into this research is essentially seen as providing a theoretical underpinning and appropriate, experientially-tested and proven, methodological approaches. On this premise, the HCI literature referred to in the thesis, by dint of identifying conceptual parameters and principled design supports, is fundamentally referential and, therefore, relevant and applicable to hypermedia as its theoretical basis transcends technological changes. Interestingly however, mention must be made that, still, remarkably, little context-specific theoretical research is carried out in the field of hypermedia aside from web-related studies, let alone hypermedia for language learning.

5 The Hypermedia Environment: An Authoring Approach

5.1 Definition and Concepts

The name *hypermedia* derives from *hypertext,* a term coined by Ted Nelson (1965), to represent 'non-sequential writing'. The expression, based on the Greek prefix *hyper*, essentially describes an important metatext application presenting a multi-layered text management format thus enabling the user to browse through extended textual data in a non-linear manner. Interestingly, the concept itself was introduced by Bush who, in his now famous seminal paper 'As we may think' (1945), defines the human mind as operating by thoughts organized on the basis of associative links.

By enabling other media extensions, such as sound, animation and video, to be incorporated and interlinked as discrete nodes, hypermedia encompasses hypertext which, initially and restrictively referred to the digitization of textual material. This added multimedia dimension to hypertext inevitably gives hypermedia greater design and interactive scope as well as the potential for representing and structuring the relevant knowledge base more closely mapped onto natural interpersonal interaction. For this reason the term hypermedia will be used consistently although, conceptually, hypertext and hypermedia present similar interactive problems and raise comparable issues (Landow, 1992).

The main function of hypermedia is to establish and facilitate cross-sectional movements within multiple documents, bypassing, in so doing, both traditional linear approaches to textual material and formal distinctions between documents (Balpe *et al.*, 1996). From a different and more focused perspective, Whalley (1993) defines hypertext design as "a fragmented text whose components can be rapidly accessed" given the right measure of interaction by end-users. Thus, hypermedia manages nodes, such as text, graphics, sound etc., both in hierarchical and non-hierarchical structures with the help of customized links which when activated allow the user to access and "crisscross" (Kommers, 1996: 6) within the information space. The resulting interactive control exercised by users is therefore at the crux of the main interlinking function of hypermedia. An interesting introduction is provided by Fisher and Mandl (1990: 9) who, differentiating *hyper*media from *multi*media, describe hypermedia as *virtual* media because of the deep and rich nature of its *hypersource* of information whose full potentiality is conditional upon full and meaningful user interaction. This symbiotic interactive relationship contingent upon *the stimulus attributes* of the *hypersource* and the *responder attributes* of the *user* raises an important conceptual duality of hypermedia. On the one hand, it intrinsically links the domain-specific data and media input with the range, scope, accessibility and interactive potential of embedded user tasks and achievable goals. On the other, it recognizes and therefore highlights the need for a satisfactory mapping between the system's potentiality and the user's ability to react to it. Such a *virtual* role makes hypermedia the most logical vehicle to convey and present the multimedia database within a structure controlled by the user. Nielsen (1995) who defines hypermedia as the natural technique providing the necessary interlinking between multimedia-based nodes corroborates this point. Beyond the multimedia modularity, hypermedia provides and supports information, communication and exploration. Indeed, the meaningful user interaction generated by the semantic structure of the information base and its satisfactory manipulation by the user is the hallmark of hypermedia insofar as it represents its strength and *raison d'être*. It is also, ultimately, its weakness due to the complexity of information structures, resulting user interactions and the range of expertise required to design interfaces. Therefore, one of the crucial conceptual problems of hypermedia lies in the rapport between the structural potentiality of the content of the knowledge base and the representation of its formalizations in the shape of webs of semantic links. All the more so since, unlike expert systems with their sophisticated models and data structures, hypermedia promotes a naturally intuitive navigational user-interaction through its information base, which is not predicated upon a prior knowledge of its structure. However, the correlation or, indeed, the confusion between user-interaction and user-intuition, often results in blurring the aims and objectives of hypermedia whilst ultimately linking it to a wider variation of navigational concepts such as browsing and ill-proven inductive learning modes promoting discovery, associations of ideas and default memorization through practice. But as Kommers (1996: 6) rightly warns "As you get a taste of browsing, you will soon discover its price. Jumping away via hot spots often brings you into contexts that have little to do with either the previous fragment or your global interest".

In parallel with recent and relentless technological achievements, research in hypermedia has been first and foremost focusing on developing more intelligent systems providing a greater capacity for machine *comprehension* (Balpe *et al.*, 1996). In a second instance, research in Human Computer Interaction (HCI) has been more recently emphasizing the need to provide users, instead of machines, with a greater *comprehension* of the content and inner structure of its database with a view to encouraging greater and more meaningful interaction. However, the remaining discrepancy between users' conditioned approach and relationship to paper-based *text* and screen-based *hypertext*, favouring traditional forms of writing, is still the clearest indication that hypermedia needs to create new interactive methods commensurate with its visual, layered presentation. This last point is particularly pertinent since the lack of conceptual methodology in hypermedia explains, to some extent, the reason why the information base used in hypermedia design is almost always initially conceived in a paper-based presentation.

By contrast, if hypermedia is a virtual media necessitating user interactivity, multimedia is a generic term, which fundamentally describes a display of different discrete media, such as textual fields, graphics, animations, video clips and sound recordings, supporting a range of complementary representations. However, unlike the hypermedia environment, the multimedia interface is a computed entity in its own right and, therefore, is not dependent upon a specific or expected navigation by users who are perceived as passive information-seekers. In this respect, Nielsen (1995: 13) compares the difference between multimedia and hypermedia with that between "watching a travel film and being a tourist yourself".

Finally, a note of warning must be added to these introductory definitions within the context of this thesis focusing on the field of hypermedia for language learning. Indeed, if both generic terms are conceptually clearly defined at this stage, their conceptual difference when used to describe either environment in summative evaluations or when referred to by students (see Chapters 7, 8, 9) cannot be so conveniently clear-cut for two essential reasons. Firstly, developers tend to opt for the more eye-catching and commercially viable term of interactive multimedia instead of the lesser-known, more academic hypermedia, hence surreptitiously and unwittingly instilling an element of confusion into multimedia interactivity. Secondly, it was felt that, in conjunction with the previous point, students would find it easier to relate to and understand the term multimedia and thus be more willing to answer the questionnaire and be attracted to the experiment than if the more esoteric term of hypermedia had been used instead. Interestingly, references to multimedia, interactive multimedia or hypermedia by students will inevitably convey a degree of confusion between these terms but also between the different interactive roles and interfaces identifying these environments.

5.2 Design Considerations

Theoretically, hypermedia's virtual dimension is conceived at three different levels which could be broadly defined as the design of the user interface, the design of its architecture based on nodes and links and, finally, the storage of its database. However, even if this forms the initial premise of hypermedia's theoretical definition, in practice, these identified layers of abstraction have tended to overlap blurring such a three-pronged design model. Indeed, most hypermedia systems seem to have adopted a more flexible design approach encapsulating an appropriate range of design features from these levels as opposed to adhering to a strict, more recognizable structure at the design stage (Nielsen, 1995: 131). This last point will become all the more pertinent when considering hypermedia CALL authoring with its empirical, task-based approach and limited expertise.

On this basis, particular attention has been paid to these important design considerations focusing on structural architectures, cognitive and design issues related to the user interface and authoring requirements. Indeed, these aspects of hypermedia authoring, including the influence and role of the information base must be examined as they form an intricate as well as an inextricable part of the design process.

5.2.1 The User Interface

In hypermedia, special emphasis is often placed on a frame-based design approach highlighting the crucial importance and role played by the node. Therefore, the user interface is similarly, or by default, node-driven and essentially concentrates, judging by existing systems, on the availability and display of the necessary interactive commands as well as links in order to highlight types and functions of embedded anchors in and out of nodes. These artefacts, creating the design demarcation line between author and user control, can take the shape of typed links, icons, different colour patterns, changing cursor or mouse-pointer designs, pop-up windows, reference fields, viewers and so on. But most importantly, as can be appreciated from these broad introductory considerations, the user interface cannot be approached and conceived in isolation from its inherent and necessary structural mapping.

5.2.2 Nodes

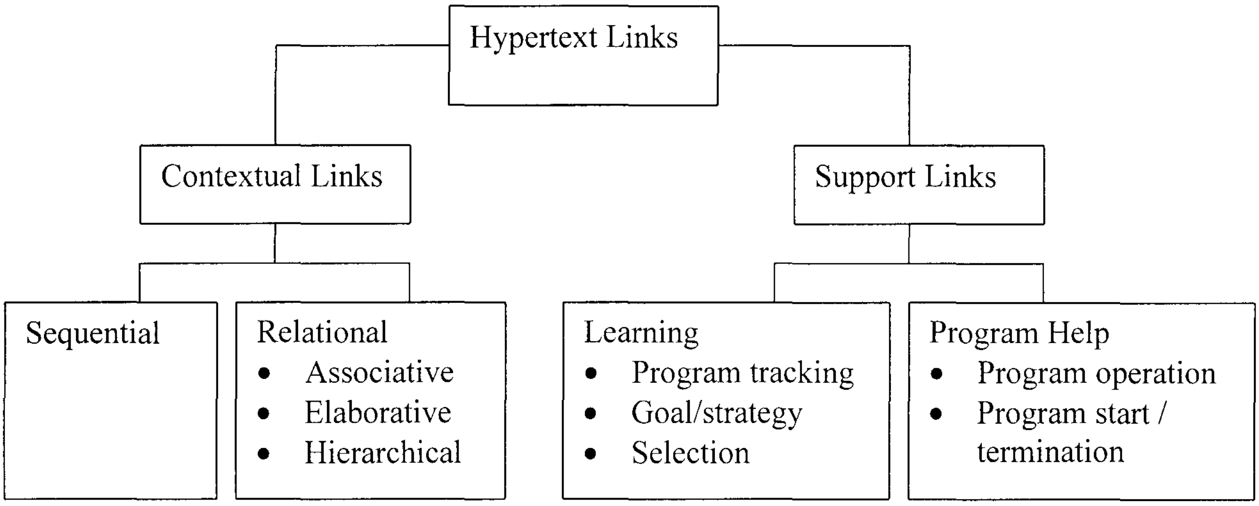
Nodes are computational modules of information representing textual as well as multimedia material interrelated by means of embedded links. Also called frames, they represent the basic unit of data or basic building block. Nodes vary in size, although the information they contain is often limited to a single screen, hence, their common comparability with the computer screen. However, although this analogy is somewhat restrictive since information bits are, by essence, multiform, nodes can be metaphorically and conveniently referred to as pages or note-cards. Nielsen (1995), on the other hand, emphasizes their capacity to hold and display information data, distinguishing between frame-based and window-based systems. Interestingly, even if frames are often identified as screen displays, their format and size do not necessarily facilitate convenient screen adaptations. In design terms, data might have to be displayed over several frames in order to comply with the limited nature of the physical interface or might incorporate a scrolling device to view a large information field. Finally, in computing terms, nodes carry vital computational data supporting the chosen architecture of the system to be designed, the media types and data.

By carrying discrete fragments of information, and being connected and interrelated by links, the node acts like a module in a modularized environment. This concept of modularity is quintessential in hypermedia, inasmuch as it encompasses access, exploration and, more generally, usability. Therefore, a coherent and manageable node input into such a modularized framework is determined by the type, size, organization and purpose of the information to be presented. At the macro level, nodes are fragmented units within an identified structure based on context of use, content, objectives and learning strategies. At the micro level, nodes break the information down into representational sections to be displayed on screen.

5.2.3 Links and Anchors

Links interconnect nodes providing access and navigation. They allow the user to navigate through the hypermedia database by means of special or customized buttons or embedded anchors within the nodes on screen. The link specificity includes attributes such as directionality, type, size, position, display and function. Links will either provide or refer to information or, alternatively, they will be intrinsically connected to the structure of the nodes (Jonassen and Grabinger, 1990). Whereas the link in the traditional text form, or *substring* (Nielsen, 1995: 141) directly connects two nodes from a clearly identified *anchor* to a specifically embedded *destination* the multimedia composition of nodes in hypermedia, such as moving images and sound, inevitably leads to problems related to the design, identification and synchronisation of anchorage points (Nielsen, 1995). Examples of such solutions include the traditional use of plain text as anchor, the *micons* or moving icon or the need to create a *visual surrogate representation* of the sound anchor necessary to trigger the link (Nielsen, 1995). In addition to anchors, links need interactivity indicators such as visual or audible feedback (Grabinger and Dunlap, 1996: 92).

In the theoretical model such as the three level hypertext system (Campbell and Goodman, 1988) link attributes as well as relevant computational information are managed at an abstract level where the nature of the interaction between the user interface and the content of the database is determined. Usefully, Grabinger and Dunlap (1996: 94) identify contextual and support links as being the two broad types existing in hypermedia (see Figure 5.1). Contextual links provide access to the information base and are, themselves, subdivided into two categories: sequential and relational links. Conversely, support links are 'metalinks' insofar as they provide permanent on-line access to support material and help facilities related to operational and structural aspects of the modular environment



(Grabinger and Dunlap, 1996: 91)

Figure 5-1 *Classification of hypertext links*

Sequential Links

Sequential links create a linear connection between nodes. This rigid path leads to a specific learning goal. These links provide a single, systematic, node-based progression through the information base. Since the user interaction is predetermined the cognitive overhead related to navigation is reduced to a minimum.

Relational Links

Relational links provide non-sequential access to information. Three kinds are identified: Associative, elaborative and hierarchical. *Associative links* enable connections or jumps to be made between nodes on the basis of associations generated by the context of use or learners themselves. These ubiquitous links in hypermedia support student-controlled interaction, in terms of exploration and navigation, as well as provide flexible and potentially meaningful access to information. Unlike associative links, *Elaborative links* essentially relate to the content of the information inasmuch as they allow the learner to explore material in-depth. Within a hypermedia structure, these elaborative paths would form optional branches presenting varying levels of depth on a given subject. *Hierarchical links* create highly structured environments providing built-in progression between nodes within a specific path towards a clearly earmarked instructional goal.

Support Links

Links supporting learning provide orientation with connections to visual cues such as to maps or overviews as well as information related to interaction and task execution such as access to a tracking device. Links must also be created to connect to specific as well as generic task-based feedback mechanisms. *Goal/strategy selection* links provide access to alternative learning scenarios related to interest, level and skills. *Program help* links provide connections to on-line support related to the operation of the system, including start, restart and quitting.

5.3 Architectures

However, beyond this mechanistic approach based on nodes and links, authoring is about shaping and designing an appropriate architecture whose structure, ultimately, enables the targeted students to undertake and, hopefully, succeed in completing the necessary and expected exploratory interaction. Therefore, high level considerations concerning the context of use, the mode of access as well as learning content and strategies whilst forming part of the author's conceptual model must be translated into projected student movements and interactive scenarios to be integrated into the designed interface. As a result, the main design problem at this stage in the process stems from the difficult transition between the conceptual model and its realization into a system image, at the level of strategies, technologies and student interaction. Ironically, the more traditional and, therefore, sequential and hierarchical the structure is the easier it becomes to reproduce a student interaction, which matches the expected learning approach. Conversely, a conceptual model of a network of associated nodes designed with full student control is unlikely to meet its mental match amongst students and, *a fortiori*, find a satisfactory system image. On this premise, hypermedia structures are intrinsically related to and assessed on the basis of their interactive impact and meaningful outcome.

5.4 User Interaction

5.4.1 Navigation and Browsing

In hypermedia, emphasis is essentially placed on meaningful user interaction and dynamic, navigational user control. By providing an associative data management structure in a rich, non-linear database, this technology-based medium allows the user to *navigate* by means of links through the desired order of nodes and access the required information. Such navigation facilities in *three-dimensional space* are often referred to by metaphors such as *browsing, travelling* or *wandering* depending on the purposeful character of the user-interaction. They pre-determine the nature of the paths chosen along links between information nodes, be they fixed *guided tours* through the data structure, knowledge based or individually controlled (Harland, 1991).

Conceptually, navigation and browsing offer two clearly separate forms of interactive controls to be exercised by the user and linked to the adopted exploratory and search strategies. Interestingly, Woodhead (1990) suggests that the former style is more appropriate to focus on the "macro structural features of the information" and corresponds to the *strategic* end of user-interaction. Conversely, the latter, in the form of browsing concentrates on the "microfeatures or actual information nodes", focusing therefore on the more *tactical* side of user control. This conceptual approach is largely supported by Kommers *et al.* (1996:7) who likens browsing with "the detailed sequence of steps" taken by the user, whereas navigation encapsulates "the browsing pattern due to overall intentions of the user".

5.4.2 User-Disorientation

The intuitive nature of hypermedia's navigational interaction can generate a well-known side effect in the form of disorientation. Although often linked to large information bases, this phenomenon is nonetheless widespread amongst users despite the provision of techniques, such as the back and history commands, to counteract its effects. Research in the field (Jonassen & Mandl, 1989; Martin, 1990; McKnight *et al.*, 1993; Nielsen, 1990, Shneiderman, 1998) has also identified a number of navigational problems linked to user behavioural patterns. These stem from:

- poor or lack of understanding of navigational facilities within the information structure,
- poor or lack of understanding of conceptual framework designed by author, due to its complexity or non-representation,
- confusion between navigation and browsing, or between a strategic and a tactical approach referred to above, the latter encouraging multiple digressions and diversions,
- poor or lack of understanding of usability goals of structure as set by author,
- poor or lack of identification of links and nodes preventing users from retaining structural information, creating additional cognitive overhead and added distraction,
- proliferation of links generating convoluted paths,
- over-fragmentation of the information base,
- poor or lack of visual representation of the structure of the information base.

5.5 The Hypermedia Authoring Platform

Within this broad, introductory context, the hypermedia authoring process can best be described as a flexible means of conceptualizing, designing and developing a wide range of dedicated environments such as computer-based presentations and instructions, student-centred interactive learning platforms and database management systems. It involves inputting text and media-based material, with a view to assembling all the component parts into the hypermedia system using the computer programming mechanism in-built into the application and other relevant pre-programmed facilities. The assembly of these components (such as text, graphics, animation, sound and video recording) is realized by means of links created by the author and subsequently activated by the user to navigate through the application. (Fox *et al.,* 1992; Deegan *et al.*, 1992).

Authoring tools available on the hypermedia market offer a wide range of possibilities, ranging from simple packages for the PC dependent on external programs to full authoring systems offering sophisticated functionality, speed and appropriate configurability to software developers. This latest generation includes versatile object-oriented applications for Windows, using improved memory management and capable of developing their own dedicated and domain-specific interactive applications. Hierarchical and non-hierarchical link structures and customizable commands are created by specially designed anchors such as words or pictures linking other similar anchorage points within the information base and customized buttons imbedded into the user-interface. These are subsequently enabled by the use of a programming language with English-like syntax specifically conceived for the novice programmer. The following are examples of such programmes: LOGiix for Guide; OpenScript for ToolBook; Hypertalk for Hypercard.

Technology in this electronic domain is now sufficiently advanced, given the right combination of processing power, random access memory and storage capacity, to turn an initial design into a professional looking and sophisticated computer-based hypermedia application. Furthermore, the accrued authoring potential of hypermedia over multimedia, from an author-user perspective, yields a good match between the wide range of available features to be handled and the necessary learning curve (Harland, 1991).

However, it is also worth noting that the concept of hypermedia authoring is often based on or quite simply reduced to providing a platform with interlinking functionality and features overshadowing or, indeed, blurring the true nature of the intended interaction.

5.5.1 Authoring Features

At the technological level, a hypermedia application needs to be delivered on a CD-ROM disc because of the large amount of storage required for all the multimedia extensions incorporated within the interface.

Generally, an authoring platform attempts to facilitate the conceptual approach to the design process by linking the presentation of its tools and features to a recognizable metaphor. In turn, authors are often encouraged to form an initial mental model of the interface design of the platform itself but, also, of the structure of what s/he will strive to conceive within the existing technical parameters. This prevalent mental architecture is itself composed of single entities, similarly called units or nodes as seen previously, linked together to form the basic construct of the structure. Each unit consists of a number of objects forming the basic elements of the authoring platform which, when encoded with appropriate commands, provide the underlying functionality of the application to be authored.

With reference to Asymetrix Multimedia ToolBook 4, authoring concepts, tools and features comprise:

- The book as a primary but predominant metaphor: the book metaphor is used to describe the development system and its authoring environment. As a result, an application within ToolBook is called a *book* constructed from basic units called *pages*. Such a mental model offers initial advantages as its universality and immediate mental recall can help authors to conveniently link the construction of a book to the design of a ToolBook application. However, ironically, it is anathema to a good hypermedia interface design which, must, by essence, break away from the overwhelming linearity of the known two-dimensional textual presentation. Therefore, whilst authored pages are numbered, efforts must be made to deconstruct its indelibly linked concept of order.

- The page: this electronic unit presents greater flexibility than its counterpart in the physical book. It can adopt any shape or size and be positioned anywhere within the application. Furthermore, several pages can be displayed together with the use of viewers, be they read-only, pop-up viewers, main window viewers, palette viewers etc. The page contains unique objects placed on its foreground layer but also permanent objects placed on the background layer of the application.
- Objects: this basic element of ToolBook includes buttons, graphics and fields. Any object can be associated with a coded script empowering it with a function. The script triggers the object to handle the programmed action such as releasing the left mouse button when pressed. When a handler is executed, instructions are passed to another or other objects. If a handler is not found it passes the message up an object hierarchy from objects, Group, Page, Background, Book, System Books to the ToolBook system. These created objects form an intrinsic part of the expected visual effect and represent the core element of the basic interactivity of the authored application when attributes or properties are assigned to them.
- Operating modes: two modes of operations can be used. The Author mode enables the author to design the application and the Reader mode permits the author to test and run the designed application.
- Tools palette: the palette contains the tools, which cannot be accessed from the drop-down menus of the toolbar. These additional design tools are used to create and generate objects which include: Button, Label Button, Radio Button, Check Box, Radio Button 3D, Field, Record Field, Borderless Field, List Box Field, Combo Box, OLE Container and Stage. Additional drawing tools and functional tools such as. Select and Magnify are similarly provided.

- Fields: fields are objects, which contain textual material. Greater emphasis is placed on their properties as these differ according to the appearance and interactive function of the represented text. They include scrollable text, list and text boxes. Record fields are background objects, which contain additional programming resources. They are comparable with data fields in a database.
- OpenScript: OpenScript is ToolBook's scripting language enabling the author to assign scripted properties in the form of natural-language instructions to created objects. OpenScript provides built-in messages, properties and functions behind ToolBook's interactivity based on the concept of detection and response.
- Events: any action by the author/user within the ToolBook interface is interpreted as an event, which is responded to by the application. An event triggers this machine interaction by generating a message. The message informs the object on the nature of the event.
- Finally, the authoring process is essentially driven by the underlying concept behind ToolBook and by events. Therefore, the designed interaction is linked to the system's response to events and ultimately to the quality and subtlety of the scripted messages. As a result, the design process can all too easily be, itself, driven by technological considerations and issues related to the varying degrees of expertise and control exercised by the author over the authoring platform's functionality.

5.5.2 Authoring Problems and Limitations

At first sight, authoring material with an appropriate authoring platform providing all the necessary tools appears to be straightforward. However, experience and hindsight has proved that the design process is complex and the design product unclear.

First and foremost, the authoring shell, representing a design tool in its own right, requires the user, in this case the would-be author, to possess adequate design skills. In effect, authoring is tantamount to overseeing the whole of the design process, from the pre-design objectives and task analysis to designing, developing the user interface, inputting the relevant data and evaluating the authored application. The sheer range of necessary skills from computer literacy to interface design in addition to the domain-specific expertise to present the relevant information base and the amount of time required to achieve a satisfactory product can constitute, in themselves, a real enough deterrent for the individual author. Additionally, the cognitively ambitious nature of the expected user interaction, at author's level, is further compounded by the lack of support and guidance by software developers more concerned by commercial prerogatives than by the identification of user groups and specific user requirements. As a result, ill-defined authors tend to be technologically influenced and driven within the confines of the functionality provided. In turn, this inadequate control over the design process and tool has a similar knock-on effect on the designed product often illustrating what was technologically and financially possible with little concern for or focus on the meaningfulness of the user interaction.

Secondly, the three-dimensional or non-linear approach to textual material offered by hypermedia, coupled with its referential browsing potential have made authoring an attractive proposition for the structural presentation of information bases. However, some subject matters and domains, thanks to the natural modularity or hierarchical structure of their information data base, have reacted better than others to the hypermedia treatment. Similarly, these areas have benefited from their vantage position and further developed their expertise, experience and confidence as in the case of encyclopaedic, historical or technical packages. Conversely, the use of hypermedia as a means of reproducing and highlighting interpersonal interaction in the field of foreign language has proved a far greater challenge due to the inherent complexity and spatial richness of its linguistic base and poor initial expertise in the field.

Ironically, the interactive strength of hypermedia is often considered its weak authoring point in so far as the initial structuring of the information data into either random access or highly structured hierarchical models must be clearly conceptualized, identified and designed not only to reflect the chosen methodology but also to improve navigation and highlight learner control.

5.6 The Hypermedia User Interface

5.6.1 A Software Approach

Although falling outside the hypermedia CALL authoring brief and, therefore, the parameters of this thesis, an insight into the software designer's response to the hypermedia design challenge can provide further informative support and background to the targeted authors in the area of data management. This is particularly the case when considering the complex nature of the media-rich environment concerned with and the problems linked with technological limitations in terms of planning, physical and temporal acommodation as well as capacity of its electronic storage it requires (Emery and Ingraham, 1992: 18).

In technological terms, the challenge in question very much rests on two main concerns. The designer is met with the dual problem of having to design a user interface which must both present the content of the information space and convey the meaning of the presented material to the users on the strength of its structural underpinnings. Therefore, what is of particular interest here is the way software designers have approached this difficulty and computed structural models designed to facilitate the design of the user interface for hypermedia. Interestingly, the very potential of hypermedia with its inherent combination of nodes, links and anchors has meant that its conceptual design have evolved into many different models depending on the nature of and necessary access to the information base.

Generically, these models derive from the three-level principle of the hypertext system enunciated by Campbell and Goodman (1988). These are the *Presentation level* or user interface, the *Hypertext Abstract Machine (HAM)* level or nodes and links and, finally, the *Database* level or the storage of data and access elements.

These early models such as the Hypertext Abstract Machine (HAM) by Campbell and

Goodman (1988) basically represented an attempt to store vital information related to nodes and links, such as "owner" attributes, updates, version numbers and design characteristics (Nielsen, 1995: 132). This organized storage of computed information was in turn conceived to better manage the structure of hypertext-based systems but also to facilitate the standardization process between existing hypertext formats.

To provide a better understanding of this approach and help inform the design process related to hypermedia in general and CALL in particular, a succinct description of the types of structural models which have been conceived for hypertextual presentations have been included. Similarly, these might generate an appreciation of the conceptual approaches to hypermedia architectures as developed in software engineering.

5.6.1.1 The Dexter Hypertext Reference Model

Another such model, the "Dexter Hypertext Reference Model" (Halasz and Schwartz, 1990, 1994), was conceived in 1988 in New Hampshire (USA) to create a general terminology and to answer the need to formalize the differing architectural components. Similarly based on three layers, a *Storage Layer*, a *Within-Node Layer* and a *Runtime Layer*, it was designed to clearly separate the content from the structure of the system. Whilst the *Within-Node Layer*, also called *Within-Component Layer* presents the content of nodes or database, the *Storage Layer* provides the functions to link them together. Finally, the *Runtime Layer* manages the user-interface and the user interaction (Balpe *et al.*, 1996) (see Figure 5.2). Central to this approach is the independence between the *Within-Component Layer* and the *Storage Layer*. In other words, the Dexter model facilitates the anchorage process of objects such as buttons, fields etc. into the Within-Component Layer or information base domain directly from the Storage Layer, otherwise known as the HAM in Campbell and Goodman (1988) model. Additionally, the separation between the link information and the Within-Component information help develop open hypertext systems with a Storage Layer capable to process different and incompatible formats of applications.

Such a formal approach help specify the different elements necessary to create the architecture of a hypertext system whilst providing a useful and referential terminology needed to describe and compare present platforms and systems. However, the key aspect of this particular model, from a user interface design view point, lies in its crucial conceptual characteristic based on a systematic separation between the content of the information base and the structure created by its links.

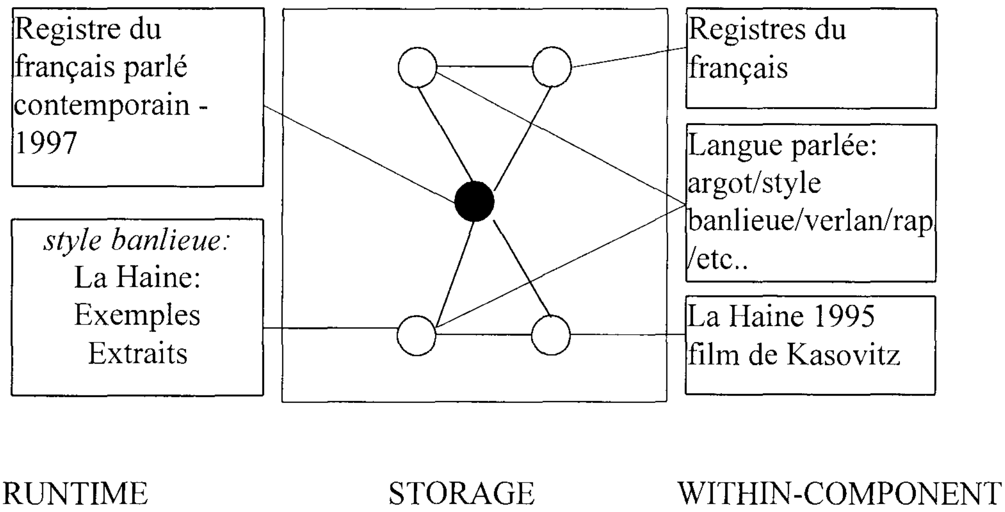


Figure 5-2 *Illustration of the Dexter Model architecture*

5.6.1.2 The Meta-Structure Hypertext Model

Conceptually comparable to the Dexter model, inasmuch as it provides a useful theoretical basis for analysing existing hypertext architectures, it nonetheless differs from it by its representation of hypertext through five levels of abstraction (Furuta and Stotts, 1990; Garg, 1988). Two abstract levels specifically define its structure and information related to its components, two concrete levels describe the nature and composition of the information base and, finally, a visible level is designed to encompass the visual features of the hypertext representation.

5.6.1.3 The Amsterdam Hypermedia Model

By extension, hypermedia, supporting synchronized multimedia with interactive links was similarly conceptualized with the "Amsterdam Hypermedia Model" (AHM), designed in 1994 by Hardman *et al.*, which added a new synchronisation dimension to the composition of the node (see also Balpe *et al.*, 1996; Rada, 1995). This model was based on the design of different types of nodes which was to facilitate access to the required information. It comprised two types of functional nodes, the basic node conceived to store the information base and the complex nodes which stored information on clusters of basic nodes but which did not contain any content data. This new, more sophisticated, structural concept which further separated content from structure, enabled the elaboration of more complex hierarchies.

6 Hypermedia CALL

6.1 Hypermedia for Learning

Whilst hypermedia technology was not originally conceived as a learning tool, its use in education and training is now widespread and expanding. The success of computer-based hypermedia systems for learning can be attributed partly to the appealing potentiality of its characteristics as an exploratory tool coupled with its adaptability as an authoring platform. Paradoxically, its use as a learning platform can equally be due to the insufficient detailed knowledge of the learning process, the lack of valuable guidance offered to educational designers (Hammond, 1993) and the poor assessment of its effectiveness. Renewed interest in the recent concept of resource-based learning supported by hypermedia platforms has, indeed, placed the onus on designers to successfully present a multi-sensory learning environment with an appropriately structured learning interaction (Boyle, 1997).

By way of introduction, Kommers (1996) delimits the instructional dimensions of the hypermedia environment with the help of three metaphors: *resource*, *communication* and *exploration*. Embodied in the resource metaphor is the notion that, hypermedia, as a delivery platform, is at the core of the information age, providing freedom and flexibility to gain and control access to knowledge bases. In so doing, information, as a resource, can be adapted to learners' needs and be more clearly defined and selected for easier assimilation. The communication metaphor is particularly pertinent to hypermedia as it helps to differentiate its potential from the multimedia database. By enabling and facilitating hyper-media communication at the levels of learners, user interaction and interface in its wider sense, the hypermedia system creates and generates the development of new communicative forms away from the previously known, computer-based, mechanistic and limited exchanges. Finally, if hypermedia delivers an information space with its intrinsic communicative potential, it also provides an environment open to new active learning approaches, within which learners acquire knowledge through their own exploration and appropriate questioning of the information base. In turn, the exploratory learning process is thought to generate "a higher level of metaknowledge" (Kommers, 1996: 31) giving learners greater manipulative control over their own knowledge representations.

However, differing views have been expressed and developed in the HCI literature as regards the viability and efficiency of hypermedia applications for learning purposes. These range from arguments supporting the role played by exploratory browsing in learning as expounded by Alty (1991) to the benefits attached to a more confined and structured exploration which, it is claimed, can lead to a better understanding (Carroll, 1990; Thüring *et al.*, 1995). Others advocate the use of more appropriate learning strategies enabling users to acquire greater learning skills and promote the flexibility and multi-dimensional nature of the medium instead of merely scratching the browsed "surface" (Whalley, 1993). Hypermedia is similarly seen as a beneficial learning platform by De Vries *et al.* (1995) when the task-based performance is measured against its two ultimate goals, that of acquired and transferable knowledge. In any case, most seem to agree that hypermedia can become an efficient tool for learning tasks when it supports and strengthens the acquisition of conceptual and contextual knowledge whilst facilitating further applications of the acquired knowledge. Given its potential for contextualizing and structuring the knowledge base, hypermedia is also perceived as the proper vehicle for knowledge representation and for enhancing learning processes (Jonassen, 1992) therefore highlighting the importance of both the knowledge representation and processes in the design of hypermedia applications.

Notwithstanding a general consensus in the HCI literature on the learning potential of hypermedia, its satisfactory translation into clear, practical design considerations and ultimately appropriate user interfaces is far from obvious. Whilst developers of earlier and therefore more limited software often adopted fact-based or drill and practice approaches, which were, by their very nature, easier to compute, hypermedia, by enhancing a more personalized, intuitive user interaction, is more difficult to capture as a concept and design as an artifact.

Therefore, hypermedia's strength is possibly its greatest weakness and the main design challenge for software developers lies in the dual interactive and spatial nature of the hypermedia platform supporting both access and new concepts of learning (see for instance, Boyle, 1997; Somekh, 1996). As a result, the omnipresent trade-off when designing a hypermedia learning platform is first and foremost encountered between the amount of interactive freedom to be given to learners and the type of instructional control the system should have. From the mechanical behaviourist approach prompting direct responses, new roles, contexts, contents and strategies need to be considered to support student centred learning approaches focusing on the process of knowledge acquisition. Thus, the emphasis must be essentially placed on the creation of an information space and the identification and design of a user interaction, with the potential to generate new knowledge constructs to be internalized by learners and translated into “intuitive problem-solving” (Somekh, 1996).

6.1.1 Role and Function of the Computer in the Learning Process

This omnipotent concept of control versus freedom in CALL is particularly well covered by Levy (1997: 178) in his expose of the tutor-tool framework. Levy usefully identifies a number of conceptual frameworks adopting, to a larger or lesser extent, the typological mould created by Taylor (1980) and based on the clear distinctive roles of *tutor*, *tool* and *tutee* that can be played by the computer. Whereas the tutor symbolizes expert knowledge, direction, intervention and evaluation, the tool, conversely, compares the role of the computer to that of an assistant, eschewing control for full, unconstrained user interaction. The tutor in Taylor's taxonomy becomes the *magister*, or doctrinal authority of the master, in Higgins's framework, the *instructor* in Wyatt's classification and *expert* in Phillips' models. Its opposite role of tool is assimilated to that of *pedagogue*, "task-setter, opponent in a game, an environment, a conversation partner, a stooge or a tool" (p.4), by Higgins, *facilitator* by Wyatt and *prosthetic model*, or supplementary but necessary support or extension, by Philipps (see Higgins, 1983; Wyatt, 1984; Philipps, 1987). As for the tutee in Taylor's original model, it is, interestingly, associated with that of *collaborator* by Wyatt who sees this collaborative role played by the computer as a way of giving the students the initiative over their own actions and directions, empowering them to discover the proposed learning environment. Notwithstanding the above the main features of tutor and tool could be summarized as follows:

Tutor

- In the instructional environment the computer substitutes for the teacher and plays a tutorial and evaluative, role.
- The hypermedia platform supports the instructional paradigm depicting the learning process under the control of the teacher. Therefore, "in the instructional role, the computer program presents material and conducts practice activities as an authority figure (Wyatt, 1984: 6).
- The teaching and learning strategy is paramount. Therefore its methodology has to be integrated into the computed programme.
- The role of the tutor / instructor is to present structured content, prescribe relevant tasks and evaluate student interaction.
- The hypermedia CALL instructional environment supports deductive and inductive learning as long as the locus of control still remains with the computer. In the latter case, the computer provides data to "reveal the pattern of the underlying rule" (Levy, 1997: 191).
- Program and task-based on-line help must be provided to support the instructional approach and expected learner interaction.

The tool

- The computer as a tool is a discrete entity used within a specific learning environment. Therefore, it is the nature of its implementation and the environment itself, which can determine the degree of success of the application.

- As a learning support or learning tool, the hypermedia system is a non-directive or self-directed resource whose interface, in a wider sense, must accommodate the indirect intervention of the teacher.
- The student interaction is predicated upon student control, initiative and decision-making role. Therefore, it supports the concept of learner autonomy, student centred design and, more specifically, student oriented CALL.
- The computer does not evaluate the student.
- The computer functions like a tool, which supports student initiatives and student-led activities.
- The functionality of the interface must facilitate and enhance authentic learning activities.
- As a learning support, it is designed to facilitate the student interaction, therefore, its functionality must be as transparent and intuitive as possible.
- The design of the hypermedia language learning support is, to a greater extent, based on the design of its tool-related components and, to a lesser extent, on its language-related elements.
- Implementation of autonomous learning needs to be facilitated by preparation and training.

As can be seen from the above characteristics, the fragmented and modular nature of the hypermedia environment often supports a mixed tool and tutor role. Of particular interest within the context of hypermedia, two role combinations can be observed in hypermedia design. Firstly, a tutor-based platform can be provided to manage and control the student interaction whilst a tool element is integrated allowing for a degree of freedom to explore the information space. Secondly, a tool-based, subject-independent, framework can be conceived, giving students overall control over their interaction and providing them with a proper learning support to assist them in their tasks, whilst additional modules, or 'prostheses', are incorporated to present exercises within a rigid, sequential structure supported by feedback and computed assessment. A further variation to these two design scenarios can be added by allowing a tutee, or collaborative input into the interactive process depending on whether the students are working independently or collaboratively with the teacher some of the time or in pre-defined activities. Finally, adding to the complexity of the hypermedia environment, another subtle variable can be brought into this role playing equation depending on the type of resource and levels of dynamic control exercised by either the computer or the learner. Levy (1997: 193) captures this fine distinction by identifying the revelatory or computer-led, inductive method, from the conjectural or student-led investigating learning.

6.1.2 Recent Developments

6.2 Concept of Constructive Learning

At the core of this learning theory lies the fundamental notion that the learning process is dynamic and free from coercive instructional orientations imposing knowledge structures (Boyle, 1997: 70). As such, its main principle stipulates that knowledge is constructed through interaction and not simply transmitted via the use of teaching strategies. On this premise, the computer, supported by the hypermedia platform, is considered ideal to enhance the interactive process of learning as opposed to promoting the longer established but reductionist role of teaching arbitrary facts.

In effect, a parallel could be drawn between the evolution of and perceptions towards the technology on the one hand and that of theories on the other. From the rigid unidirectional stimulus-response interaction at the root of the behaviourist school, the procedural drill and practice mode advocated by instructionists, to the user-centred constructivist position, learning theories have shown a close reciprocal link with the interface design (Boyle, 1997; Laurillard, 1993; Somekh, 1996). Therefore, hypermedia, by authoring an information environment based on nodes and links, feeds into the constructivist concept on the basis that learners can freely interact with it in order to construct their own knowledge and understanding. Inversely, constructivist learning, by prioritizing and promoting a quintessential, individualized learning process, feeds into the design of hypermedia on the basis that there is a definite need for a more beneficial user-centred approach.

In essence, the pedagogical theory on which constructivism is based implies that knowledge is constructed and not transmitted. As such, its acquisition is incumbent upon the successful outcome of an active process engaging the learner. Cunningham *et al.* (1993: 21) usefully sketch out some of the intrinsic features and goals involved in the necessary construction process, which, themselves, should inform the design process. Broadly, these should give the learner the means to be pro-active in the process of constructing knowledge, widen the scope of the expected interaction and maximize the context of use as well as the experience therein.

According to Cunningham *et al.* (1993: 21), the knowledge construction process should:

1. Provide an awareness of the process itself by demonstrating that knowledge is constructed on the basis of personal, contextualized experience. Learners should be encouraged to distance themselves from the concept of the classroom as the only referential, known learning environment and develop other dominant contextual metaphors within which their involvement would be more pro-active and interactive. One of the aims of the constructivist approach is to enable learners to "experience the constructedness of their own world" (22).
2. Present scope for the full exploration of the knowledge base, thereby highlighting the need for exposure to the multiplicity of different perspectives faced with when assessing positions within the construction process.
3. Ensure that the context of use is relevant and stimulating as well as facilitating the transfer of acquired knowledge. Emphasis should be placed on the cognitive dimension of the context as opposed to its physical impact by establishing aims and objectives.
4. Provide learners with the appropriate control mechanisms to allow them full

empowerment over their own actions, therefore generating greater participation and overall responsibility.

5. Encourage collaborative learning by stimulating the relevant contextual culture. "Dialogue between individuals is the primary mechanism that allows the social construction of meaning" (25).
6. Exploit all forms of communication and modes of representation to provide a balanced support to the knowledge construction process. Although the written and spoken forms of language are still predominant in educational processes, multimedia delivery is a valid complement.
7. Stimulate "reflexivity". Encourage learners to reflect on the knowledge construction process itself in order to better understand the learning *raison d'être* of the process itself, emphasizing its methodological dimension and essential transferability.

6.3 Cognitive Approach to the Hypermedia Learning Platform

On the premise that the hypermedia learning environment is best suited to a constructivist approach, conceptual design considerations must focus on the appropriate contextualization of the information space, both at local and global levels of the structural architecture, as well as usability issues based on strategies and expected user interaction.

Some of these concerns regarding hypermedia presentations are echoed in the HCI literature. For instance, Thüring *et al.* (1995; 57) make the early distinction between the hypermedia platform as a *browsable database*, reminiscent of the multimedia-based search and retrieve interaction, and the hypermedia learning environment as a *hyperdocument* supporting task-based reading strategies. Interestingly, the adoption of the latter as the appropriate learning platform suggests a conceptual approach closely linked to that of the document, therefore, assimilating hypermedia with the well-known two-dimensional textual model based on discrete elements semantically linked together. In this particular case, the whole notion of readability of the hyperdocument rests on the wider concept of comprehension or the ability to generate mental models matching the structural aspects of the given document. Crucially however, Thüring *et al.* (1995) in spite of adopting a restricted dimension of hypermedia, seek to increase comprehension by supporting greater coherence at local and global levels whilst reducing cognitive overheads triggered by the need for orientation, navigation and user interface adjustments. Furthermore, Thüring *et al.* (1995) highlight the dual complexity linked to designing coherence at net level, which necessitates local and global supports. At local level, coherence can be increased by providing a context within which links would be made explicit and the information space as fluid as possible. Similarly, global coherence would be supported by the clear identification of all components within the structure made accessible with the provision of overview mechanisms and the appropriate structuring of the information space into discrete and composite nodes. To reduce additional effort and concentration required to interacting and situating oneself within the interface, Thüring *et al.* (1995) suggest the acquisition of supplementary knowledge with the help of visual representations of the structure as well as user positions within the structure in terms of both distance and direction.

In a similar vein, Hardman (1995: 18) attempts to improve the authored application's presentation by highlighting three fundamental aspects related to the structure of the information, its presentation and the necessary exploration tools. Interestingly, greater attention is paid to the nature and appropriateness of different structures, ranging from content-based, hierarchy access structures to navigational index structures. At the level of user interaction, Hardman's approach is, however, different from Thüring *et al.* (1995) insofar as high-level HCI principles are applied with a view to generating design considerations commensurate with the authoring process. These include the need for a minimal mental load and task-specific mental processing and the necessity to adapt to the needs and competence of users. Furthermore, the case is made that the design of the information space essentially rests on two important aspects related to the space to be represented and the design of its interface. Ultimately, authoring requirements for a good hypermedia representation are based on a sound structure, a clear and aesthetically pleasing presentation and the means to move around and to annotate the information (Hardman, 1995; 23).

Likewise, user interface design considerations can also be approached from a design and communication perspective. For instance Boyle (1997) identifies three macro-functions providing a design support for authoring multimedia learning environment. Central to this conception is the notion that the context is paramount to an understanding of interactive multimedia design. Such a theoretical framework stemming from film analysis relates the context or interface to the *mise-en-scène* of individual scenes or frames. This first function, whose role consists of conveying the information and aesthetic dimension, becomes the mainstay of the visual construction. The following composition of scenes or *montage* is therefore comparable with a linear structuring of the information base. However, since the learner is an active participant, the multimedia learning context must support a third function related to the concept of interactive communication. Identifying a strong parallel with macro-functions underlying linguistic communications, Boyle (1997: 89) conceived a design framework, modelled on the basic grammar structure, based on the *ideational* function or content representation, the *interpersonal* function or interactive potential and the *textual* function or global coherence. Therefore, an interesting reciprocity can be established between the concept of contextualized communicability and the user interface. Of particular interest is the subsequent correspondence that can be found between such an approach to conceptual design and previous HCI considerations. Firstly, content representation, by focusing on content structuring which encapsulates learning and pedagogical strategies, can be seen as a sub-set of the global coherence goal. The interpersonal function can be paralleled with the interactive dimension of the interface and, as such, would fall under the heading of cognitive overheads, which includes orientation and navigation. Finally, the textual function or resulting compositional coherence by concentrating on structural architectures and linking element would rest solidly across both macro and micro strategies within the principle of design coherence.

6.4 The Hypermedia Platform in CALL

Although computer-based applications in second language teaching have now been used for a protracted period of time, they have largely been relying on a programmed approach to language learning often based on an agreed grammatical progression. In essence, the sequence or sequences of pre-conceived and computed tasks would be predetermined in advance by expected attainment levels in language acquisition. Therefore, in order to undertake task c successfully within an early CALL environment, users would have had to have performed and completed tasks a and b (Ingraham *et al.*, 1994). Ironically, despite the adoption of a traditional learning environment, this first, albeit influential generation of software design was poorly recognized or worse even met with scepticism by academics inasmuch as it did not seem to represent or, indeed, symbolize good teaching practices (Laurillard, 1991). As a result, original CALL programmes were often enough only considered appropriate as supplementary teaching material and as such referred to or introduced within a cursus as convenient adjuncts providing students with greater practical experience. The recent introduction of the multimedia dimension into CALL design with its perceived interactive potential leading to hypermedia developments have shed new light on the usage and capability of computer-based learning material. The new concepts of navigation and user-controlled access to an open environment, seen as ideal to reproduce or replicate virtual language contexts, shifted the pedagogic debate surrounding CALL to include the possibility of adding computer-based support in communicative skills and competency. However, given the evolving theoretical positions on methodological approaches to second language teaching, such a support with its inherent communicative potential also triggered questions linked to the validity of adopted learning processes and their likely outcomes. This is all the more obvious when considering the differences between language acquisition and language learning crystallised by hypermedia CALL. In addition to learning processes and outcomes, which must inform the design of the CALL interface, renewed considerations regarding the user-interaction, in terms of structures and strategies are similarly and increasingly becoming paramount within the design process at author level. These, in turn, will characterize the scope and limitations of hypermedia CALL authoring input and validate its interactive output.

6.5 Hypermedia as a Language Learning Environment

6.5.1 Language Learning Processes: an Overview

Learning processes are complex and as yet scientifically unfathomed. This generalization adequately applies to the field of second language learning and the particularly complex nature of foreign language acquisition. The lack of a widely agreed theoretical position on a process or processes has inevitably led to the adoption of a number of intrinsically valid but unproven approaches. As a result, schools of linguistic thought have developed on the strength of their specific convictions. At the traditionalist end of the spectrum, language specialists believe that the learning process is best facilitated by the adoption of a syntactic approach to the language, emphasizing the initial need to learn rules concerning prescriptive forms and grammatical constructions. These rules which form the theoretical basis of the learning process are, in turn, best assimilated by rote learning whilst further strengthened by applications using vehicles such as drill exercises and translation practice followed by their systematic corrections. At the other extreme, there is the belief that language learning is a natural process, which comes to fruition by sustained and repeated exposure to the language input in all its authenticity in the form of unstructured interpersonal learner interaction. As such, it is best left unhindered by artificial, rebarbative and rigid linguistic concepts, which could only act as learning deterrent and therefore interfere with the process itself. Within these two extremes a range of other approaches can be found providing carefully balanced mixtures of both rules and interaction either emphasizing grammar, in a more descriptive than prescriptive presentation or interpersonal interactions, variably structured on a range of tasks and supported by mnemonic devices such as drills and appropriate references. It is these different and largely incompatible theoretical positions on the nature of the second language learning process which, in turn, have inevitably led to the adoption of distinct second language teaching methodologies.

Interestingly, the recent importance given to novel, better balanced, more relevant and attractive teaching approaches often fuelled or simply stimulated by hypermedia's technological and educational potential has emphasized the necessity to develop both communicative practice and the knowledge to understand its underlying mechanisms. According to Laurillard (1991), evidence from proposals produced by the DES for foreign languages in the National Curriculum strongly suggested that a national consensus based on the assimilation of linguistic data supported by the exploration of the underlying language structure could now be reached. Quoting the following two selected paragraphs from the DES document:

> *Once they have thoroughly absorbed a set of related chunks of language, learners need to explore and if necessary be shown how the underlying model works, not told about it. (DES, 1990, p.54)*

> *If learners can be helped to see the common features of the chunks of language which they have learnt, they will be better able to adapt them to the demands of different situations and increasingly to check their own production. (Ibid, p.56)*

Laurillard (1991) adds that such an access to the underlying model or "framework of structures which forms the skeleton of any language" should be achieved by discovery steered equally by "learner-controlled exploration" and "teacher-controlled demonstration". By extension, this consensus based on a balanced second language teaching methodology providing both a strong communicative emphasis combined with an exploratory mode within a monitored environment would appear to be ideally suited and particularly enhanced by computer support using an appropriate hypermedia platform.

6.5.2 Foreign Language Teaching Methodologies

If learning approaches, in terms of language input and output, are to influence and inform the design of the authored educational platform, then, underlying language teaching methodologies must be more clearly identified. As a potential design support, this identification could adequately take the form of a basic taxonomy based on the combination of environmentally and linguistically based factors.

First and foremost, the environmental and pedagogic distinction between language learning and language acquisition must be made. The process of language learning involves students in acquiring the language within the confines of the university environment which can be seen according to Barrett (1994), as a *hypercontext* with its real-virtual presence generated by its various sites such as the library, the classroom, the language laboratory etc.. Teaching in this artificial context is tantamount to achieving a fine balancing act in order to provide the right amount of information, exposure and monitoring enabling students to process and digest knowledge appropriately. Such an approach would for instance necessitate a traditional presentation of information, sources, visual supports, feedback, written assignments and corrections within the classroom but also without it in the wider hypercontextual domain of the university. Therefore, in the context of language learning, teaching methodologies are explicit, with clear objectives, and have been and still are largely and almost unavoidably prescriptive. It is, essentially, a top-down, structured approach generated by the teacher providing expert knowledge for novice learners in an artificially interactive learning environment. Typically, language learning activities organized in a classroom context include vocabulary learning, oral and written grammar exercises, listening, aural and reading comprehension, written composition and oral presentation (O'Malley and Chamot, 1990). Within this educational framework, the use of CALL has been fundamentally perceived as an appropriate satellite mechanism to support class-observed language processes still essentially providing teacher-led or class-led activities at foundation or intermediate levels. In any case, limited resources have so far hampered expansion in this domain which has meant that students are still getting a limited exposure to CALL applications in terms of contact hours and interaction as the ratio of students per computer is often three to one. Conversely, activities outside class contact hours would be essentially library-based such as on-line and textual referencing but could also incorporate further practice with CALL material in self-access mode and social communication such as an active participation in a student-managed foreign language society and conversations with native speakers. In this respect, the fluctuating and artificial interactivity provided by the university's hypercontext could be likened to some forms of exploratory and associative learning under learners' control.

Foreign language acquisition, on the other hand, implies that learners are already implicated in the real environment within which the language is spoken. In other word, the process of acquiring the foreign language is contextualized enabling learners to establish a useful relationship between context and use designed to facilitate and support the understanding and communication of meanings. Since language constructs are "embedded" into situational contexts, appropriate teaching methodologies need to ensure that the language content is "disembedded" from the situation to achieve language competence (Laurillard, 1991). It is very much within this environment that hypermedia platforms, relying on inductive modes and exploratory learning, have been conceived. Benefiting from the multimedia display of audio, visual and textual resources, hypermedia, with its renewed emphasis on access, is seen as ideal to enhance the communicative approach which can then be articulated around task-oriented situations (Chanier, 1996b). In this particular context, learners are immersed in a virtual language environment and therefore are compelled to relate to and use the language as a necessary vehicle for understanding, making tactical and strategic decisions and solving task-related problems. This approach is at the core of the acquisition of communicative competence which, rid of its old reductionist image of basic vocabulary proficiency, is now understood to comprise a socio-linguistic and socio-cultural dimension in addition to grammatical, discourse, referential and strategic competence (Chanier, 1996b). By extension therefore, foreign language acquisition is similarly perceived as providing the ideal language context for the Language for Specific Purposes (LSP) approach as developed by the CAMILLE project (Chanier, 1996; Ingraham *et al.*, 1994).

Mapping above mentioned language learning processes, language teaching methodologies are thus either partially leaning towards grammar and structures or towards interactive communication depending on the adopted theory and set objectives, levels of proficiency, but also the learning context and resources.

The earlier and better tried approach is essentially based on grammatical analyses and translation work developing skills in manipulating and understanding the written form of the language. Two distinct teaching modes can be broadly identified within this grammar-oriented category based on either the traditional top-down deductive approach or the more recent bottom-up inductive approach. The earlier mode introduces rules and structures rather arbitrarily and encourages learners to acquire and memorize them through a deductive process by means of their systematic applications in reading and writing. The latter encourages learners to find and appreciate rules and principles inductively by means of structured and protracted practice, identifying for example, commonalities and exceptions. Since both approaches promote the written material along with language expert knowledge, they have been successfully supported by information technology in CALL authoring developments, from text jumblers, text parsing to hypertext-based expert knowledge databases. Astride both aural and written language practice, CALL similarly supports a common approach based on audiolingual drills and repetition often requiring the use of audio laboratory work in conjunction with computer-based programmes. This is particularly the case for gap-filling and substitution exercises. (Fox *et al.*, 1992).

Conversely, the interactive communicative approach is based on the notion that a foreign language is best learned naturally through a contextualized and meaningful interpersonal interaction replicating the initial steps of first language acquisition. As a result, oral recognition, understanding and interpersonal skills are prioritized at the expense of reading and writing activities. Increasingly, audio and visually based CALL interfaces strive to support such linguistic stance, providing databases combining both multimedia extensions with meaningful, learning-oriented tasks. At the root of this approach is the notion that learners will interactively and constructively seek, exploit and internalize the required formal data within the remit of given activities in order to improve their knowledge of and general competence in the studied foreign language. This language learning theory based on the concept of constructive learning has already generated a variety of different platforms claiming to provide language support or fully-fledged language courses whilst emphasizing to a greater or lesser extent, their hypermedia or multimedia potentiality. The complexity linked to the implementation of this approach stems from design problems as constructive learning is more difficult to harness and compute whilst, similarly, the capability of a learner-controlled user-interaction is such that the original authored narrative has little incidence on the resulting "path of disclosure" created by learners (Laurillard, 1991; Plowman, 1992; Somekh, 1996).

However, aside from considerations related to the appropriateness of adopted teaching methodologies, the meaningfulness of the authored hypermedia applications must be seen as paramount. As such, the functionality and usability of its user interface must be predicated upon the satisfactory identification of its design space within the broader parameters of the user interface. In this respect, the latter must encompass not only the expected student interaction but, similarly, the role of the language teacher as well as that of the computer in addition to the selected data, learning objectives as well as the techniques and strategies.

6.5.3 Learning Models

Whilst language learning theories evolve reflecting different attitudes and considerations towards the context and aspects of learning concentrating on aims and potential outcomes, special emphasis must be placed on the process of learning as expounded and analysed in the field of psycho-linguistic. Firstly, there is a need to highlight research findings in the area of language learning in order to understand better the learning stages of language approaches. Secondly, if the learning process is to inform the author of a hypermedia CALL application then it is crucial to appreciate how learning models are perceived and implemented by these authors within the design process, since such projected models of learners must seriously impact onto the conceptual design.

On this premise, an important section of a survey (Hémard, 1995, 1998) carried out amongst language staff in HE was devoted to such perceptions. Interestingly, no clear patterns emerged on aspects of methodologies in relation to student requirements. The ratings were generally high across both tables separating teacher-led from student-led situations. By a process of adding up the given rating scores, it was possible to establish that teacher-led, therefore controlled, situations were felt to best serve the students. However, such findings ought to be interpreted with a degree of circumspection as responses varied greatly, almost suggesting that respondents did not fully understand and appreciate the differences between the proposed methodological approaches or simply did not have a strong view on this particular topic. Indeed, bar one questionnaire clearly stipulating the difference between teaching and learning, in two cases the responding authors genuinely indicated that they felt their knowledge to be insufficient to even tick the appropriate boxes. Although the degree of clarity of the presentation and resulting appreciation of respondents cannot be ruled out, such a wide range of differing opinions on such a critically important aspect of student requirements could be, as yet, the clearest indication of the poor pre-design knowledge and lack of preparation of authors as they embark on the design process.

6.5.4 Knowing the Students

However, beyond language learning objectives, it is the whole of the usability field of hypermedia CALL which must be properly defined in order to establish a clearer theoretical underpinning for its authoring process. If academic authors are seen to be playing a key role at the conceptual stage of the design process, then their strategic input has to encompass not only the creation of a conceptual model, informed by language learning theories, but also, and critically so, the design of a system image reflecting its student requirements, both at the level of learning strategies and interface design.

As previously mooted (see Chapter 4) the acquisition of knowledge on target users is fundamental to the satisfactory conception and implementation of the interface to be designed. Indeed, student requirements form an intrinsic part of the process inasmuch as they are instrumental in shaping the functionality and usability features of the conceptual design and play a pivotal role in setting usability goals, which, with appropriate design support such as design guidelines, help formulate design decisions and lead to design solutions. Reciprocally, a designed system conceived on the basis of informed design solutions must encapsulate the identified student requirements translated in the form of usability goals. As a result, information about the students as prospective users, and its proper processing when conceptualizing the design is paramount to both creation and evaluation. Firstly, mental models (refer to Chapters 7, 8 and 9), student requirements (refer to Chapter 11) and, by extension, usability goals (refer to Chapter 12), will delineate the usability field of the authoring process by setting remits, by generating focused designed support and by informing design solutions. Secondly, these usability goals and requirements will be used as essential benchmarks for the design of the theoretical framework and, by extension, subsequent formative evaluations.

On this premise, an important part of this research, contained in Chapters 7, 8, 9, 10, 11 and 12, is devoted to bringing new knowledge on target students on the basis of an original HCI approach tailor-made to hypermedia CALL. Indeed, it is strongly felt that the empirical nature of hypermedia CALL development can be judiciously exploited to produce valuable qualitative data through summative evaluations of existing applications. Therefore, the global aim of the approach is to study student attitudes, reactions and reflections when interacting with selected hypermedia environments in order to identify student requirements and circumscribe an appropriate usability field for the theoretical framework (refer to Chapter 14). The originality and strength of the method rest on its adaptability and applicability to hypermedia CALL as it supports the empirical summative / formative model of knowledge transfer whilst providing a structured approach and theoretical underpinning.

Therefore, this study into student requirements begins with an in-depth analysis on mental models presenting a necessary theoretical foundation and summative evaluations yielding vital data on the student interaction and position. These important findings will feed into the theoretical framework (see Chapter 14) and help provide a structured approach and design support for formative evaluations as well as a valuable checklist for future projects.

7 Models

The domain of mental representations and organization within the cognitive process, whilst very complex and still fundamentally esoteric, has generated an important area of research in cognitive science as well as in Human Computer Interaction (HCI). However, the intricate nature of the process itself has, symptomatically, led to many different approaches and interpretations of how people acquire, store and use their knowledge when interacting with external events (Staggers and Norcio, 1993). Whereas, cognitive scientists have been attempting to produce clear evidence that mental models do exist as constructs and are, indeed, being used as such within the interactive process, research in the field of HCI has capitalized on the model concept as a means of better appreciating the users' behaviour when interacting with a view to constructing interfaces supporting these mental models (Preece *et al.*, 1994). Therefore, the emphasis in HCI is not so much on knowledge structures but more specifically on knowledge representations and, more generally, on the correlation between the user interface design and user interaction generated by existing mental models. This important contrast in research focus is fundamental within the context of this thesis as the presentation of mental models and subsequent data analyses adopt the HCI position and, therefore, concentrate on eliciting context-specific mental representations in order to better inform the design of hypermedia CALL interfaces.

7.1 Towards a Working Definition

As a useful introduction, Preece *et al.* (1994) highlight the recognized stages of the cognitive process from the represention to the necessary organization of knowledge in memory for undertaking appropriate cognitive tasks. Research findings suggest that, initially, knowledge is memorized according to representational patterns. Three types are identified: the image-based *analogical representation*, the abstract, fact-based *propositional representation*, both of which manipulate semiotic and semantic symbol structures respectively, and, finally, the implicit, network-based distributed representation or sub-symbolic representation (Eysenck and Keane, 1990). Without entering the debate between emerging schools of thought, it is possible to further conceptualize the process by simply differentiating between symbolic and non-symbolic representations with symbol structures, complementary in essence, forming sub-sets of neural networks. Similarly, several theories identify and explain the organization of knowledge. Generally based on the network principle, they vary according to their perceived structures, be it associative, semantic or schematic. Preece *et al.* (1994) place greater emphasis on the theory, which defines knowledge as being organized on the strength of schema, themselves, based on previous knowledge acquisition and experience. These pre-fabricated schemata, or their scripted sub-sets, help guide people through their interactions and ultimately help simplify and reduce cognitive efforts to carry out recognized, familiar and conventional tasks. Likewise, this approach can be adapted to user interface design insofar as users develop schema based on their use and experience of computers hence reducing the cognitive load linked to these interactions. Such schema are further enhanced by the current process of standardization taking place within the window environment even though differences and design quirks between applications can still disrupt the cognitive process and create confusion. By implication, schema can, themselves, lead to the conceptual formation of mental representations or models more adaptable to complex and changing situations. These mental models, as they are often referred to in the HCI literature, are potentially more attractive than scripted schema as they are better adapted and responsive to human behaviour.

7.1.1 Models: Definitions in the HCI Literature

Not surprisingly, many definitions of mental models, with their varying terminologies, can be found in the HCI literature. Whilst such a variety of approaches and interpretations is undoubtedly a fair reflection on the limited understanding of the complexity and potential of the cognitive process, it was felt desirable to identify more clearly the range of interpretations so as to adopt the most appropriate basic definition and clearly defined terminology thus avoiding unnecessary confusion.

Historically, the concept of model can be traced back to Craik (1943) when he intimated that the human organism could internalize, relate to and re-utilize past experiences in newly occurring parallel situations. Craik defines the concept of model as:

> *"Any physical or chemical system which has a similar relation-structure to that of the process it imitates. By 'relation-structure' I do not mean some obscure physical entity which attends the model, but the fact that it is a physical working model which works in the same way as the processes it parallels..." (Craik, 1943, p.51)*

> *"If the organism carries a "small-scale model" of external reality and of its possible actions within its head, it is able to try out various alternatives, conclude which is the best of them, react to future situations before they arise, utilize the knowledge of past events in dealing with the present and future, and in every way to react in a much fuller, safer, and more competent manner to emergencies which face it." (Craig, 1943, p.57)*

However, it is generally agreed that the term "mental model" was coined by Johnson-Laird (1989) who further defined the model as a structured and functional representation of knowledge whose manipulation was tantamount to a form of reasoning. Johnson-Laird argues that, structurally, the model stems from dual analogical and propositional representations and constructed to help form deductions and predictions unlike the image concept with its fixed representation.

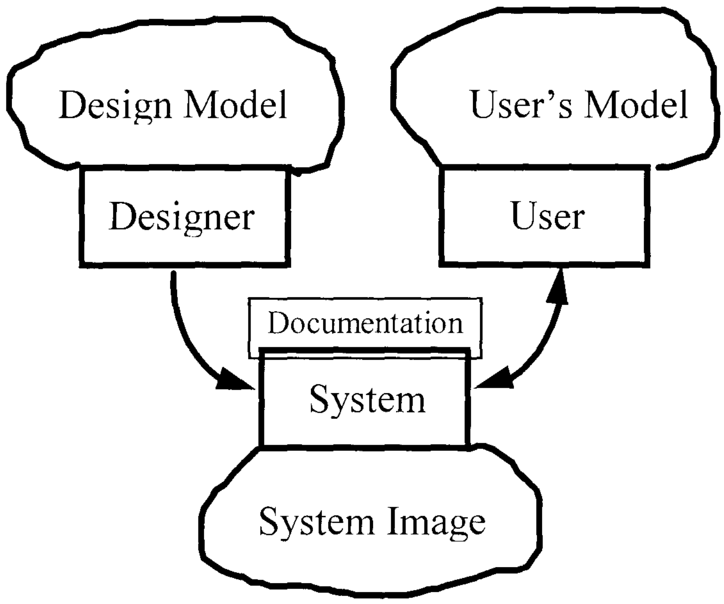
From this original basis, the concept of "mental model" has been generally agreed but authors have felt the need to develop alternative concepts of mental models although as Johnson-Laird (1989) explains "they nearly all concern the same underlying reality". According to Staggers and Norcio (1993), some authors, like Young (1983) have used the terms "mental models" and "conceptual models" reciprocally or synonymously, adopting one expression or the other, to define mental representations. In other cases, authors make a more systematic use of either mental or conceptual models, Moran (1981) for example makes reference to conceptual models whilst Halasz (1984) uses the term mental model to define both system's and user's models. Others have given the original terminology a different meaning defining mental models as "the user's conception of the 'invisible' information states and transformations modelling the human-computer interface", creating a "conceptual model of the human-computer interface" (Clarke, 1986) or, indeed conceptual models to be "instructional device for learning the system" (Staggers and Norcio, 1993). Conversely, Farooq and Dominick (1988) reacting against the wide variety of terminology used declared the terms meaningless. Whilst retaining the notion, expressed by Staggers and Norcio (1993), that "the only requirement is that readers adopt the premise of the mind operating in a symbolic fashion" the definition of models and terminology provided by Norman (1983, 1986) has been adopted here on the basis of its clarity, concision and adaptibility.

Usefully, Norman (1983, 1986) makes the clear distinction between mental and conceptual models, initially identifying the *target system* ("the system that the person is learning or using"), the *conceptual model* (providing "an appropriate representation of the target system by its author), the *system image* (image of the system), the *user's mental model* (of the target system) and the *scientist's conceptualization of the mental model* (model of mental models). Therefore, the conceptual model is "invented by teachers, designers, scientists and engineers" to be the complete representation of the target system, whereas the mental model is an "evolving model" which will be formulated by users through their interaction with the target system (Norman, 1983).

On this premise, the model conceptualization process is instigated by the designer who proposes a conceptual design model of the potential target system based on potentiality and users' requirements. Norman (1986) calls this model the *Design Model*. Users' perception of and interaction with such a conceptualized model will help them to create an internal mental model of the system, called *User's Model*. However, Norman (1986) stresses that the user's model does not derive from the *Design Model* but from an interpretation of the *System Image*. In turn, this process, enables users to form an image of the system or a visualization of the *System Image*. Therefore, through the interaction with the *System Image*, the aim of the design process is to reach full compatibility between both the *User's Model* (mental model) and the underlying *Design Model* (conceptual model). Thus, theoretically, the *System Image* should represent the perfect superimposition of both the designer's conceptual model and the users' mental models (see Figure 7.1).

> *Mental models seem a pervasive property of humans. I believe that people form internal, mental models of themselves and of the things and people with whom they interact. These models provide predictive and explanatory power for understanding the interaction. Mental models evolve naturally through interaction with the world and with the particular system under consideration. These models are highly affected by the nature of the interaction, coupled with the person's prior knowledge and understanding. The models are neither complete nor accurate, but nonetheless they function to guide much human behavior.* (Norman, 1986, p.46).

> *The problem is to design the system so that, first, it follows a consistent, coherent conceptualization - a design model - and, second, so that the user can develop a mental model of that system - a user model - consistent with the design model.* (Norman, 1986, p.46).



Norman, (1986) p.46

Figure 7-1 *The system image*

7.1.2 Conceptual Models

Adopting the above approach to knowledge representation as expounded by Norman (1983, 1986), conceptual models correspond to the design model as perceived, conceptualized and realized by designers of systems on the basis of user requirements, levels and established parameters for the given systems. Crucial to the satisfactory outcome of this process is the creation of a system image, which should ideally replicate both designers' models and users' mental models. The aim of this design approach is to enhance the development of proper mental models of systems by utilizing as best as possible users' existing knowledge based on previous interaction with computers, people, learning experience and their physical world. One way to help users to develop such mental models is by adopting the use of appropriate metaphors (Preece *et al.*, 1994).

7.1.3 Mental Models

Studies in HCI, if falling short of supporting the existence of mental models, have nonetheless gathered evidence supporting the view that, generally, users perform better and more efficiently when shown the conceptual model of a system prior to using it (Moran, 1981; Norman, 1983; Staggers and Norcio, 1993; Young, 1981). Thus, a mental visualisation of the conceptual model helps to shape and structure the users' knowledge representation of a given system. This, in turn, helps users develop their own mental model of the system in its interactive dimension. Indeed, Staggers and Norcio (1993) suggest that mental models are "a very visual, structured proposition that rely on identified similarities between known and unknown systems. These visual constructs, known as analogies and metaphors, tend to generate two different types of mental models depending on the nature of the identification process and knowledge representation required. Preece *et al.* (1994) classify both types as structural and functional models. The structural model is formed on the development of an internal representation of the structure of the system, otherwise called *the model of "how-it-works"* (Preece *et al.*, 1994: 134). Conversely, the functional model is developed on the strength of an internal representation of the operation of the system, itself tagged *the model of "how-to-use-it"* (Preece *et al.*, 1994: 134). Whereas the structural model stems from an essentially context-free, conceptual representation of the system's working structure, the functional model is generated by the identification with previous comparable operations. As such, the latter referred to as "task-action mapping model" by Young (1983) is used by designers in order to identify and map tasks with their expected interaction to better reflect users' knowledge.

7.1.3.1 Perceived Limitations of Mental Models

Whilst advantages brought by mental models clearly imply that designers must not ignore their intrinsic design potential, it is similarly relevant and important to add that models are particularly difficult to exploit. Based on his own observations on a variety of tasks and people, Norman (1983) arrives at the conclusion that:

1. Mental models are incomplete.

2. People's ability to "run" their models are severely limited. This point related to the construction of models is corroborated by Young (1983). It is generally observed that users tend to asssimilate models given to them better than when they personally induce or deduce them from their interaction with the system.

3. Mental models do not have firm boundaries.

4. Mental models are "unscientific.

5. Mental models are parsimonious because, by their nature, they rely on mental effort easily traded off for extra physical actions.

Other shortcomings could similarly be added to the above list:

6. Mental models are inaccurate (Johnson-Laird, 1989; Norman, 1983).

7. Mental models are unreliable and can lead to erroneous interpretations. Users may continue making the same mistakes on the strength of well entranched but erroneous mental models or may become "cognitively locked-up" (Staggers and Norcio, 1993) by not updating their mental models of evolving systems. Conversely, they may over apply new models to other knowledge domains generating misleading generalizations or simplifications.

8. Mental models may also be used to interpret actions in different ways, an interpretation called "creative comprehension" by Lewis and Mack (1982).

9. Mental models are dependent upon users' motivation and expertise. Their formation will fluctuate accordingly.

7.2 Conceptual Models in Hypermedia CALL

In the light of the above adopted theoretical premise, an initial attempt has been made to contextualize and circumscribe existing conceptual models in hypermedia CALL on the strength of both the design knowledge of current authors, by means of surveys, and design features and rationales from a representative selection of system images including systems with their available documentation. Interestingly, although largely ignored in HCI, user interface designers, especially if working in small design teams or by themselves, as users of authoring platforms, are noticeably affected by their own mental models and knowledge representation of previously designed or known existing systems. This is all the more relevant in an area such as CALL, and hypermedia in particular, which, as a result of being in the forefront of CAL software development, is still largely influenced by its relatively short and largely empirical approach, its technologically-led but, similarly, technologically-limited progress and the complex nature of the communication and interaction modes of its information base. Indeed, by looking at software development and design in CALL in recent years, it is, to a large extent, possible to arrive at a recognizable, albeit approximate, photofit version of CALL authors of learning platforms in HE based on design experience, learning theories and practices and perceived outcomes of hypermedia. For the purpose of this study into conceptual models, findings from a survey carried out in 1994 amongst language specialists in London-based universities (Hémard, 1995) have been analysed with a view to better appreciating and comprehending authors' models of hypermedia's conceptual models and potentiality. It must be said, at the outset, that the widely differing, almost dilettante, positions adopted by authors, echoed by findings from an international survey carried out in 1991 by Levy (1997) would appear to corroborate the elaboration of these conceptual models.

7.3 Authoring Developments

Whereas the majority of definitions of hypermedia have centred on the structural dimension of the information base (see for instance Deegan *et al.*, 1992; Jonassen and

Mandl, 1990; Nielsen, 1995), emphasizing its interactive potential linked to its "hyper" size and non-linearity, the dominant conceptual approach to hypermedia in language studies has tended to concentrate on its interlinking capability. Such a noticeable difference in perception and conception can be initially attributed to the pervasive impact of hypertext on CALL authors and its quickly recognized potential for manipulating textual material. In an area where textuality has always been preponderant and computer literacy peripheral, the text has remained the dominant feature and referential anchor in hypertext. Therefore, whilst nodes and links enable authors to be "freed from the constraint of creating a cohesive expository or narrative text as is required in writing a textbook" (Cunningham *et al.*, 1993) the very concept of non-linearity highlighted by the potentiality of hypermedia has regularly been measured against the standard linear format of the text mode. As a result, authors have been naturally conditioned into adopting a node-based, bottom-up, design approach to develop networks of communication modes subsequently semantically interconnected. Such an empirical design process has been further exacerbated by two influential factors: hypermedia, stemming from hypertext and CALL authoring expertise, was inextricably linked to the computer which, itself, was all too often compared to a glorified word processor and, secondly, its piecemeal and poorly funded introduction in language studies, inevitably, lent support to technically manageable albeit limited design projects. In essence, early authors of hypertext-based CALL applications "formed an individual concept of Hypertext from the key features of whatever product they first used" (Harland, 1991). Generally, these ranged from the above-mentioned word processing tool in language learning (Brierley & Kemble 1991; Levy 1997) to text production and reproduction programmes which became very popular in the 1980s (Levy, 1997: 21-25). Additionally, authors, themselves users of authoring platforms, have had to bear the brunt of the new technological momentum and, as a result, have been faced with an increasingly challenging learning curve in order to capitalize on the ever increasing but complex authoring facilities and available functionality supplied with its own design agenda and models in the shape of unsubstantiated design help and guidance.

Therefore, the emphasis has been more particularly oriented towards the text mode with its range of links between textual forms such as words, sentences, paragraphs etc. and their respective displays, be it in the form of popup text windows, graphic illustrations or "enabled" buttons than on the semantic and interactive nature of the whole of the designed architecture. This lingering concept of hypertext, first implemented with authoring packages such as Guide, has noticeably affected authors' attitudes and, as a direct result, subsequent hypermedia-based user-interface designs. If, indeed, text was the primordial element at the root of hypertext, what was to be made of hypermedia, very much seen as an extension of hypertext or at any rate a more contemporary version of it? Again, Harland (1991) emphasizes the interlinking notion between text, graphics and sound but adding that such interrelation should be "in a manner over and above the traditional linear methods of learning" therefore raising the need for a non-linear and interactive approach to a new multimedia representation of knowledge. With hypermedia, the hyper dimension, previously reduced to textual interlinking, now includes physical media interconnections to facilitate the abstract mapping of knowledge, or the serendipity of human knowing as Ingraham *et al.* (1991) put it, and the introduction of interpersonal user-interaction. However, paradoxically, this technological panacea designed to transform the learning environment is still dependent on a tactical design approach firmly tied to the textual root seen as a key signature in CALL interfaces, even if these interfaces have graphically improved with the use of GUIs and greater technical specifications.

7.4 Design Implementation of Teaching and Learning Strategies

Recent and more flexible approaches to language teaching and learning supporting the development of communicative competence within such a propitious environment have attempted to exploit the scope and interactive potential of hypermedia CALL (refer to 4.1, see also Chanier, 1996; Ingraham *et al.*, 1994; Laurillard, 1991; Levy, 1997). However, these new approaches have, similarly, blurred the previously established design parameters of structured methodologies such as the better known and confinable, linear, deductive, programmed instructions. This has thrown further confusion into the conceptualization process which, had to include new considerations such as the role of the computer and the teacher, and computationally elusive concepts such as user control and access modes as well as student needs and strategies.

In this respect, the survey carried out by Hémard (1995) to develop an accurate author's profile in language studies provided useful findings supporting, to a large extent, the above points. The data analysis showed that: less than 10% of all language teaching staff in London-based universities expressed an interest, built up specific experience and developed appropriate skills in hypermedia authoring of which, 1/3 indicated their lack of authoring knowledge and expertise.

The majority of authors specified using two software packages, often in the following equally distributed combinations: Guide and ToolBook; Guide and Hypercard. All had already authored material in a professional capacity, most of them for the purpose of designing courseware. Interestingly, all the authors were self-taught, 36% indicated that they were not getting any technical support, whereas 55%, were not benefiting from any design guidance. Furthermore, all the authors, bar one, considered hypermedia authoring to be difficult, stressing the steep learning curve and the general frustration at not being able to make screens look sufficiently professional. On the competence issue, several points were made: First of all, few authors felt confident enough to give their degree of competence a rating of 3 or 4 in the course of the design process; secondly, those who did, tended to benefit from technical support and design guidance; thirdly the greatest amount of competence was related to the creation of nodes, the management of nodes and student requirements, whilst the least amount of competence seemed to be observed in the design of parameters, interface design and the evaluation process. Finally, all the authors, regardless of whether they were experienced or not, welcomed the opportunity of gaining access to suitable and applicable principles and guidelines with a view to facilitating the authoring of hypermedia language learning applications. The few comments provided, on the whole, suggested that whilst the principle and potential of C.A.L was recognized and generally accepted, the lack of time, energy and adequate skills meant that good quality computer interaction in language teaching and students' curriculum was still a remote possibility.

Overall, the potentiality attributed to user-interface features related to hypermedia authoring was very highly rated. Highest on the list was the potential and range of input devices for designing improved interaction with the recent addition of sound, animation and video control. This awareness and predisposition to technologically-based resources felt by authors was further compounded by the similarly high rating given to interaction with external applications and multi-user mode facilities. Given that the existing authoring software seldom provided these last two features, such response could only indicate a degree of wishful thinking or speculation on the part of authors. It is, indeed often pointed out that the discrepancy between functionality and usability stems both from the need for greater technological compatibility across packages, since most commercial authoring platforms provide their own dedicated object-oriented programming facilities, and fuller design co-operation between language specialists turned authors.

In-built navigational facilities such as linking; object and link editing were also rated very favourably, compared to more complex, programmable navigational devices such as graphic overviews, route mapping and indexing. By the same token, text and graphic creations, formatting and editing commands and functions, colours and displays of links were featured high on the rating list, supposedly as a result of their accessibility. This was all the more obvious when such screen design devices were compared with animation, video facilities and design templates. Following the same pattern, mechanisms such as author/browser mode switches and the search and replace device were given greater prominence than collaborative editing, storing and printing facilities under authoring usability.

The above observations based on the authors' attitudes towards the potentiality of hypermedia authoring tools seemed to suggest that whilst the interactive potential, in terms of interface design, navigation and more generally authoring facilities, was generally recognized and appreciated, authors clearly tended to identify with features related to linking and navigation. This indicated a greater degree of confidence and competence whilst seeking additional technological as well as HCI expertise, the lack of which being seen as hampering them in the design process.

Similarly, the above-mentioned survey on authors' profiles indicated that all respondents, including those without authoring experience, felt that hypermedia applications could improve the language learning process. From this positive starting point, a clear pattern of answers regarding hypermedia suitability was noted across the proposed language learning methodologies. Whilst the more traditional deductive methods such as grammar exercises and databases, translation work and text parsing ranged from being mainly suitable to highly suitable (with some reservations), language practice and interpersonal interaction, at the other end of the language learning spectrum, were almost invariably and, indeed, predictably considered highly suited to hypermedia systems.

Such a response would suggest that hypermedia language learning applications should apply to all aspects of the learning process and therefore be integrated into the overall learning environment. This assumption could, in turn, be further interpreted as enabling hypermedia to present all the various component parts of the language learning process highlighting their complementarity according to the chosen delivery mode. Authoring could therefore apply to the provision of grammar support mechanisms in the form of explanations and controlled exercises, further practising interactive facilities such as multiple choice questions and finally, fully interactive simulations such as dialogues providing realistic exposure to the given foreign language. From the above premise, the student interaction should include a choice of varied learning tasks, a good selection mechanism, easy and user-friendly access to information databases and entertainment value.

Finally, the lack of general design and HCI expertise translated itself into poor design considerations, which made little or no mention of design potentiality in terms of expected student interaction, student requirements and the desired match between the task and the action domains. This is symptomatic of such an authoring approach, too often conditioned by technologically led solutions and limitations.

Interestingly, Levy's international survey carried out in 1991 shed more light on the way authors conceptualized CALL in terms of strategies, roles, modes and scope (Levy, 1997: 118). These findings are of particular relevance and interest when considering hypermedia CALL inasmuch as the survey aimed at exploring the whole foundation supporting the CALL conceptualization process and clearly targeted CALL practitioners amongst a majority of language teachers with extensive language and teaching experience. Results were selected on the basis of their applicability and relation to hypermedia features. Not unlike the previous London-based results, respondents were perceived as being notably "eclectic" when selecting their preferred teaching and learning approaches showing a preference for communicative approaches whilst still supporting, although to a lesser extent, more formal, deductive methods. "*15.4 per cent of respondents registered only communicative language teaching and task-based learning*". But "*95.2 per cent of respondents recorded two or more categories and 35.6 per cent of respondents marked four or more categories from the list*". However, "*respondents showed support for the more formal, traditional approaches such as formal grammar instruction, situational language teaching, and cognitive code learning*" (Levy, 1997: 122.123) highlighting the wide range of answers given by authors on the subject of learning strategies which indicated the "*complexity and the ambiguity in actually developing a CALL program with a communicative framework*" (127). A similar range of responses was elicited on authors' perception of the role the computer should play. Whilst split on the question, the majority of respondents considered that the computer should play a non-directive role and saw it fundamentally as a tool. Not surprisingly, directive roles such as *manager of tasks, expert system or surrogate teacher* were the least favoured. "*In all 55.8 per cent of respondents registered a role for the computer as a useful provider of mechanical language practice*" and this role was "*the most frequently recorded within the context of the self-access mode*" (128). Last but not least, respondents did not seem to differentiate between roles and context of use making the computer, regardless of its role, suitable in "*both the self-access mode and the classroom*" (128). Interestingly, the scope of CALL encompassed a wide spectrum of applicable topics ranging from word processing, with over 70 per cent of responses, Interactive video and hypermedia coming in third position with 65 per cent of responses before AI, text processing, sound/speech, instructional design, communications, natural language processing, computational translation, computational linguistics and voice synthesis. Whilst supporting the earlier observation related to textual features in CALL design, these findings suggest that CALL is particularly suited to hypermedia delivery even if its general usability is not particularly well defined or delimited. Questions related to the design process showed that the majority of respondents had "*difficulty in specifying a single orientation*" (130) when in the pre-design, conceptualization phase. Strikingly, "*the most frequent initial orientation registered by respondents were certain potentials of the computer and the respondent's language-teaching methodology*" (130). In any case, responses identified a broad range of pre-design considerations or *points of departure* from the lower level, task-based problem solving approach to the higher level design process adopting a theoretical framework. Such widely differing considerations similarly highlighted the wide range of authors involved in CALL design, from the language teacher with no prior design expertise to authors conducting research and reviews or developers (132). This last point was, indeed, corroborated by the general view expressed by respondents supporting the role of the teacher as author, "*73.2 per cent thought teachers should be involved in CALL materials writing, specifically writing support materials to accompany CALL software packages, whereas only 8.5 per cent did not*" (141). Authors helped in this process by authoring platforms instead of complex, high-level programming languages. On the question of CALL materials delivery, the majority of responses showed, yet again, the overwhelming domination of textuality in CALL indicating that the computer was still best at enhancing reading, writing and text reconstructions with listening coming in 6th position, interactive video in the 9th, interactive audio in the11th followed by simulation and finally speaking in 15th place. Therefore, if hypermedia was considered high on the list of appropriate topics, its multimedia applicability, in terms of hardware delivery, language aspects and learning strategies, was not easily realizable.

7.5 Students' Mental Models in Hypermedia CALL

In many respects and for obvious reasons, the students' experience in CALL-related activities has, by necessity or default, been closely influenced by the nature of their academic environment. In the broader sense, this contextualization is predicated by teaching and learning approaches whilst being conditioned by the subject-specific exposure to authored applications to a large extent and interactive multimedia platforms for home entertainment to a far lesser extent. The chosen approach adopted to study mental models formed by current students of French essentially relied on a small but representative sample of students, established from the students' general profile, to interact with a number of current systems purporting to be either hypermedia-based or multimedia-interactive or even in one case a video-based learning support. Findings from resulting data analyses ensue.

7.5.1 Students' Profile

The students' profile was established on the strength of two surveys carried out in 1994 and 1996 and based on questionnaires, observations and user-walkthroughs. The first survey was essentially relying on a questionnaire linked to the evaluation of a CALL application. Whilst the findings it yielded were considered useful in the process of developing students' perceptions of the software and, by extension, hypermedia CALL, its exposure, in terms of student involvement and subsequent interaction with the platform, was not considered sufficiently representative. As a result, it was felt that a second, more comprehensive, survey, implicating the whole of the French intake, was necessary to complement the original attempt and to establish a clearer student profile.

7.5.1.1 Survey No1

In the first instance, a summative evaluation of an existing hypermedia CALL product was organized primarily to provide a common denominator as well as a visual and interactive basis for discussion within the targeted group. Considering that French students had had very little exposure to hypermedia CALL, this approach was designed to pump prime them into expressing their views on the application's usability whilst facilitating a discussion at the level of hypermedia usability in French studies in general. Therefore the evaluation, based on the observation of students' reactions and interactions, was essentially empirical and aimed at establishing an identifiable and recognizable student profile rather than providing data solely related to the user interface design. In other words, this evaluation was primordially student centred and not aimed at developers.

This initial survey targeted a single group of final year French students who were asked to familiarize themselves with a hypermedia CALL application in its final design stage and undergoing an iterative evaluation. Students were asked to interact with the software, give their impressions on its usability and fill in a questionnaire based on their experience. The questionnaire was designed:

- to help these French degree students circumscribe the functionality and usability of the dedicated hypermedia application.

- to ascertain the suitability of hypermedia in the field of language learning on the basis of the specific values they had come to appreciate whilst interacting with the application, in terms of expectations, satisfaction and knowledge contribution.

The following approach was adopted:

A. Knowledge of Hypermedia
Students were asked if they were in any way familiar with hypermedia applications within the context of their studies.

B. Potentiality of Tested Hypermedia language learning application
Students were asked to rate a number of relevant user-interface features.

C. Hypermedia and Language Learning

Students were asked if hypermedia applications could improve the language learning process.

D. Teaching Methodologies and Student Requirements

Students were asked in which delivery mode the hypermedia interface could best serve them.

E. Personal Views on Tested Hypermedia Application

Students were asked to comment on their expectations, the suitability and usefulness of the application and any other points they felt like raising about their hypermedia experience.

7.5.1.2 Results

The large majority of students involved in the laboratory-based evaluation claimed to have no prior knowledge of hypermedia. Out of the 12 questionnaires, three indicated having gained previous experience in this field with a hypermedia package designed for intermediate students of French. Although the tested application adopted an hypertext structure as opposed to hypermedia with multimedia extensions, ratings of screen design features ranged from poor to average, most noticeably in the area of colours and interface design. Interestingly, navigation facilities were rated slightly, albeit perceptibly, better than the system's interactive features suggesting that navigation tools essentially led to browsing as opposed to meaningful and goal oriented interactions.

A general tendency to attribute top ratings to language practices and interpersonal interactions pertaining to hypermedia platforms, also led to believe that students still had unfulfilled expectations regarding the potential and applicability of the available technology.

Both points are confirmed by results in sections D and E showing promising capability in multimedia laboratory environments, whilst discarding on-line assessment as a possible consequence of such an exercise. Similarly, unsupervised, non-assessed self-directed study was highly rated, strengthening the previously raised concept of browsing and unstructured information gathering interactions. Finally, the main indictment brought by this small but typical group of student users against the proposed hypermedia language application focused on its general unappealing approach and flawed interface design, undermining the students' motivation, attention and learning capabilities in the process.

7.5.1.3 Survey No2

In the second instance, students' characteristics were gathered by means of a questionnaire. Since the targeted student group was already pre-determined, no attempt was made to further identify and analyse aspects such as age and individual educational backgrounds or what Ohlsson (1993: 204) refers to as *global descriptors* of the students. Instead, the survey purposefully focused on the students' level of proficiency in French, their level of computer literacy, their interest in multimedia developments and their keenness to participate in organized user-walkthroughs, considered particularly relevant, albeit unknown, domain-specific descriptions.

Above all, this second and current survey was designed to cover a wider and therefore more representative group of students and shed some useful light into the rapport established between language students and computer technology within their learning environment. This time, the targeted student group consisted of the whole 1996 intake of French students at all three levels of the degree programme and the questionnaire aimed at eliciting how experienced, confident and interested the students considered themselves when interacting with computers as part of their learning process. The rationale for such an approach was based on the following criteria. Firstly, It was felt that the initial survey was, indeed, too restrictive in its scope to develop relevant students' mental models.

Secondly, it was thought particularly important to gauge how students were likely to react to the proposed experiment in order to assess its likely impact. Thirdly, if computers are increasingly forming a compulsory part of the language students' learning experience, no data is, as yet, available on how this is perceived by them, beyond superficial, albeit generally negative, feedback. This last point is rather pertinent when seen against figures produced by the computer industry, which, were they to be believed, suggest that interactive multimedia systems are increasingly impacting on this particular 18 to 20 year old age group and their environment, allegedly making them more receptive and positive to such developments and exposure.

The questionnaire, which was kept deliberately succinct and easy to fill in, sought the following information: name, level, French language unit undertaken, computer skills, IT confidence, multimedia interest, multimedia hands-on experience and availability for user walkthroughs. The questionnaire was handed out to students in their respective language classes over a two-week period and the students were asked to fill it in by simply circling the appropriate boxes (refer to Appendix 1 for further details).

7.5.1.4 Results

A data analysis on the basis of the returned questionnaires seemed to highlight the following points (Refer to Appendix 1 for further details):

- Fewer questionnaires were returned than had been anticipated despite allowing for a two-week distribution period. Out of an overall number of 211 students, 70 questionnaires or 33% were returned. The worst offenders were Level 1 students who, overall, only returned 24% of the questionnaires after some persuading by the members of staff concerned. This compared with 38% for Level 2 students and 40% for Level 3 students. Furthermore, these percentages were indicative of the degree of motivation and enthusiasm generated by the proposed project, briefly introduced with the questionnaire. The response from final year students was generally far more positive and spontaneous than that from either their Level 2 or Level 1 counterparts.

As a result, it was easier to enlist Level 3 students for subsequent user walkthroughs than Level 2 and above all Level 1 students.

- Computer skills: allowing for some unavoidable distortions due to the small numbers used at times, the highest percentage of students claiming to be experienced IT users came from the Level 3 cohort with 33% of third year and 29% of fourth year students. Conversely, only 18% of Level 2 students and just above 20% of Level 1 students felt they were experienced in IT. However, the majority of students, at all levels, declared having "some" experience. Worryingly, a small but noticeable minority of students, at Levels 2 and 3, indicated that they had no IT experience whatsoever. If the number of returned but unfilled questionnaires as well as no-shows were to be included in this percentage, on the assumption that these students fell into such a category, then the proportion of students, regardless of levels, with little or no IT experience must be far greater than imagined.
- IT confidence: In parallel with the above observation, students, predictably, showed varying degrees of confidence generally on a par with their own IT experience. Therefore, in most cases, the numbers and resulting percentages matched those entered for computer skills. As a result, 40% of students entered "reasonable confidence" which precisely matched the peak of 40% who had declared "some" IT experience. However, the most significant difference worth noting could be found at both extremes of the range. Indeed, more "inexperienced" students entered a no confidence rating (13%) and less "experienced" students entered a very confident entry (11%) suggesting that even if confidence was generated by acquired experience, its acquisition and level were not quite commensurate with it. Finally, Level 1 returns, bar unfilled questionnaires, showed that no students at that level claimed to have no confidence.
- Multimedia interest: The greatest amount of interest generated by multimedia came from Level 3, fourth year students with 50% indicating that they were "keen" and 14% "very keen". As pointed out earlier, this accounted for the higher level of participation offered by students. Overall, the majority of students were, in principle, keen to practise with the available multimedia software with 43% of entries whilst 7% at

Levels 1 and 2 indicated their complete lack of interest in the field. Were this last percentage to be added to the 14% of no entries, a substantial number of students, the equivalent of 20% of returned questionnaires, would have signalled how swayed they were by these new technologies supposed to introduce novel and attractive learning approaches.

- Multimedia experience: Not surprisingly, the majority of students indicated that they had no experience of multimedia (39%) followed by "little experience" (29%) and "some experience" with 17% of returns. Only one Level 3, third year student declared having "a great deal" of experience. It is worth noting that Level 3, third year students returned the highest percentage of students with "some experience" (33%) whilst Level 3, fourth year, and Level 1 students returned the highest percentage of students with no or little experience in multimedia with 43 and 32% respectively.

7.5.2 Overall Results

Both surveys yielded interesting results in their own right, inasmuch as they were, purposely, different yet intrinsically complementary. Additionally, they provided valuable information stemming from a comparative analysis emphasizing the evolutionary nature of the students' profile as perceived between the two surveys spanning a three-year period from 1994 to 1997.

Therefore, results from both surveys were analysed with a view to clearly establishing a number of recurrent patterns related to behaviour, attitudes, competence and interest in the field of multimedia as well as attempting to provide pertinent, relevant and accurate profiles of students of French in HE within CALL.

- Students in 1994 had no prior knowledge of hypermedia. Results from the 1997 survey indicated that little had changed since. The majority of students showed that they had little or no experience with this type of software and a substantial number had no interest in it.

- Students in 1994 perceived the hypermedia platform as a navigation tool facilitating and highlighting browsing as its main interactive feature. In this respect, hypermedia was seen as essentially supporting unsupervised and non-assessed self-directed work. Furthermore, hypermedia suggested an appealing interface with full multimedia extensions but its potentiality and applicability were not clearly appreciated. Recent evidence of little or no interest in multimedia would seem to corroborate the view that multimedia was still considered an educational gimmick at best or a mere disposable adjunct at worst which had not yet fulfilled its potential and, therefore, gained the necessary credibility to make it worthy of attention.
- A large proportion of students at all levels still considered that they lacked experience in IT generally which, in turn, generated unease and apprehension towards computers.
- Surprisingly, third and fourth year students expressed a stronger desire to participate in and benefit from the project as they realized that it would be an opportunity to discover a new range of interactive software in the area of French which could reconcile them with a technology previously perceived as being limited, flawed and poorly interactive. Conversely, Level 1 students showed little interest and motivation in taking part in the experiment which did not seem to be in any way beneficial, either in terms of exposure to new software or in terms of personal experience to be gained from it. The interesting suggestion was made that final year students belonged to the early computer generation with access to computers such as Acorn, Atari or Amiga who had been initially involved in creative, user-fronted, activities and who, therefore, related to the design problems and potentiality linked to computer-assisted applications. On the other hand, first year students belonged to the computer-game generation, and therefore, were more accustomed to the console than the keyboard. As such, they were primarily motivated by the programmed-functionality and the entertaining value of the software with its built-in simulations and computer-led virtuality. Whether this could be generalized or not is debatable, however, results from the more recent survey tended to support the view that such a difference was perceptible at this crucial level of conception and perception of what computers stood for.

- Finally, the three-year interval between both surveys did not indicate a significant shift in attitudes and skills. Such findings militated against the emergence of a noticeable trend in renewed and widespread computer literacy amongst young people.

7.6 Methodology for Exploring Mental Models

As previously stated, the aim of the current survey was to identify students' mental models of hypermedia CALL material. Therefore, it was felt that the best way to facilitate the exploration of such an elusive and abstract concept was to record and decipher students' views and attitudes built on the strength of their interaction with selected systems, emphasizing both its process and outcome. On the basis that mental models are essentially associated with the learning process, performance and the user interface design (Staggers and Norcio, 1993) the adopted methodology reflected a three-pronged approach focusing on the system design with a series of summative evaluations, on performance with task-based user-walkthroughs and on learning with group discussions and feedback sessions. In order to get to a valid and accurate representation, the interaction was related to a sufficiently wide and representative selection of appropriate platforms. For the purpose of this experimentation, the summative evaluation provided the main framework for this experimentation, as it not only encapsulated the user interface design but also learning strategies and expected learning outcomes. Furthermore, it was hoped that such an evaluation would yield valuable data to authors since the study of student interaction with the current generation of CD-Rom based hypermedia CALL packages is not widely carried out or made available.

As a result, the adopted methodological approach (Knussen *et al.*, 1991) could be defined as comprising an experimental element, in the form of a summative evaluation conducted in language laboratory conditions, a research and developmental aspect in the shape of task-led user-walkthroughs and finally experimenter-led group discussions and interviews of students after their interaction with the given software. Ultimately, its validity rested on the satisfactory organisation of an acceptable student representation matching the general profile of the actual student intake in French. By the same token, it required access to hypermedia CALL systems which would represent a wide, domain-specific range of types of interfaces, functions and modes of interaction, considered symptomatic within the currently perceived momentum in CALL software development.

A normal cycle for a given group of students evaluating a specific hypermedia CALL system comprised an average of four sessions of one hour each in length. This exposure was considered not only realistic but also sufficient for the purpose of the experiment. Indeed, sustained observations would seem to indicate that students, albeit motivated and dedicated, tend to arrive at boredom thresholds more quickly than expected. The first session was considered exploratory insofar as students, given a minimum amount of background and starting up information, would be allowed to 'navigate' through the application as they pleased, trying to understand and appreciate its parameters, structure and interactive potential. Students were simply asked to explain and to exchange their views on the nature of their interaction orally in order for the experimenter to record this information in writing. The second and third sessions adopted the structure and organization of user walkthroughs based on specific tasks considered typical within the application. Walkthrough sessions were kept voluntarily short, generally fifteen minutes per task, so as not to dampen the much coveted enthusiasm generated by students. In all sessions, task performances were followed by discussions on the software in order to extract the general impression the application gave, its perceived strength and weaknesses and what its possible purpose and outcome were both in terms of user interaction and learning objectives. The final session was devoted to filling in the check list listing all the evaluation criteria to be tested. To facilitate this final and important part and extract a maximum amount of information from students the checklist was voluntarily filled in by the experimenter, accurately recording on paper the students' answers. Students, who by then were feeling reasonably confident about the interactive environment, were also allowed to use the software to either illustrate the points they were making or to simply enable them to refresh their memory on some previous functions or tasks which were seen complex at the time. The checklist was usefully treated as a relevant and comprehensive list of design considerations which not only and conveniently helped to focus the mind but also and more crucially helped to crystallize the views and reactions expressed by students.

The only digression to the above format was operated solely on one occasion when it was felt necessary to use an additional video-based learning resource in order to glean supplementary information on video-generated interaction.

7.6.1 Student Representation

The appropriate student representation involved in this experimentation directly stemmed from a selection process based on the second survey used to establish a student profile. This process aimed at selecting and involving a manageable number of reliable students whose characteristics, in terms of language proficiency, computer skills and interest, would match or correspond to the more global profile previously arrived at. One obvious, but in this case unavoidable, weakness of such an approach rested on the necessary degree of motivation called upon for the experiment to be satisfactorily completed. Indeed, since evaluation sessions had to be scheduled outside class contact hours, it became obvious, as recruitment got under way, that only students with a 'keen to very keen interest in multimedia' were attracted to them. As a result of this corrupted factor, motivation and interest have not been taken directly into account as valid representation criteria when attempting to establish patterns and models. However, efforts were made to attract students with little or no IT experience as they, surprisingly, still represented a larger than expected percentage of the targeted student population. It is on this basis that the experience / inexperienced axis was formed as it corresponded with the most novel and salient aspects of the findings generated by the latest student survey. Firstly, this important dichotomy between experienced and inexperienced students seemed to best fit the student profile. Secondly, it was felt that, by undertaking different studies on student interaction, useful data could be obtained to help understand such a phenomenon. Finally, noticeably different degrees of interactive expertise were thought to be well worth a thorough HCI investigation at the level of the user interaction and interface design.

At the practical evaluation level, this experienced / inexperienced axis translated into the creation of small groups of twos, at the request of students since they felt happier and more secure when taking part in this way, on the basis of shared experiences with other fellow students of the same level and often enough the same language group. However, interestingly, computer skills and multimedia experience varied quite substantially within groups adding a useful, albeit unavoidably distorted, dimension to results.

7.6.2 Summative Evaluation

If, indeed, a summative evaluation is to test a designed application against "normal practice" (Laurillard, 1994) which, in this case, could be associated with known teaching and learning processes, it was thought some valuable light could therefore be shed onto the system image as perceived by both author and students. On such a premise, the summative evaluation that these students undertook was aimed at the widest possible range of currently available CD-ROM-based, hypermedia CALL applications in French. These broadly fell into two design categories: the off-the-shelf, commercially-oriented, products on the one hand and applications designed and produced by universities within the remit of approved and officially funded software projects on the other. However, if summative evaluations are usually designed to measure the effectiveness of completed applications against their stated aims (Chanier, 1996), this evaluation was primarily used as a valuable tool which aimed at registering students' reactions to different interfaces, encouraging them to compare design approaches, structures and learning strategies between platforms as well as with their own preferred methods, approaches and strategies. As such, this form of evaluation was adopted in view of its flexibility and suitability as it created a comprehensive working structure for students' interactive sessions. Additionally, it enabled the experimenter to make full use of his vantage position combining authoring and teaching expertise as well as specific research interests.

7.6.3 Evaluation Criteria

To ensure that these essentially empirical and heuristic evaluation techniques would correspond to and match students' characteristics, a selection of evaluation criteria was drawn up. The selection process initially stemmed from the comprehensive list produced by Ravden and Johnson (1989) albeit pruned down to the most relevant and manageable criteria within the user interface design of the application whilst adding evaluation criteria specific to an hypermedia for language learning platform. Therefore, the checklist used comprised broad sections concerned with: *visual clarity*, *adaptability*, *informative feedback*, *explicitness*, *appropriate functionality*, *flexibility and control*, *multimedia extensions*, *applicability for language learning*, *error prevention and correction*, *student guidance and support*, and two sections looking at the whole experience with the application: *usability problems* and *general questions on the usability of the application.*

7.6.4 Evaluated Software

Since the *raison d'être* of this evaluation was primarily to record students' reactions to and interactions with software with a view to exploring and appreciating mental models, the following criteria were adopted when identifying and selecting the relevant software:

- Type: purposefully limited to hypermedia CALL software on CD-ROM in French language, although a video-based "interactive learning resource" was used to provide additional information on video-based interaction whilst highlighting differences between approaches and interface designs. This selection of software, which was inevitably constrained by availability and resources, was nonetheless considered to represent a fair and accurate window image of current developments and output in CALL design. Furthermore, the wide ranging and often differing interactive potentiality of these platforms provided a useful diversity of conceptual models within which students could interact and develop their own appreciation.
- Levels: all levels were considered appropriate, from beginners to advanced, as long as the software was deemed to match general expectations for students in Higher Education. Whilst attempts were made to match both recommended level of language proficiency of software with that of students, different combinations were similarly tried to approach and test the user interface differently.

7.6.5 Evaluation Process

On the basis of previously mentioned questionnaires, the surprisingly manageable number of students who had volunteered to take part in the language laboratory experiments joined suitably arranged one hour weekly sessions. Each student interactive session, which ran over a four week cycle, was organized on the following basis:

Purpose of the evaluation: to identify and define students' mental models of hypermedia CALL in French language in Higher Education.

Student selection process: selection was arranged on a purely voluntary basis stemming from the questionnaires. However, special attention was paid to the representativeness of the student volunteers selected on the basis of their IT / multimedia expertise as well as their linguistic competence ranging from level one (first year) to level three (final, graduating year).

Number of participating students per session: the nature of the exercise with its limited provision of software and hardware meant that the computer/student ratio was generally one to two.

7.6.5.1 Description of evaluation

As previously mooted, the objective of this evaluation was to record students' interaction with and reactions to a selected range of hypermedia CALL interface designs. Therefore, the emphasis, throughout the exercise, was primarily placed on studying the formation of the students' own mental models of the given software with which they interacted. To help and stimulate this student interaction, the adopted approach was structured on a series of customized user walkthroughs essentially relying on "think aloud protocols" (Preece *et al.*, 1994) and a final student audit. User walkthroughs were, themselves, exploited to focus on either the exploration of the software environment or on special design features with the introduction of task-based exercises. Additionally, the concluding student audit was used as a practical framework to enable and encourage students to translate their previous perceptions and reactions into appropriate design considerations whilst circumscribing these design issues into manageable and finite sets. Furthermore, this audit was seen as a useful device to yield valuable evaluative data related to the user interface design of the selected applications.

As a result, the evaluation was carried out in three stages, the first two being based on verbal protocols produced by user walkthroughs and the third on the audit. The first stage was exploratory so as to enable students to become familiarized with the structure and knowledge base of the application and obtain valuable information on their initial reactions. Therefore, it was largely heuristic insofar as students were explained the aims and objectives of the exercise, were briefly introduced to the chosen application, whilst being encouraged to interact with it and instructed to express their observations verbally. The second stage of the evaluation, which would take place during the following two weeks, consisted in verbal protocols based on specific tasks considered key or representative activities within the given learning environment and its expected goals. The aim of such tasks was to provide a broad structure and purpose for the subsequent interaction. In turn, this was designed to produce a more realistic context for the interaction to take place and help students to focus on the potential of the software within the learning process.

Summative evaluation of the tested software: The final session was devoted to the given application, thus enabling the experimenter and students to rehearse some of the points and arguments previously expressed, and to interact with the interface to illustrate the noticeable strength and shortcomings of the application. By then, students were sufficiently familiar with the application to feel confident enough to talk about their perception of the application's wider structural dimensions and embedded learning strategies. This session was based on filling in a checklist substantially adapted from Ravden and Johnson (1989) according to customized evaluation criteria. This final audit was designed to ensure that all the salient points related to the interface design, needs of students and expected outcome were covered (Nielsen, 1989).

Help available: students were initially encouraged to explore the application to be tested so as to develop a working model of its structure including notional aims and objectives of the learning environment within which they evolved as well as its inherent design and technological limitations. Therefore, students were not guided through the application although help was provided on request, by the experimenter or with support material when made available, if and when students needed it. The amount of help sought by students depended on the degree of expertise and confidence they mustered and was essentially and purposefully limited to the 'getting started' phase of the interaction.

7.6.6 User Walkthroughs

According to Polson *et al.* (1992), the purpose of such an evaluation method is to assess how easy it is for a user to perform a task using an identified interface design "with little or no formal instruction or informal coaching". It involves evaluating the cognitive processes required by the "subject" to satisfactorily proceed through the necessary physical action sequence in order to complete the assigned task.

The walkthrough method is therefore primarily an evaluation technique designed to focus on the learnability and usability of a system. It is particularly appropriate when emphasis is placed on exploratory learning. Walkthroughs are normally conducted during the design process or after implementation of a design and on marketed products to sift potential flaws and weaknesses. In this particular case, user walkthroughs were adapted to the nature of the experiment, which, as explained, prioritized the user interaction at the expense of the interface design. Therefore the emphasis was essentially placed on the recording of verbal protocols which students would be encouraged to utter out loud whilst interacting with the software, either in an exploratory or structured manner. Resulting verbal protocols were used qualitatively to develop a more accurate perception of students' mental models on the basis of their interaction.

The user walkthrough took place in a computer laboratory enabling the student or a small group of students and the experimenter to sit in front of a computer. The first step consisted in explaining the aims and objectives of the exercise, the nature and format of cycled sessions and the procedure adopted for the user walkthroughs. Additionally, a brief introduction to the software was provided to help students to better appreciate and relate to the chosen hypermedia CALL environment. Following this short initiation, the assistance provided by the experimenter was minimal. As a rule, the experimenter played the part of the impartial observer busy writing the think aloud protocols and, generally, did not intervene whilst students were involved in either exploring the new CALL environment or completing a task. Intervention would be prompted only when specifically asked for by an irretrievably lost student whose level of helplessness was such that the whole process was considered jeopardized. Therefore, aside from the necessary clarification of utterances and possibly actions in addition to verbal reminders to ensure students thought aloud, the experimenter refrained from entering a dialogue with students.

Since students had already volunteered, they were sufficiently motivated and willing to accept the few constraints imposed by the format of the user walkthroughs. Generally, they welcomed the opportunity to be exposed to new computer-based learning material, which was considered of potential benefit to them. They appreciated the relaxed and informal conditions under which the user walkthroughs were taking place and welcomed the possibility of expressing themselves freely on all aspects of the user interaction and interface design. As a result, students were articulate, even when apprehensive about the software, confident in the knowledge that it was expected of them to be critical.

The subsequent data was recorded in writing by the experimenter using a previously prepared recording sheet to capture the information. This recording sheet comprised three columns with the following headings:

- Action made
- Outcome of action
- Observations by the student(s)

A customized version of this recording sheet, giving overall prominence to observations, was made for the initial think aloud protocol in order to fully record the verbal observations of students whilst exploring the new CALL environment.

Nature of tasks: Tasks were purposefully limited to a maximum of ten strategic functions and reactions expressed by students were consistently noted down by the experimenter. Such a manageable length meant that students were expected to comfortably complete two or three tasks within the hour-long session. Following the successful completion of a task, students were asked to fill in a brief questionnaire related to the usability and suitability of the particular task. Questions were directed at the degree of difficulty involved when performing the task and overall meaningfulness and validity of the exercise within the evaluated application as a whole and in terms of its learning objectives.

8 Elucidation of Mental Models in Hypermedia CALL

8.1 Summative Evaluation of Télé-Textes

8.1.1 Description of Software

Télé-Textes is described by its authors as a "fully interactive learning resource for advanced learners of French....designed to promote independent learning". More specifically, its main aim is to give students access to authentic extracts of French television news programmes providing an exploration of topical and cultural issues, practice on the four key language skills and exposure to current-affairs vocabulary for both classroom use as well as self-study. *Télé-Textes*' objective is to "promote the students' confidence in using authentic television by highlighting a variety of viewing strategies.

Télé-Textes' main attraction rests on its central video resource presenting a selection of eighteen television news items, taken from TF1's evening news broadcasts. These items, chosen because of their "intrinsic interest" and recurrent nature in television news, are arranged into seven *Dossiers* according to their type. These *Dossiers*, which include *Intempéries*, *Tourisme*, *Loisirs et Culture*, *Evolutions Sociales*, *Environnement*, *Manifestations* and *Faits Divers*, are designed to offer a balanced presentation of lighter and harder topics. Each *Dossier* comprises a minimum of two and a maximum of four video extracts, all of them introduced by a French presenter who provides some information about the context and highlights some key words in the video. Typically, the *Dossier* opens with a succinct introduction supported by an explanation of its designed strategy. Students are advised that the *Dossiers* represent discrete units and, therefore, can be accessed in any particular order. In addition to all its language-based transfer activities, *Télé-Textes* offers a supplementary voice-recording facility provided in a Studio mode where students can try to replace the television reporter by recording their own scripted or improvised versions over the original soundtrack. The new, revised soundtrack can then be played back and saved.

Unusually, however, *Télé-Textes* is also conceived as a text-based print resource. As such, all the video-related activities are essentially relying on traditional textual interaction and, generally, work on the printed text. As part of this strategy, *Télé-Textes* comes complete with an activity book. In the absence of any multimedia support and hypermedia considerations within the activity section, students in this particular user walkthrough were expressly told to simply concentrate on the video interaction whilst, similarly, encouraged to share their views on the whole of the user interface design.

8.1.2 User Interaction

The main user interaction is built around the video extract. Students are advised to view the news item at least three times in order to develop a sound understanding of its content. Similarly, pre-viewing exercises are highly recommended prior to watching the video as they are designed to prepare students in terms of context and vocabulary. However, the integration of tasks and viewing sessions is considered discretionary and, as such, left to students and / or teachers to decide on appropriate routes and interactive exposures.

8.1.3 Verbal Protocols

8.1.3.1 Verbal Protocol 1: Group (a): Exploratory Session

Refer to User Walkthrough of *Télé-Textes* in Appendix 2 for a full detailed breakdown of actions, outcome of actions and resulting student observations.

Introduction: a short introductory presentation was given to students including the level of linguistic competence, target users, the underlying content of the application and the purpose of both the user walkthrough and the present exploratory session. In particular, the students were told to focus their attention on and around the video interactive parts of the application, which could be considered a potentially valuable multimedia extension. Additionally, students were given a working definition of multimedia and hypermedia, highlighting the fundamental differences between both design approaches and subsequent interaction.

Analysis of Results of Recording Sheet:

Quantitative analysis

The task undertaken by the students was exploratory. Its unique goal was to explore and interact with the video-based domain of the application with a view to exploiting and evaluating its multimedia potential.

- Bar unquantified but numerous random clicking and random screen scanning movements, 28 actions leading to recorded outcomes were performed within a 40-minute session.
- All actions were performed by mouse-clicking operations.
- The majority of actions were carried out by student A, as agreed at the beginning of the session, with the full and active collaboration of student B. However, student B became mouse-active twice.
- On 5 occasions, the action taken did not lead to the expected outcome.
- At no stage was the Help facility accessed.
- 2 dossiers were successfully accessed.
- The students watched 2 selected video clips at least twice in addition to the introductory video presentation. In each case and for the first time the video was seen in its entirety and without interference.
- The experimenter intervened once to help solve a technical matter.

- None of the exercises linked to the video clips were attempted.
- Of all the comments made by the students, only three were overtly positive.

Qualitative analysis

Students' observations and comments based on their interaction could be encapsulated as follows:

- The students had high expectations at the start of the user walkthrough, possibly because it was the first one of this experiment and, therefore, genuine assumption was made that new, fully-fledged multimedia software would be tried out. Secondly, their initial anticipation was fuelled by a promising introduction relying on the strength of a realistically designed video clip of a well-known news presenter introducing the themes explored in the application. The students imagined they were going to interact with a well designed and novel interface supporting authentic material, unlike what they were used to in CALL.
- Therefore, the immediate appeal rested on the presentation and use of real authentic material, which the students could immediately relate to and easily identify with. In this respect, the model of the television set broadcasting the evening news bulletin was clearly established.
- However, the expectation was not fulfilled beyond the introductory stage, especially when the system failed to respond to the students' actions or simply match the students' enthusiasm. This contrast in attitude was particularly felt when student A started clicking on the picture-based icons representing the dossiers which, although occupying a large section of the screen, were just part of the decorum.
- By their eighth recorded action, the students were already highly critical of the design of the software, having tagged it "pretty dead", uninformative regarding the content of the dossiers, handicapped by its lack of hypertext links and oblivious of basic design conventions such as the use of highlighting for enabled buttons. This critical stance,

adopted at an early stage in the student interaction, and tantamount to a complete reversal of the initial situation, as previously described, generated a litany of negative aspects, systematically spotted as the students progressed. Ironically, this attitude, although fundamentally counterproductive, led to the formation of a number of recognizable mental models. For example, multimedia meant designing and properly exploiting pictures as well as providing the necessary data such as maps if and when required. Additionally, the interface design was old fashioned with its choice of a filing system and was far too busy to be acceptable. Video controls were not sufficiently accurate and appropriate. The systematic use of text made the presentation boring. The lack of automatic synchronization between the clip and the transcription was seen as a frustrating limitation. Finally, the perceived change of file headings across the dossiers was considered inconsistent and confusing, especially when controls could not be found.

- Finally, the students feeling disappointed and frustrated, unexpectedly curtailed their session. The exploratory interaction had shown that multimedia could do it better and more intelligently.

8.1.3.2 Verbal protocol 2: Group (a): Task 1

Refer to User Walkthrough of *Télé-Textes* in Appendix 2 for a full detailed breakdown of actions, outcome of actions and resulting student observations.

The same students who had taken part in the exploratory session undertook this task in the second verbal protocol based on *Télé-Textes*. It also proved to be the last protocol on this application, following the students' own unequivocal recommendation, tantamount to a thinly veiled threat of resignation if further sessions were still based on the same software. For this particular verbal protocol, student B became mouse holder and A support member.

Introduction: a brief explanation of the task to be undertaken was provided giving the students a broad indication of the steps to take and the task outcome. Furthermore, the *students were encouraged to think of the task within the wider educational remit of the application as a learning platform in terms of its perceived potential and practicability.*

Analysis of Results of Recording Sheet:

Quantitative analysis

- Bar random mouse movements on screen, 22 actions leading to recorded outcomes were performed within a 45-minute session.
- On 2 occasions the action taken did not lead to the expected outcome, although, unlike in the previous exploratory session, all actions led to a new physical outcome.
- The students watched the video clip they had chosen at least three times: twice uninterrupted and a third time using the controls.
- Only once was there a overtly recognizable positive comment, albeit directed at the content of the clip being watched.

Qualitative analysis

- From the start, the students' recall factor was a negative one. The application had been poorly received and tagged as a good but irretrievably flawed idea, although, nothing in particular was clearly identified as the overwhelming culprit.
- Not surprisingly, the students initially concentrated on one of the very few aspects of the application, which had won their approval: the use of authentic newsreels as basis for the dossiers. Additionally, as if to find an antidote to their frustrated interaction, they isolated light, entertaining topics to choose from.
- However, beyond the recognizably good content of the chosen clip, the students, yet again, reeled out a number of criticisms, which were symptomatic of their ways of thinking and attitudes regarding multimedia in general: for instance, a multimedia presentation was only justified if it was built on sufficiently high technological

specifications, exploiting the full potential of the visual impact in conjunction with its audio dimension. In this respect, *Télé-Textes* was considered antiquated already with its rather slow and fragmented image sequences.

- Similarly, a studio mode enabling students to edit video clips was well received but quickly rejected when its functions and design were considered below par and limiting. This was particularly felt since the students, coming under some pressure to complete a recording task, were far more susceptible to be critical and likely to be affected by a poor design under duress.
- Generally, the students showed a sensitivity towards the need for consistency, as in the case of "Ouvrir", which was used to mean different functions, or, indeed, the need to adhere to existing standards and protocols to ease the cognitive load and simplify the interaction.
- Finally, the students, having completed the task, could not be swayed to reconsider their initial negative verdict. *Télé-Textes*, for them, was simply not acceptable as a multimedia application and, furthermore, not applicable as a learning platform within the students' known learning environment.

8.1.4 Summary of Identified Mental Models

On the strength of the above analyses, an attempt was made to identify mental models elicited from the students' interaction and pattern of behaviour. These models, which closely related to their real life experience and the context within which the experiment was taking place, were classified as follows: the computer as a physical interface, the learning environment and the system as an interactive construct.

The computer as a physical interface:

- The initial enthusiasm shown by the students, fuelled by high expectations, suggested that their multimedia experience had been a positive one. Indeed, they were looking forward to practising with a novel multimedia platform, which would be different from the CALL material, so far used in their known learning environment.

- Interestingly, the introductory frame, with its live presentation, served to feed the above-mentioned expectations even further. For once, the software looked "professional" suggesting it displayed authentic and attractive material in a multimedia mode combining full visual and audio support, not unlike television. Therefore, it was assumed, at that stage, that its interactive potential would be on par with its visual impact.
- The students already had a clearly defined pre-conceived idea of a multimedia interface and potential functionality. Whilst they became increasingly disappointed with the interface design of *Télé-Textes*, it indirectly goaded the students to project their own opposite model of a multimedia platform. Here, the display was too busy, unnecessarily complex, too often purposeless, whilst its video controls were unconventional. Its design was old-fashioned and not much different from what they were used to. Furthermore, its database potential was hardly exploited since it relied on secondary material, such as a textbook, to complement its interaction. The systematic reference to text such as these, in addition to its limited and traditional interface, provoked a dismissive reaction at first, followed by a complete repudiation of the application as a valid, multimedia application. In fact, it was literally felt to represent the antithesis of what a good presentation ought to have been.

The learning environment:

- By extension, a multimedia application was meant to convey what the traditional CALL program had not succeeded in providing. If CALL material was not described, *per se*, the contrast which was established with multimedia suggested that CALL, as experienced by the students, was not well designed, not novel and not supporting authentic material.
- Since *Télé-Texte* failed to stimulate the learning process, its acceptability and validity

as a learning platform was not even contemplated.

- Additionally, at no stage, did the students feel the need, or the obligation, to learn anything from either the material or their own interaction. Their well-entrenched model of the clearly structured and coercive learning environment, coupled with its rejection of it when transposed in a different guise, encouraged their natural inclination and convenient predisposition towards the adoption of a passive role.
- Finally and more ambiguously, it felt as though the application was ultimately rejected when the students realized that their adopted passive, almost provocative, role was never challenged by the system.

The system as an interactive construct:

- The reference to the lack of hypertext links and the natural tendency, both students had, to click on displayed icons and text were ample evidence that their model of interactive potentiality was not only based on their multimedia experience but also on their protracted use of the Internet.
- In this respect, the students thought the application was 'pretty dead', 'handicapped by its lack of links, and unaware of design conventions for enabling / disabling buttons.
- Since the interactive potential of the application had been all but dismissed, the students seemed relatively, and conveniently, happy to resort to watching, passively, the video clips, chosen for their entertainment value. As such, the only successful, and protracted, interaction could have been linked to the most pervasive and overwhelming model of all, that of television.

8.1.5 Audit

For further details refer to the special section set aside for an analysis of audit data.

The audit session, which followed the unexpectedly truncated user walkthrough, was, similarly, hijacked by the students to further vent and stress their criticisms of the software. Not surprisingly, the majority of the design criteria were considered *Very Unsatisfactory* or *Moderately Unsatisfactory*. The only notable exceptions are *Flexibility and Control* thought of as *Moderately Satisfactory* and *Error Prevention and Student Guidance*, which were both given a *Neutral* verdict. Generally, comments reiterated the negative attitudes, which had been triggered by the students' interaction with the system.

8.1.5.1 Verbal protocol 1: Group (b): Exploratory Session

Refer to User Walkthrough of *Télé-Textes* in Appendix 3 for a full detailed breakdown of actions, outcome of actions and resulting student observations.

Introduction: a short introductory presentation was given to students including the level of linguistic competence, target users, the underlying content of the application and the purpose of both the user walkthrough and the present exploratory session. In particular, the students were told to focus their attention on and around the video interactive parts of the application, which could be considered a potentially valuable multimedia extension. Additionally, students were given a working definition of multimedia and hypermedia, highlighting the fundamental differences between both design approaches and subsequent interaction.

Analysis of Results of Recording Sheet:

Quantitative analysis

- Bar unquantified multiple clicking, 24 actions were performed in this session which lasted 45 minutes.
- All actions were performed by mouse-clicking operations.
- The majority of actions were carried out by student A, as agreed at the beginning of

the session, with the full and active collaboration of fellow student B. However, student B did become mouse-active on one occasion.

- On 5 occasions, the action taken did not lead to the expected outcome. In fact, in each case, nothing happened.
- The on-line Help (Guide) whose access is facilitated in the introductory window was successfully accessed and utilized.
- The students watched 2 video clips from the same Dossier (1) as well as the introductory video presentation. Each time, the video was watched in its entirety.
- The experimenter intervened once to show the students how to access other Dossiers when already in a Dossier mode.
- One exercise was tried, albeit briefly, but the interaction proved to be inconclusive.
- No comment was overtly negative.

Qualitative analysis

Students' observations and comments based on their interaction could be encapsulated as follows:

- The students were slow and methodical in their approach to explore the new software. They opted to look at the "Guide" which they read and progressed in this rather rational and systematic manner. Similarly, although of no major significance, the students also chose the first Dossier as if conditioned into looking at learning material in a known, logical order.
- The students were reasonably impressed by the video material, possibly as a result of being simply polarized by the attraction of moving images. At no stage, did they explain why they thought it was "good" and "interesting". Notably, the visual impact was potentially marred or lessened by the complex nature of the video controls, especially the "Video oui / non" and the "Audio oui / non, which appeared to be

confusing to the students. Similarly, the poor quality of the picture, especially in full screen mode, was felt to be almost defeating the whole object of the exercise.

- At one stage, one exercise was attempted, but it was quickly abandoned when the students realized they were not getting the expected or satisfactory feedback from the computer.
- Finally, despite its "multimedia" interactive presentation, the students, who had rightfully followed instructions and interacted with the application, remained neutral about its potential. So unimpressed were they, that they thought it probably would not stand comparison with a similar but conventional presentation of video material with questions in a classroom situation.

8.1.5.2 Verbal protocol 2: Group (b): Task 1

Refer to User Walkthrough of *Télé-Textes* in Appendix 2 for a full detailed breakdown of actions, outcome of actions and resulting student observations.

The same students who had taken part in the exploratory session undertook this task in the second verbal protocol based on *Télé-Textes*. It also proved to be the last protocol on this application, following the students' own unequivocal recommendation, tantamount to a thinly veiled threat of resignation if further sessions were still based on the same software. For this particular verbal protocol, student B became mouse holder and A support member.

Introduction: a brief explanation of the task to be undertaken was provided giving the students a broad indication of the steps to take and the task outcome. Furthermore, the students were encouraged to think of the task within the wider educational remit of the application as a learning platform in terms of its perceived potential and practicability.

Analysis of Results of Recording Sheet:

Quantitative analysis

- Bar a number of unquantified, repeated mouse clicking, 30 actions were performed within a 45 minute session.
- Student B performed all the actions, but the majority of the comments came from student A.
- On 9 occasions, the action taken did not lead to any satisfactory or expected outcome. In four cases nothing happened, whilst in the remaining five, the student was simply trying to find the action which would match the requested outcome (the studio mode).
- Only one Dossier was successfully accessed for the purpose of the exercise.
- The experimenter felt the need to intervene three times to prevent the students from getting unnecessarily frustrated.
- The exercise linked to the task was only attempted once.
- The majority of comments made by students showed a degree of despondency and resignation when interacting with the application.
- Not unlike the previous user walkthrough, both students expressed positive comments when accessing a new interface for the first time. This time it took place when first exposed to the recording studio. This initial enthusiasm was not maintained and enhanced by the subsequent interaction.
- At no stage, were any attempts made to access the Help facility.

Qualitative analysis

Students' observations and comments based on their interaction could be encapsulated as follows:

- Unlike their more experienced counterparts in Group (a), the students did not seem to have or express any preconceived ideas about the application with which they had previously interacted.
- Whereas they were reasonably happy to explore the interface in the first session, the imposed task in the follow-up user walkthrough made them noticeably more nervous and apprehensive. This attitude was brought to the fore when it became evident that they did not know how to complete the task.
- The apprehension generated by the task, which also comprised an unappealing recording element, coupled with a nascent feeling of inadequacy, triggered by their recent stalling, made the students critical of the application as well as less involved in what they had to do.
- Aside from liking the precision of the editing functions, nothing went right once the students found themselves in Studio mode. They could not display the transcription, understand a command, nor was the video sufficiently synchronized or slow or even working properly.
- Strikingly, the students, who had up until then been assiduous and systematic, showed unmistakable signs of disaffection. This translated into a quest for expediencies to complete the task as quickly, but also meaninglessly, as possible with a view to primarily satisfying the experimenter.
- The final and telling plea of "Can we go now, please!" indicated that what had surely been conceived as the enticing 'icing on the designed cake' had gone off and, worst of all, had, inadvertently, turned the students away from it.

8.1.6 Summary of Identified Mental Models

On the strength of the above analyses, an attempt was made to identify mental models elicited from the students' interaction and pattern of behaviour. These models, which closely related to their real life experience and the context within which the experiment was taking place, were classified as follows: the computer as a physical interface, the learning environment and the system as an interactive construct.

The computer as a physical interface:

- The students remained uncannily neutral on the question of the physical interface. One possible explanation was that they did not feel that they were in any way capable or eligible to criticize the application in a domain in which they knew so little. If anything, they simply expressed their satisfaction at having the guide with explanations displayed on the right hand side of the screen.
- If the interface was not an issue, the students felt positive about the video material and were genuinely attracted and engrossed by the video clips they chose to watch.

The learning environment:

- Being unsure of their capabilities in such an unknown territory, the students progressed through the application with great caution. However, their approach was rightfully studied, inasmuch as it was essentially orderly and predictable and was reminiscent of the kind of learning progression model software designers dream of.
- Not impressed by the interactive potential of the application, the students would have been equally happy, if not happier, to have had a video projection accompanied with questions organized in class. This highlighted the popularity and possible prevalence of traditional learning models over modern, and fashionable ones, especially when the new functionality, meant to improve the interaction, was seen as a major obstacle.
- From a neutral but assiduous attitude at the very beginning of the user walkthrough, the students became gradually disenfranchised as they progressed through the interface. Firstly, they found it increasingly difficult to justify the intricacies of the software, being already accustomed to the video technology, and secondly, they felt increasingly inadequate and, similarly, unsupported when confronted with such a

complex, although unimpressive, functionality. As a result, they ended up being disaffected and looking for appropriate expediencies to complete the task and terminate the experiment as quickly as possible. Interestingly, this known behavioural pattern, common in the traditional learning environment, rather impressively, completed its whole life cycle over two forty- minute sessions. If motivation and dedication were easily generated, so were adverse effects such as despondency, resignation and disaffection.

The system as an interactive construct:

- The students interacted with the application in a methodical, systematic fashion. The model, which they projected, suggested that they primarily relied on and responded to instructions.
- The interactive potential of the system lost its aura when the students realized that its complexity was ill justified and the exercises left completely unsupervised and non-assessed. In this respect, the machine was very much seen, or simply identified as a substitute, albeit of the poorer variety, for the better-known tutor.

8.1.7 Audit

For further details refer to the special section set aside for an analysis of audit data.

The audit session, in this particular case, was almost perceived as an imposition by the students, who had to be convinced of the importance and usefulness of the exercise for the experiment. If they had experienced problems with the interface, they, equally, stumbled upon a terminology, whose meaning they felt impervious to. Although the experimenter strove to explain what was seen as plain jargon, the students found it difficult to adequately judge the listed design criteria. As a result, the majority of verdicts found themselves somewhere in the middle between *Moderately Satisfactory* and *Moderately Unsatisfactory*. The only exception to this general rule was *Multimedia Extensions*, which were considered *Very Satisfactory*.

8.2 Summative Evaluation of Up to Standard in French

8.2.1 Description of Software

Up To Standard in French (USF) is conceptually designed as an "innovative multimedia package for language needs analysis and language learning". As an educational platform, it is clearly intended for "complete beginners" interested in learning business and vocational French up to NVQ Levels 1 and 2. Its programme of study is designed to help users learn and practise the four key language skills: listening, speaking, reading and writing. The course comprises ten units specifically conceived to represent the finite language progression from *ab initio* level in unit 1 to NVQ level 2 in unit 10. Each unit is based on two central dialogues stemming from selected everyday business situations and topics earmarked by the National Language Standards to NVQ Level 2. Additionally, the unit's interface contains relevant cultural information, vocabulary, notes, tips as well as practice material and diagnostic tests.

The programme is designed for supported self-study and therefore provides cultural information, explanations, translations as well as support and practice material ensuring satisfactory self-access. However, users are warned that some of the exercises linked to writing and speaking cannot be completed adequately without the help of a tutor as it is important to assess the degree of accuracy of answers whilst checking the validity of alternatives.

USF is a standard Windows-based package which presents a familiar interface with the use of easily recognizable conventions and controls, such as the pop-up dialogue box with its control-menu box, title bar and minimize button, pushbuttons and radio buttons.

Clear instructions are provided to install, load and access the software whilst on-line suggestions are made in "Tips" to enable users to relate to the structure, content and potential use of the user-interface.

A consistent display of command buttons provides users with navigational facilities to move from frame to frame within units. Progression is uniquely linear insofar as users can either click on "Move on" to go to the next imposed or selected frame or click on "Exit" to go back to the previous frame. A permanent, context-sensitive, on-line Help button is similarly displayed. It presents the screen-based contents of the application and provides users with a standard approach to its knowledge base including facilities such as "Search", "Back" and "History".

8.2.2 User interaction

Strategically, the user-interaction is designed to direct users from the "Front Screen" to the "Password Screen", to register a personalized password, to the "Course Menu Screen", displaying all ten units to finally individual "Unit Menu Screens".

Tactically, the unit-based user-interaction is designed to intervene at three clearly distinct levels. Firstly, the main area of the screen displays and emphasizes the three essential activities offered in each unit, which are: "Dialogue A", "Dialogue B" and "Check Your Progress". Secondly, four functions at the top of the screen, underneath the Title bar, give users access to the following additional information: "Tips", previously mentioned, which suggest specific ways to interact with the software and "Vocabulary", "Notes" and "Cultural Information" which provide the unit's background linguistic and cultural information. Finally, users can go back to the previous frame or exit the application by using the control-menu box. Therefore, aside from the guidance recommending sequences of activities and the data providing specific references, the unit's user-interaction is fundamentally based on the "Dialogue" mode and the exercises in the "Check your Progress" mode. The Dialogue interface enables users to a) Listen to the dialogue with the help of screen permutations and combinations based on text display, run modes and role selection, b) Practise with the provided recording facility and c) Review the recorded material. In turn, the "Check your Progress" interface enables users to put their newly acquired knowledge to the test with the Listening, Speaking, Reading and Writing tasks related to the relevant units and set according to Levels 1 & 2 of the National Language Standards. These self-tests come with a scoring device giving both the unit and the overall scores for self-assessment and speculative motivation.

8.2.3 Verbal Protocols

USF was the second application used to elicit mental models from our students of French. Its summative evaluation based on user walkthroughs was considered of particular interest because a) its targeted *ab initio* level in French meant that the knowledge base it offered did not present an undue cognitive strain on students with a higher level of language proficiency, b) it encouraged students to concentrate on the design and interactive potential of the multimedia interface and c) because it was considered a useful vehicle to detect how students interacted within a multimedia environment.

For this evaluation, it was possible to organize two distinct groups of two students each. Both groups were identified, irrespectively of the students' level of study, on the following basis: Group (a) was composed of students with good IT expertise, some multimedia experience and high degree of confidence; Group (b) was composed of students with some IT expertise, no multimedia experience and a low degree of confidence. Interestingly, the profile of students who had volunteered tended to closely match the general profile of the whole cohort of students with group (a) composed of one level 3 (4th year) and one level 3 (third year) students whilst group (b) was composed of two level 2 students.

8.2.3.1 Verbal Protocol 1: Group (a): Exploratory Session

Refer to User Walkthrough of USF in Appendix 2 for a full detailed breakdown of actions, outcome of actions and resulting student observations.

Introduction: a brief description of the application was given to students including the required level of linguistic competence, the stated learning aims and objectives and the purpose of the exploratory session designed to enable students to freely interact with the software with a view to developing a spatial feel of its interactive structure.

Analysis of Results of Recording Sheet:

Quantitative analysis:

The task undertaken by both student was exploratory. Its simple goal was to discover as much of the interface as possible or, indeed, as felt necessary, within the allotted time.

- Bar unquantified random clickings, 32 actions leading to outcomes were performed in 45 minutes
- Aside from entering the password, all actions were performed by mouse-clicking operations.
- The majority of actions were performed by student A in joint cooperation with student B.
- Twice the lack of physical outcome to an action triggered on-screen random clicking.
- Twice the students called the on-line help for further clarification on navigational facilities.
- The experimenter intervened 3 times: to reassure, to provide advice and to prompt the students to pursue their interaction.
- On 3 occasions, the actions performed did not lead to a satisfactory outcome.
- Only 1 unit was attempted out of a possible choice of 10.
- When in dialogue mode, the students only attempted 2 cues.

- Only 1 recording of a cue was carried out (interaction prompted by experimenter).
- Out of 32 actions the students attempted 4 actions in the reference section and 4 actions in the exercise section.

Qualitative analysis:

The behaviour of students stemming from their interaction with USF and expressed through their recorded observations seems to suggest the following:

- The students had no difficulty relating to the interface. One of them even thought it was vaguely recognizable with another application they had used before. This was, indeed, an accurate recollection as the student had previously tried *Hotel Europa,* which presents design similarities.
- Direct and indirect references to their perception of multimedia functionality were regularly made throughout the experiment. B expressed surprise at not getting any sound when the first dialogue frame was entered, suggesting the multimedia presentation was flawed or at the very least weighed in favour of the visual display. However, A vented a degree of frustration when it became clear that the displayed pictures were only fulfilling a cosmetic function as they were not in any way interactive. Finally, they thought that there was too much on-screen reading to do. This was interpreted as an indictment on the design since it was felt to be in direct contradiction with the perceived potential multimedia had to offer. Therefore, a multimedia platform was only considered worthy of the appellation if its interface was enhanced by the complementary multiplicity and interactivity of both audio and visual media extensions.
- The mental model students had of a multimedia application was further refined when its credibility was linked to the satisfactory delivery of an authentic contextualization of its knowledge base. The students naturally expected and believed they were immersed in a French environment, hence their surprise and dismissive tone of voice when they were confronted with English-accented French.

- Since no indications and explanations were provided in the main menu displaying the units, the students opted to choose a unit solely guided by their subjective personal instincts.
- By far, the most important pattern, which emerged from this user walkthrough, was the students' inability to relate to the navigational functions of the interface. Their system image of the application formed from their mental model of what an interactive multimedia structure was supposed to be, according to their past experience, could not be superimposed onto the system image as conceived on the basis of the conceptual model of the authors. The prevailing influence of the linear, frame-based approach as explained in paragraph 4.2. was all the more apparent in the conceptual navigation model of the system symbolized by *Move On* (meaning move to the next frame) and *Exit* (meaning exit from the frame onto preceding one). In other words, the mental model of the students, transcending frames in their efforts to find free movement, was somehow more advanced and sophisticated than that of the application' s designers who had not gone beyond the original two-dimensional frame-based design approach.
- Whereas the students had developed an initially positive image of the system, which could have been pedagogically productive, they became noticeably disenchanted with and critical of its interface. As a result, their attitude changed from that of genuinely receptive learners exploring an application to that of evaluating explorers out to find drawbacks and design weaknesses.

8.2.3.2 Verbal Protocol 2: Group (a): Task 1

Refer to User Walkthrough of USF in Appendix 2 for a full detailed breakdown of actions, outcome of actions and resulting student observations.

Only one student used the mouse (recorded observations), the other student took part in the discussion which followed the user walkthrough. The students took it in turn to operate the mouse for task 1 and task 2.

Introduction: a brief explanation of the task to be undertaken was provided giving the student an indication of the expected steps and likely outcome. The student was also encouraged to think of the task within the broader context of the application as a learning platform.

Analysis of Results of Recording Sheet:

Quantitative analysis:

- 17 actions were performed within the session, which was cut short by 15 minutes.
- All the actions, bar the typing of the password, were mouse-driven.
- All navigational actions led to an expected outcome.
- Twice the functionality in the recording mode failed the student: a wrong click on "Record" and on "Finished".
- The student attempted the recording of a total of 4 phrases out of a potential 12.
- Only once did the student formulate a positive comment related to the design compared to 4 explicitly negative remarks.

Qualitative analysis:

The behaviour of students stemming from their interaction with USF and expressed through their recorded observations seems to suggest the following:

- From the onset, the student was critical. This frame of mind lingered throughout the exercise and clearly stemmed from the previous exploratory session, which had taken place the week before.
- By then, the structural model of the application was recognized even if it was

considered limited and poorly designed. Therefore, the student had no difficulty using the "Move On" and "Exit" buttons, albeit reluctantly.

- However, the student could still not come to terms with the functional model of the system when positioned in the recording mode. This was unequivocally seen as being unacceptable to a point when interacting with the interface was almost physically painful. As a result, it came as no surprise when the student took the unilateral decision to quit the application and terminate this kind of mental torture further exacerbated by the feeling of being locked in.
- Arising from the above, the functionality of the application dominated all other considerations on the interface design and simply obliterated considerations on all relevant pedagogical issues pertaining to the system as a learning platform.

8.2.3.3 Verbal Protocol 3: Group (a): Task 2

Refer to User Walkthrough of USF in Appendix 2 for a full detailed breakdown of actions, outcome of actions and resulting student observations.

Introduction: a brief explanation of the task to be undertaken was provided giving the student an indication of the expected steps and likely outcome. The student was also encouraged to think of the task within the broader context of the application as a learning platform.

Analysis of Results of Recording Sheet:

Quantitative analysis:

- 26 actions were performed within the allotted time.
- Over half of these 26 actions (14) were performed within the set Writing exercise, which was completed and voluntarily started again.

- All the actions led to expected and satisfactory outcomes.
- There were 3 positive comments made against 2 negative ones.

Qualitative analysis:

The behaviour of students stemming from their interaction with USF and expressed through their recorded observations seems to suggest the following:

- The student indicated a liking for some of the design decisions made such as a) the use of a gauge next to units and exercises to indicate if it had been done or entered therefore showing the student's history within the software, albeit crudely; b) the changing pointer design linked to its changing functionality and c) the conceptual design behind the Writing exercise. However, the student disliked the design of the textual material within the Writing exercise, which attempted to display an authentic sheet of paper with typed characters. This was felt to be confusing as a multimedia presentation had, by essence, to present a novel approach to textual presentations.
- At no stage, did the student establish a valid pedagogical link between both tasks 1 and 2. They simply acknowledged the repetitive nature of the tasks without trying to correlate both activities. Therefore, the students did not appreciate the context-based dimension of the second task.
- Interestingly, although coaxed by what was perceived as a better system image, the student was still overwhelmingly conditioned by the last two user walkthroughs and felt like testing, even challenging, the functionality of the application. This became apparent when it was decided to check how the system would react if mistakes had been made when completing the exercise. Therefore, the student went as far as starting again the exercise and making deliberate mistakes in order to note how the interface would cope. Needless to say, the student was not impressed inasmuch as it showed and emphasized the limitations of the platform. Therefore, what could have been the necessary breakthrough for the student to begin to accept the validity of the system never materialized.

- On such a premise, the question of validity was a permanent issue. Both students needed to be convinced that the application, and by extension, the knowledge base it presented, was worthy of consideration and commanded respect. The mental model elicited by the students was very much on a par with the ancestral and deeply entranched model of the unbalanced relationship between master and learner. Therefore, its primordial recognition and subsequent realization was paramount in the early, formative stages of the user interaction. The fact that the students became fixated on the flawed functionality of the system and never seriously considered its global, intrinsic value was the clearest indication that they could not match their mental model with that of the system image. Instead, they simply acknowledged that they were being unduly coerced by a mere machine endowed with a poor interface and ill conceived functionality.

8.2.4 Summary of Identified Mental Models

On the strength of the above analyses based on Group (a)'s user walkthroughs, an initial identification of mental models elicited or simply called upon by the students whilst interacting with USF can be drawn. Overall, these models formed by students stemmed from comparisons and correlation with preconceived ideas and past experiences which have been classified under three recognizable categories including the computer as a physical interface, the students' known learning environment and the system as an interactive construct.

The computer as a physical interface:

- Strikingly, the students were confronted with an interface, which did not correspond to their interpretations of multimedia. They criticized the balance between the visual and sound extensions, which was weighed in favour of the visual display. They expressed surprise at the poor interactive potential of the visual display. Finally, they thought too much emphasis was placed on the written text, which was relied upon as a means of presenting and displaying the knowledge base. Therefore, both students elicited a mental model of a multimedia interface based on design novelty, full interactivity and student control within standardized design parameters.

- Further emphasis must be placed on the need expressed by students to differentiate between textual and multimedia presentations. Interestingly, the designers' system image of the pad which must have been conceived as a metaphorical means of helping users to quickly identify with and relate to the displayed material had, quite radically, the reverse effect. Therefore, the meeting of system images can lead to confrontation or repulsion followed by a counterproductive interaction. In this particular case, the students rejected the design decision to project the image of the sheet of paper with its typed characters as an electronic gimmick defeating the object of the whole multimedia exercise.
- The physical interface, hampered by what was perceived as a poor functionality, was overwhelmingly considered a stumbling block. The students' mental model of a multimedia platform was already three-dimensional inasmuch as they clearly did not relate to the designed linearity of frames. Similarly, the adoption of a non-conventional functional display for the recording mode was dismissed as a design flaw and a waste of time. Clearly, the students projected the model of an interface conveying and promoting free navigational movement within an easily recognizable design framework.

The learning environment:

- Although USF is a learning application, no direct pedagogical issues were raised throughout the experiment. Indeed, none were deliberately triggered by the platform which, from the students' position, presented educational material with no obvious pedagogical justification. However, the students were far more interested in or, indeed, critical of, the delivery aspect of the platform than in its blurred learning aims and objectives. If, conceptually, the dissemination of information and the learning process relied on exposure and interaction, it failed to generate a mental model commensurate with this original system image. Not only was there no explicit educational exploitation on the part of the students, but they even dismissed any pedagogical potentiality. Indeed, one of their main criteria for general acceptance as courseware was that the delivery had to be different from the "known" traditional classroom, paper-based delivery they had so far experienced.

- As a learning platform, USF had to prove its authoritative strength both in terms of linguistic competence but also adaptability and responsiveness to the students' needs. Goaded by an uncanny combination of limited functionality mixed with design innovations in the interactive exercise mode, the students felt the need to test the true capabilities of the application. The students' mental model elicited in this case was that of the deeply rooted and crucial relationship between master and learner. Unconvinced by a flawed interface design, it had become imperative to ascertain if the system, as educational reference, could be relied upon. Tellingly, the unsuccessful application of this model only led to distrust and distanciation on the part of the students who, by then, had lost all motivation.

The system as an interactive construct:

- The students never went beyond the physical interface of the system. Indeed, whenever they tried they would only be reminded of its limitations. Of particular interest is the fact that the students were naturally and genuinely inclined to be taken into a more spatial, therefore more authentic, interaction. In turn, this willingness was further stimulated by their early expectations of what multimedia could offer in terms of novel approaches and new deliveries. They were ready to transcend the physical barrier posed by the machine to be exposed to a different contextualization of the knowledge base it presented. Ultimately, the mental model formed by the students was of an unsatisfactory, functionally limited, man-machine interaction clearly instigated and dominated by man.

8.2.5 Audit

The audit element of the summative evaluation of USF was designed to enable the students to play the part of evaluators confronted with an application which, by the fourth session, they were beginning to know reasonably well. The potential of such an audit rested on the format it adopted, based as it were on a comprehensive list of questions covering all aspects of the user interface, therefore giving the students the chance to distance themselves from their previous task-based interaction whilst allowing them to go back into the application if they wanted to illustrate a point or simply refresh their memory. Finally, it was a natural means to draw the experiment to a close (for further details refer to Appendix 3). A general summary of its findings is given below whilst a thorough analysis of the results generated by all the audit sessions will be carried out to establish user requirements.

The most striking, although not unexpected, aspect of the audit was that only one Very Satisfactory verdict for *Student Guidance and Support* was returned. Secondly, the large majority of ratings were to be found in the Moderately Satisfactory band with the highest score for *Consistency* and the lowest for *Multimedia Extensions*. Although generally magnanimous in their new role as assessors compared to the recorded comments expressed in previous sessions, the students were particularly scathing on the multimedia exploitation and presentation, reiterating and strengthening an earlier position whilst suggesting that USF had failed as an innovative platform. Usability was considered a major problem in two cases only: the system was thought of as being too inflexible, making reference to the lock-in phenomenon, as well as having too low a boredom threshold. Minor usability problems (7 in total) ranged from navigational issues such as knowing what to do next and a general sense of aimlessness to a poor functionality, making reference to the highly criticized recording mode, as well as a poor assessment mechanism. Finally, the application was solid, well built with clear and consistent screen displays but was too rigid, predictable whilst unclear as to what it was providing and how its knowledge base was meant to be exploited.

8.2.5.1 Verbal Protocol 1: Group (b): Exploratory Session

Refer to User Walkthrough of USF in Appendix 2 for a full detailed breakdown of actions, outcome of actions and resulting student observations.

Introduction: a brief description of the application was given to students including the required level of linguistic competence, the stated learning aims and objectives and the purpose of the exploratory session designed to enable students to freely interact with the software with a view to developing a spatial feel of its interactive structure. Additionally, the students were given the necessary instructions in order to start and enter the application.

Analysis of Results of Recording Sheet:

Quantitative analysis:

- 30 actions were performed within the allotted time of 1 hour. However, the students opted to terminate the experiment after 45 minutes.
- 2 units were explored out of a potential 10.
- The students resorted to using the on-line Help once.
- On 5 occasions the students' actions did not produce the expected outcome.
- The great majority of the actions were performed within the dialogue interaction.
- Of the 2 dialogues entered, the students only attempted 1 recording of a cue in the first one and clicked 5 times on Next to listen to the second.
- No mention and no attempt were made to explore the support material (exercises on reading, writing, speaking listening).
- No mention and no attempt were made to explore the reference section.

Qualitative analysis:

The behaviour of students stemming from their interaction with USF and expressed through their recorded observations seems to suggest the following:

- The students' apprehension in venturing into unknown multimedia territory was clearly expressed by their blinkered preoccupation with the basic functionality of the system. As a result, their understanding and appreciation of the interface remained essentially two-dimensional, relating to it at the level of the screen display.
- As a direct consequence of the above point, the session was essentially "physical" inasmuch as the student interaction never went beyond the physical level of the underlying action. This helps to explain the reasons why the students felt the need to shorten the experiment as they undoubtedly thought that the exercise was physically as well as cognitively taxing.
- Interestingly, the students' physical and therefore pragmatic approach meant that they were, similarly, systematic in their choice of actions. For instance, they wondered if the units had to be done in a certain order, although they did not show undue concern one way or another. Ironically, the lack of clear explanations on progression sought from the on-line help led them to choose the unit entitled "Finding your Way". Could their subconscious have been at play at the time?
- Although somewhat tense due to their uneasiness, the students were able to verbally indicate, albeit briefly, their liking of the design, commenting on the drawings and the clear explanations provided. Their uncritical stance extended to accepting, even if unimpressed, the ambiguously worded navigational commands. The only time their frustration became apparent was at the very end when they unsuccessfully tried to get out of a dialogue, which they had selected, in continuous mode.
- The recording function proved largely unrewarding as the students felt it was fiddly, complex and ultimately useless at playing back the recorded text, even if no such text had been recorded in the first instance. In other words, it was felt convenient to blame the machine for one's own inconsistencies.

- Finally, the mental model of the application elicited by the students as they were interacting with the software was, unsurprisingly, closely related to the functional model of the known language laboratory and its most likely learning function of providing "comprehension exercises". Their observation that this could be so was the most accurate indication that this was how they related to the application. This verdict was brilliantly arrived at by their own conditioned interpretation of the platform making them oblivious of its full interactive potential as they progressed through it.

8.2.5.2 Verbal Protocol 2: Group (b): Task 1

Refer to User Walkthrough of USF in Appendix 2 for a full detailed breakdown of actions, outcome of actions and resulting student observations.

Introduction: a brief explanation of the task to be undertaken was provided giving the student an indication of the expected steps and likely outcome. The student was also encouraged to think of the task within the broader context of the application as a learning platform.

Analysis of Results of Recording Sheet:

Quantitative analysis:

- 26 actions were performed within the allotted time of 45 minutes.
- 14 actions out of the 26 were performed within the dialogue activity.
- On 1 occasion, the action did not trigger an outcome and was followed by repeated clicking.
- On 1 occasion, repeated clicking was performed to note the design outcome as opposed to the functional outcome.
- On 1 occasion, repeated clicking was performed triggering each time a warning sound.

- The experimenter intervened once.
- On 1 occasion, the student has to backtrack by one frame on the advice of the experimenter.

Qualitative analysis:

The behaviour of students stemming from their interaction with USF and expressed through their recorded observations seems to suggest the following:

- The student did not seem to understand the function of the password. This is corroborated by the fact that, at that stage, neither of them had realized that there were assessed exercises in the knowledge base.
- The whole student interaction seemed to be dominated by apprehension. Furthermore, this natural fear of the unknown and untamed machine fed onto the previously felt apprehension related to the "fiddly" commands in the recording mode. As a result, the original mental model of the interface formed by the student was very much present throughout the session. One such reminiscence was that it had been difficult to record the part of a character within a dialogue.
- Of particular interest is the fact that the student behaved exactly as if the oral exercise was practised in language laboratory conditions. There was no attempt at understanding or relating to the concept of "Continuous Mode". Although it was linguistically possible for the student to feel part of and appreciate the enhanced interactive nature of the "continuous" dialogue (at the basis of the design / conceptual model), the student never took up that path and felt particularly frustrated at not being in a position to verify or simply listen to their recorded phrases. The ubiquitous mental model elicited in this case could only be linked to a strong and resilient environmental model of their well known learning environment.
- Finally, too many obstacles made it difficult for the students to fully appreciate what the application stood for in terms of learning outcomes. In this respect, they similarly

queried the usefulness of the task itself since it could not be related to any relevant structure.

8.2.5.3 Verbal Protocol 3: Group (b): Task 2

Refer to User Walkthrough of USF in Appendix 2 for a full detailed breakdown of actions, outcome of actions and resulting student observations.

Introduction: a brief explanation of the task to be undertaken was provided giving the student an indication of the expected steps and likely outcome. The student was also encouraged to think of the task within the broader context of the application as a learning platform.

Analysis of Results of Recording Sheet:

Quantitative analysis:

- 36 actions were performed within the allotted time of 45 minutes.
- 22 actions out of all 36 were performed within the Writing activity itself.
- The whole Writing exercise was completed.
- On 1 occasion, the experimenter intervened as the student was completely at a loss.
- On 1 occasion, the action did not lead to an expected outcome.

Qualitative analysis:

The behaviour of students stemming from their interaction with USF and expressed through their recorded observations seems to suggest the following:

- Despite it being the third session, the student did not know that there were exercises in the database. As a result, several attempts were made at finding a way in. These early actions were, by their panic-stricken nature, rather illogical and therefore far-fetched and stemmed from a misinterpretation of the term "Check Your Progress" which was understood in a literal sense.
- The student was already overwhelmed and frustrated by such a slow start, appreciating that everything became obvious when you knew what it meant. Indeed, if the fellow student had not intervened in the initial stage of the writing exercise, it is conceivable that the main student would have given up there and then.
- Once conversant with the exercise, the student found it sufficiently motivating to complete it. This was a first and as such a real enough achievement.
- Interestingly, the students felt confident enough to argue with the machine as they thought they would dispute the score obtained on the strength of their answers. The question of validity was resurfacing inasmuch as they could take the humiliation generated by the technical superiority of the machine but hardly that of linguistic competence and supremacy. Following the recognition that they had made the mistakes and not the machine, attitudes changed somewhat and the exercise was similarly declared useful. The power base was being readjusted.

8.2.6 Summary of Identified Mental Models

On the strength of the above analyses based on Group (b)'s user walkthroughs, an initial identification of mental models elicited or simply called upon by the students whilst interacting with USF can be drawn. As with group (a), these models formed by students stemmed from comparisons and correlation with preconceived ideas and past experiences which were, similarly, classified under three recognizable categories including the computer as a physical interface, the students' known learning environment and the system as an interactive construct.

The computer as a physical interface:

- The students' lack of expectations coupled with their general apprehensiveness meant that they remained permanently preoccupied by the functionality of the platform as an end in itself. In this context, the multimedia presentation was not questioned and was fully accepted at face value. Furthermore, the novelty element acted as an initial stimulant and generated sustained motivation. As a result, the main mental model developed by the students highlighted the impact of the visual display which they had never been exposed to before and already suggested an immediate comparison with the known and well tried audio experience and the supremacy of the image.
- Never did the students express the need to gain a structural picture of the software's architecture. As a result, they remained blissfully unaware, until the final task, that there were more exercises than those they had seen, interacted with and understood.

The learning environment:

- An interesting observation suggests that the students compensated for their perceived technological inadequacies by adopting a rigorous, systematic approach to their interaction, eliciting well-inculcated mental models of good learning practices.
- The functional, two-dimensional interaction, which dominated the experiment, led to comparisons being made with the known language laboratory. The students even drew some comfort from their conviction that they were in the recognized territory of the "comprehension exercise". Their mental model of the system was formed on the basis of both the limitations of the platform as well as the necessity to cling onto a safe, well experimented learning environment clearly mentally delineated. As a result, this environmental mental model became overwhelming as it conditioned the students' behaviour throughout their interaction whilst it attached as well as reduced the software to a conveniently overpowering model of known and well tried learning practices.
- Given that the machine was never challenged in its role as technological supremo, the

students, not unlike those in group (a), took it to task to establish and enhance their own linguistic competence. The mental model called upon in this case must surely be linked to the notion that, ultimately, man still dominated the machine. However, the model differed from group (a) since the machine was, at no stage, compared to or associated with the position or role of master and that, additionally, the students rarely identified with that of learners.

The system as an interactive construct:

- The interaction never went beyond the straightforward man-machine functionality. As such the interaction was essentially machine-driven and the balance of power was fundamentally weighed towards the machine which could, indeed, be blamed if the outcome of actions did not meet with the students' expectations. Significantly, the power game was seen as being readjusted towards the end of the user walkthrough when the students felt to be in a position enabling them to flex their linguistic muscles.

8.2.7 Audit

Unlike the previous audit which was seen by the students as an opportunity to approach the software differently and which, therefore, was perceived as a useful exercise, this evaluation session failed to generate the expected motivation on the part of the students and collect the expected data. The reasons for this are twofold: Firstly, because the students were rapidly losing the momentum required to pursue the experiment to its logical conclusion, thus leading to a visible degree of apathy at the time of the audit, itself translating into unreliable and ill thought-out answers. Secondly, because the students, weary of computers, were equally intimidated by what they regarded as abstruse terminology and technological questions, which they could not sufficiently well understand or, simply, relate to the interface.

In any case, given this note of warning, the majority of the ratings were found, not surprisingly, in the middle ground with four Moderately Satisfactory, three Neutral and three Moderately Unsatisfactory returns. However, exceptions were made for *Consistency* which got a Very Satisfactory and *Flexibility and Control* which found itself between Moderately and Very unsatisfactory. Two major usability problems were recorded: losing track of where you were in the application and a lack of clear learning indicators, reinforcing the earlier point stipulating that the students had only concentrated on the functional as opposed to the structural dimension of the system. Finally, recurrent elements were apparent in the last section seeking general views related to the application. These centred on the earlier comparison with the functionality of the language laboratory delivering aural exercises seen as an asset of USF, poor recording facilities, the perceived rigidity of the interactive parts of the application, the lack of clear learning objectives which would have given the students a better focus and last but not least a more attractive and original multimedia interface which, undoubtedly, would have stimulated the students for a more sustained period of time.

8.3 Summative Evaluation of A la Recherche d'un Emploi (ARE)

8.3.1 Description of Software:

A la Recherche d'un Emploi (ARE) is a hypermedia application, supporting autonomous learning, for intermediate / advanced learners of French. The minimum level of language proficiency is expected to be on a par with the first-degree level of DEFL (International Diploma of Elementary French Language). As a learning environment, it is designed to promote and stimulate both communicative competence and the use of the language for specific purposes.

Through 33 different activities, allowing users to identify with two job seekers and solve the tasks, which they encounter, this hypermedia platform claims to offer more than 25 hours of interactive language practice including 30mn of video. The user interaction comprises recording facilities, simulations and access to referential information such as culture, vocabulary, grammar.

Application: ARE is functionally easy to use. As a Windows-based application, it presents a standardized, coherent and consistent user interface whose control mechanisms are easily recognizable and applicable. Additionally, an on-line help is displayed in the form of "Instructions" for context-specific advice and "Aide" for a full graphical explanation of the functionality of the interface.

Structurally, users are provided with screen-based menus at unit and activity levels enabling them to access relevant parts of the lesson section of the system. Scanning over these menus displays further information in the form of pop-up boxes indicating objectives or suggested resources and activities relevant to a given unit or activity when the mouse pointer is temporarily positioned over its title box. To facilitate navigation through the underlying hierarchical structure, users can activate back and forth arrows, a dedicated arrow to take them back to the menu of the activity concerned and a special button to go back to the main menu of the application. Finally, the interface is designed to clearly accommodate both the main interactive language material in the lesson section as well as the additional activity-based resources situated at the bottom of the screen.

The screen layout is functional and uncluttered. It is divided into three clearly defined areas. Typically, the top area across the screen comprises the title and reference boxes of the displayed window on the left and "Instructions" and "Aide" on the right. By contrast, the additional on-line database including "Culture, Functions, Grammaire, lexique, Bloc notes, Suivi" are grouped together at the bottom left of the screen, whilst the navigational functions are grouped at the bottom right. Finally, the third, central and larger area of the screen is dedicated to the interactive language practice.

Colours are used relatively sparingly. Colour schemes are applied to enhance the visual effect and presentation of the display as in the introductory frames, exercise and resource modes, with the help of coloured pictures, graphics and charts. Furthermore, they are used to highlight the functionality of the application with titles of units and activities as well as arrows changing colour when activated or when enabled. Therefore, colours are not perceived as permanent features of the interface but more as a means of emphasizing or contrasting specific aspects of its display or important items against a standard Windows-based grey background.

Sound is similarly, although peripherally, integrated into the screen layout with introductory audio-presentation of new frames, be they menus, activities, videos or exercises.

Exploiting standard Windows-based practices, the screen layout designed for exercises often resorts to conventional text boxes with scrolling facilities, identified hotwords and pop-up messages.

Finally, great care seems to have been put into the design of the resource section. Aside from the extensive use of coloured charts and graphics made to better present the information in "Culture", "Fonctions" and "Lexique", the display of linguistic information in the lexicon is further enhanced by its novel use of lexical networks showing semantic fields.

8.3.2 User Interaction

The purpose of the user interaction is to further develop the language proficiency in oral and written French of users, on the basis of the constructive learning approach, through a contextualized and personalized interaction supported by problem solving goals. Therefore, users are immersed into a replicated real-life environment through their identification with two job seekers and encouraged to engage in solving problems linked to their particular predicament. At the root of this approach is the notion that learners will interactively and constructively seek, exploit and internalize the required linguistic data within the remit of selected activities supported by associated resources and thus improve their knowledge of and general competence in the given foreign language.

From such a pedagogical premise, activities and sub-activities are carefully sequenced so as to initiate and generate the fullest response from users. This is particularly the case for the organization of video-based activities, which sequentially present combinations of filmic material and text followed by graded comprehension tests related to the content of the video. Activities are thus designed to encourage users to progress through pre-defined task-based interaction.

A typically anticipated user interaction would expect users to build on previous performances by accessing own files and personalized note book, identify and select a unit and an activity within the unit on the basis of its linguistic appeal and / or unexplored content. Additional information related to the structure of the system or providing context-based advice could be usefully found by clicking on the reference buttons "Suivi" or "Instructions" respectively. When interacting with exercises, the meaning of words can generally be traced directly if they are themselves computed as hotwords or indirectly in the Lexicon.

Feedback from exercises is provided by means of a "Correction" button, which can be triggered when the activity has been attempted or simply abandoned. Users can easily come out of an activity to go into another one keeping a tab of the performance trail by looking at the hierarchical structure in "Suivi".

Finally, users can print their notepads prior to quitting the application.

8.3.3 Verbal Protocols

ARE, being designed for intermediate / advanced students of French, was only evaluated by third and fourth year students. For this evaluation, it was possible to organize two distinct groups of 2 students each: Group (a) was composed of 4th year students with good IT expertise, some multimedia experience and high degree of confidence; Group (b) was composed of third year students with some IT expertise, no multimedia experience and a low degree of confidence.

8.3.3.1 Verbal Protocol 1: Group (a); Exploratory Session

Refer to User Walkthroughs of ARE in Appendix 2 for full detailed breakdown of actions, outcome of actions and resulting student observations.

Introduction: brief description of application within the specific context of learning a second language for special purposes given, in this case: finding a job. Information on design context and purpose supplied. Suggested pointers given to students: need to look at the structure to understand its spatial dimension and control own orientation, need to appreciate the learning potential and objectives.

Analysis of results of Recording Sheet:

Quantitative analysis:

The task undertaken by both students was exploratory. Its simple goal was to discover as much of the interface as possible or, indeed, as felt necessary, within an hour.

- 31 actions were performed within the allocated time.
- All actions were performed by mouse-clicking operations.
- Student A was self-designated mouse holder for 30 actions, whilst student B was willingly self-appointed partner for the session, only mouse active for one action.
- All attempts made by students, bar one, were successful.
- All navigational action triggers were satisfactorily translated into expected physical actions.
- On one occasion only the students felt the system was not responding to their action.
- "Explications" (on-line help) was called upon only once, not as a result of disorientation or incomprehension but because the students wanted to know if extra information would be provided.

- Excluding Unit 5 on overall assessment and outcome, the application comprises 4 units translating into16 activities, themselves subdivided into 39 different exercises. The students accessed 2 units (2 and 1, chronologically) and 2 activities (4 and 1 respectively). In both cases, when the activity was accessed, the students only attempted one exercise (out of 2 in U2A4 and 2 in U1A1). Similarly, in both attempts, neither of the exercises or interaction was completed (including playing the video). Therefore, in percentage term, the students explored 5% of all available exercises within the lesson materials provided by the software.
- The reference section of the software comprises 5 discrete areas (*Culture*, *Fonctions*, *Grammaire*, *Lexique*, *Bloc Notes* and *Suivi*). The students explored 3 of these areas. In Culture and Grammar, they accessed 2 different items successively, in Lexique, only one.
- Overall, the students attempted 12 specific actions in the reference materials provided by the application.
- In percentage term, the students performed 60 % of actions in the lesson section and 40 % in the reference section.

Qualitative analysis:

A number of patterns seem to emerge from the behaviour of the students as expressed by their recorded observations and choice of actions.

- The students had no difficulty loading, accessing and navigating within the application. Their approach was indicative of the ease and confidence demonstrated by expert-users with much experience in windows-based systems. Therefore, the design of the interface posed no problems inasmuch as the students were always in a position to form functional mental models of operations to perform based on past experience. If anything, they expressed their frustration when the system did not seem to respond fast enough to their actions, as in the case of the loading time felt to be surprisingly longer than it should have been or the seeming lack of response of the video functions when activated. Furthermore, they reacted quite strongly against design choices such as the colour scheme which they could not relate to, or the cartoon characters which were felt to be crude, simplistic, almost infantile, therefore hurting their self-esteem whilst weakening their process of identification with the software.

- The main overriding pattern developing through the chosen sequence of actions arose out of an inability or a refusal to arrive at a structural perception of the application. Actions were successfully performed but were not thought-out *per se*. The approach was randomly exploratory and in no obvious way strategic. Hence an activity was accessed because it had generated some fleeting interest, as in the case of CVs, only to be discarded once the interest had waned and the attraction to discover new, more exciting items had become prevalent. This does not mean to indicate that the students cared little about their orientation within the application, for they very much approved the systematic graphic display of menus which they found useful, but their structural mental models which they formed within the interactive process were strongly associated with that of multimedia databases and not hypermedia. This was best illustrated by their overwhelming reference-driven interaction and poor interactive involvement when task-based exercises were triggered. Additionally, corroborating this interpretation, the students did not feel the need, at this stage, to seek or to experiment with hypertextual links within the textual database.
- On the strength of the above point, this verbal protocol revealed a potentially crucial deficiency of the interface and a potential design fault by not making the structural, hypermedia dimension more evident. Although a clear, detailed overview of the lesson materials can be accessed (in Suivi), it should be better incorporated into the design to prevent users from confusing multimedia and hypermedia interactions and objectives. Ultimately, this quasi aimlessness prevented the students from acquiring and developing a spatial feel for the application and, importantly, a valid, pedagogic *raison d'être* as this became apparent in the discussion which followed the user walkthrough.
- The students failed to complete the exercises, which they had accessed. Although it

would be wrong to jump to conclusion and give too much prominence to a hasty interpretation, since the students were after all "exploring", it is nonetheless an interesting observation because it could denote that: a) the exercises themselves were not attractive and absorbing enough for the students to generate the required motivation; b) the exercises were considered dispensable extras and optional; c) the types of activities were not considered sufficiently relevant within the context of the interaction, as in the case of the curriculum vitae which the students felt did not correspond to their needs and requirements; d) the students thought that it too closely resembled the type of assessed activities normally carried out under duress in the more rigid and less permissive environment of the classroom situation. This last point would indicate that the students formed mental models of their learning environment which ill matched their more ludic mental model of multimedia functionality generating a negative impact.

- The short discussion, which ensued, supported some of the above points. Both students stressed that they did not know what to expect or, indeed, what they would find through their interaction with the interface. Above all, they did not think they were in a position to seriously comment on the aims and objectives of the system, nor could they say if they perceived it as a valid learning environment which they could trust and within which they could contemplate working. Interestingly, this question of identification and validity, raised during the very first session, was to become a leitmotiv throughout the summative evaluation of the application raising some further questions on the potential impact of the initial contact with and feel for the new application. A negative mental model of this system had already been shaped and this would prove difficult to redress. The students did not know what the application was offering (was it language teaching or advice on finding a job?) nor were they better informed as to what they could do with it and achieve through it. Whilst relating to the application as if it were a multimedia platform, they did not think the multimedia extensions, i.e. the video they had seen, were particularly well designed, yet again, highlighting the important concept of identification within the interactivity which had previously been raised.

8.3.3.2 Verbal Protocol 2: Group (a); Tasks 1/2/3

Three tasks were set for this user walkthrough: the first two concerned the retrieval of data in the reference material which required different actions in order to be successful; the third task was fully interactive and required students to realize a telephone simulation.

Refer to User Walkthroughs of ARE for further details in Appendix 2

Only one student used the mouse (recorded observations), the other student took part in the discussion which followed the user walkthrough. The students would take it in turn to operate the mouse for undertaking the tasks.

Analysis of results of Recording Sheet:

Task1: This task undertaken by the student was purposefully simple with only one set goal: to find the meaning of an unknown word identified in one of the activities. Only one sequence of actions was allowed by the application but other alternatives could spring to mind, hence the potential interest behind setting the task.

Quantitative analysis:

- 8 actions were performed in the space of 5 minutes.
- All 3 alternatives were tried: access to definition of "stage" was attempted by a) clicking on word (failed); b) via Lexique (successful) and c) by identifying links with associated themes (work, enterprise) (failed).

Qualitative analysis:

- The student experienced no difficulty in finding the given word. Moreover, the three alternative trails which could have been rightly called upon to seek the required information were found, suggesting that the student knew about hypertext links generally and that the reference data could be context linked to some extent. Whereas, the student, in the exploratory mode, could not quite see why he would need any of the information, which was accessed in the reference section, here he attempted to interact with the reference section as a properly integrated learning support. The disappointment expressed by the student stemmed from the formation of the mental model of the virtual library, associated with his own working environment, which clashed against the simpler, unidimensional model of the basic, pocket-like French/French dictionary provided by the system.
- Whilst not disputing the fact that these links might still exist in a form or another, the students expressed the view, during the discussion, that a referential database should be comprehensive and consistent.

Task 2: This task was slightly more complex as it required the student to look for specific linguistic formulae in the lesson section. The search included selection of the right unit, activity and exercise. Furthermore, it required going through the exercise to select all telephone expressions.

- 10 actions were performed by the student in the space of 15 minutes.
- By associations of ideas, the student performed a minimum number of actions required to access the formulae (bar one when the video was played).
- Out of the 7 formulae, which needed to be found, the student highlighted 4 then gave up.

Qualitative analysis:

- The pattern of behaviour, which emerges here, was reminiscent with the one previously encountered in the exploratory mode. The student did not have an accurate sense of direction or space. Progress was made via a process of elimination, taking him logically from the main menu to Unit 3 (title refers to appointments by telephone), to the video (almost by default because the student did not understand the title of one of the other activities) and finally to further related exercises within the chosen activity hoping to get somewhere. As a result, the student showed a degree of frustration, which lingered throughout the task.
- The main pattern which developed here, however, related to the student's general apprehension and resulting insecurity regarding rules and expectations governing activities. Activities are purposefully varied, ranging from passive, listening sessions to fully interactive comprehension exercises complementing one another. Because the content, purpose and interwoven complementarity were not understood or assessed by the student, appropriate mental models of such activities could not be formed. Hence formulae could easily have been hidden in the video itself and, similarly, the following comprehension exercise was interpreted as a vicious memory test almost missing the exercise which was specifically related to the task.
- Reproducing a previous pattern of behaviour, the exercise, by then considered rebarbative at best and obscure at worst, was not completed, although encouraged to do so by the system. This was strengthening the formation of a new mental model of the application: that of peripheral involvement, uncommitted performance and non-achievement.

Task 3: This task was the most comprehensive as it involved the students in finding the requested activity and in undertaking the targeted exercise with a view to testing its functionality.

- 22 actions were performed within the space of 30 min.

- On one occasion the student felt the need to click on "Instructions" in order to know what to do or what was expected.
- The telephone simulation session was tried 3 times in succession (not prompted by failure but goaded by performance).
- Not once were the recording facilities used.

Qualitative analysis:

Two main patterns would seem to emerge from this interaction.

- Firstly, the student quite clearly resented being coerced into making choices in the preparatory stage which were felt to be restrictive. The student would have liked a degree of flexibility which would have enabled the selection to be more representative and therefore more realistic. This reaction was interesting insofar as it stemmed from this pervasive attitude and lingering feeling that the software could only offer a poor, technology- replicated version of a real-life situation and, more critically, provide an information base whose veracity had to be either challenged or at least questioned. Mental models formed by students in this context were environmentally influenced and therefore suggested that if the system behaved like a teacher, peremptorily presenting true facts, then the instilled truth had to be substantiated if it were to be believed.
- Secondly, possibly intrigued by the novelty of the exercise, the student became noticeably engrossed by the simulation process. Without any suggestions or prompting on the part of the experimenter, the simulation was performed in different, consecutive ways to find out how the system would react against different performances. In this respect, the machine's additional interactive response fuelled the student's curiosity generating concentration and involvement generally related to electronically interactive games.
- Finally, the functionality of the activity was only partially exploited since the student

did not attempt to use the recording facilities, although recording extensions were supplied. Following the example of a previously illustrated mental model, the student opted for the path of exposure offering the minimum amount of effort. Reminiscent of the well-tried audio-language laboratory, the mental model formed in this case suggested that voice recording was an unfriendly classroom activity, which was, therefore, dispensable with if not absolutely necessary.

8.3.3.3 Verbal Protocol 3: Group (a); task 4

One task was set for this user walkthrough: it exclusively concerned the preparation of and interaction with the interview simulation. This activity was essentially chosen because it was felt that the whole assessment exercise, relying on voluntary cooperation, needed to gather a new momemtum, which could be best generated by an activity whose approach had previously proved popular. Due to the comprehensiveness of this activity, this user walkthrough was conducted over two one-hour sessions.

Refer to User Walkthroughs of ARE for further details in Appendix 2

Only one student used the mouse (recorded observations), the other student took part in the discussion which followed the user walkthrough. The students took it in turn to operate the mouse for undertaking the tasks.

Analysis of results of Recording Sheet:

Quantitative analysis:

- 37 actions were performed within the allocated time of 50 minutes, making this user walkthrough the most action-intensive session of this assessment.
- "Instructions" was clicked on, once, to seek further explanations.
- The lexicon in the reference section was accessed once to find the meaning of a word.

- The experimenter intervened once to prevent the students from being unnecessarily frustrated.
- the simulation activity was accessed only at the 13th action.
- The simulation was freely attempted twice.

Qualitative analysis:

- For the first time, the student seemed to be responsive to the seemingly displayed sequential nature of subactivities. This was interesting at two levels: a) confirmation was needed that the meaning of these (previously unseen) arrows linking the subactivity boxes in the activity menu had been properly understood, suggesting the student was not unsympathetic to the notion of a clearly displayed sequence of exercises and reacted positively to such a display; b) the "Instructions" message produced was the standard one given at the level of the menu inviting users to choose an activity by clicking on it, thus ignoring completely the different display adopted for this particular menu. What the student had noticed and had felt was understandable was, therefore, flatly denied by the system, strengthening the feeling, already formed by the student's mental model that by being too clever or investigative you could only lose time and be rebuffed by the rigid and limited response of a machine.
- A similar, albeit more damaging, denial further aggravated the sense of frustration and generated despondency. This time, the student, quite rightly, wanted to investigate the meaning of a word, displayed in the body of the text, which, genuinely, had not been understood. However, this approach was somewhat confrontational. It was as though the ulterior motive was to "test" the system, to see if, after all, it was as good and comprehensive as it claimed to be and therefore worthy of attention. The failure of the system to retrieve the word in its database almost led to contempt and the student felt vindicated in the belief that it lacked general credibility as a learning platform.

- The above actions, although trivial in themselves, did set the tone which was to dominate the dual session. A critical stance was, indeed, expressed on several occasions: the stark and simplistic presentation of behavioural patterns offered in the section "How to present oneself" was considered simply laughable; the unexpected integration of a grammatical point (the imperative mode to support the exercise) into the contextualized task was met with outright disapproval and dismissal; assessment criteria were brushed aside as incomprehensive. When, finally, the student was ready to embark on the simulation exercise, the opinion and, ultimately, the model of the interface which had been formed was heavily tainted by impressions of inconsistency, unreliability and superficiality due to the limited and unrefined nature of the computed interface

- Not surprisingly, the simulation was undertaken with a critical eye. Although there were some positive remarks linked to the consistency of the screen display and the very concept of the simulation exercise, as it had previously been well received, the criticisms, by far, outweighed anything else. The student felt that: not enough alternatives had been provided; the situation was unrealistic; the tone and insinuations in the video were unpleasant; the performance was impaired by the fragmentation of the simulation due to the poor correspondence between image and text and the intensive number of actions required; the finite number of permutations was unhelpful and criteria practically irrelevant. Again, the student tried to challenge the system by performing the simulation twice in an attempt to ascertain how it would react to a "worst scenario" case.

- The students' behaviour had drastically changed from that of the earlier sessions The mental model which was beginning to get shaped was generating negative forces distancing the students from the learning mould and bringing them closer to a demolition mode. This feeling of resentment and distrust could almost be interpreted as a reaction against what had been perceived as a remote form of betrayal of a system which had failed to convince of its authenticity and veracity. Moreover, it showed how underestimated the sensibility and vulnerability of users are when forming their system image of the original concept.

8.3.4 Summary of Identified Mental Models

On the strength of the above analyses, it is possible to identify mental models elicited from the students' interaction and patterns of behaviour. These models, formed by students, closely relate to their real life experience and the context within which the experiment was taking place. As such, they can, themselves, be classified under the three recognizable headings comprising the computer as a physical interface, the learning environment and the system as an interactive construct.

The computer as a physical interface:

- The students were always in a position to form functional mental models of operations to be performed based on their previous experience of Windows-based environments. However, the manipulation of windows was interpreted as a two-dimensional interaction designed to merely provide access to the available database as a result of the inadequate emphasis on the structural dimension of the platform.
- Reciprocity between the students and the physical interface. Some design decisions (colour schemes, graphics) clearly hampered the identification process developed by the students. The students could not contemplate being associated with an interface which, at times, was seen as hurting their own acquired design tastes and conventions but also and more potentially damaging, their self-esteem and pride. The mental model formed by the students in this particular instance was considered important, even if less easily definable, due to its recurrence and potential repercussions when applied. Whilst based on personal feelings and attitudes it was, nonetheless, perceived as being tangible throughout the experiment and, generally, more relevant than originally thought. Therefore, attention to design considerations was, in many respect, seen as the most accurate indication of the degree of professionalism and involvement applied by the design team.
- Similarly, the students elicited a mental model of the interface highlighting the notion

of consistency in the design of the user interface and the information data base suggesting that flaws or perceived weaknesses could noticeably affect the expected interaction. Interestingly, this model was felt to be comparable with a previous one linked to the reliability and comprehensiveness of the machine-driven platform.

The learning environment:

- One of the most recurrent mental models formed by the students was that of their learning environment (structure, coerciveness, assessment, rigidity, learning support facilities). This was often compared to or set against their more ludic mental model of multimedia functionality (open access, control, knowledge base, entertainment, games). For example recordings were discarded whilst simulation attracted their attention.
- The students never felt in a position to explain its pedagogic purpose. Therefore, the aims and objectives and the design of activities were not adequately understood leading to the formation of a new mental model of the application tainted by peripheral involvement, uncommitted performances and non-achievement.
- Similarly influenced by their environment, the students felt that a technologically-replicated version of a real-life situation could only be believed if the veracity of its facts and figures were proven and its projected truth substantiated.

The system as an interactive construct:

- The limited rapport man-machine, as conceived by the students, implied that hypermedia was misconstrued as multimedia whose functions were that of a database. When the interface purported to be more interactive and actively sought the students' participation and involvement, the model formed became intrinsically linked to the concept of entertainment.
- The students were unable to develop an accurate structural perception of the system. The structural mental model which they formed was closely linked to that of a

multimedia database mainly because a) the students were inclined to think that *A la Recherche d'un Emploi* was a misleading title offering practical advice and a relevant referential database to students who were soon to look for work b) because the reference section was seen as the dominant multimedia part of the software and c) because, at no stage, were the students stimulated to explore or investigate the pedagogically-oriented architecture of the platform. As a result of this initial and possibly convenient confusion, the students were unable to develop a spatial feel for the application.

- The mental model of the system, being formed by the students, suggested that the system, and by extrapolation all systems, presented mechanistic, physical rigidity, such as an incomplete database, which severely undermined their degree of involvement and relationship with the interface.
- The students' mental model of the system was therefore built on their perceived notion of rigour requiring consistency, authenticity, veracity, reliability but also breadth and depth within an identifiable and attractive environment.

8.3.5 Audit

The student evaluation of ARE tended to highlight some of the points raised in the above analyses whilst, overall, it produced a much more positive feedback than the user walkthroughs. In particular, despite a few perceived problems, the students still thought that visual clarity, consistency, adaptibility, informative feedback, explicitness, appropriate functionality, flexibility and control, multimedia extensions, error prevention and correction and student guidance and support were all to be sanctioned as either moderately or very satisfactory. The only sore point was the applicability for language learning considered very unsatisfactory. Students as assessors were therefore more generous than students as users indicating that, globally, the clear, uncluttered and functional interface worked, even if 6 out of 21 usability problems had been identified as major. Although highlighting its assessed potential, the students felt that the design could have been more adapted to their needs and clearer as to what it claimed to achieve, suggesting almost encouragingly that it is not because it is academic that it has to be dull and obscure.

8.3.5.1 Verbal Protocol 1: Group (b); Exploratory Session

Refer to User Walkthroughs of ARE in Appendix 2 for full detailed breakdown of actions, outcome of actions and resulting student observations.

Introduction: brief description of application within the specific context of learning a second language for special purposes given, in this case: finding a job. Information on design context and purpose supplied. Suggested pointers given to students: need to look at the structure to understand its spatial dimension and control own orientation, need to appreciate the learning potential and objectives.

Analysis of results of Recording Sheet:

The task undertaken by both students was exploratory. Its simple goal was to discover as much of the interface as possible or, indeed, as felt necessary, within an hour.

Quantitative analysis:

- 18 actions were performed within the allocated time of 50-minutes. The interaction only lasted 40-minutes.
- All the actions took place in the task section.
- The experimenter intervened twice to reassure the students and to give peripheral advice.
- 2 comprehension exercises were accessed, the first one was abandoned after 2 attempts and corrections sought, the second one was not attempted.
- On two occasions the students did not understand the functionality of the display. When in the video mode, they clicked on the video screen repeatedly. They also had

difficulty with the bent arrow, not knowing what its outcome would be when clicked on.

- The students resorted to "Instructions" twice. Once to find out how to operate at the level of the main menu, a second time when experiencing difficulties with the video.

Qualitative analysis:

- These two students had little IT experience, no multimedia experience and little confidence. This became obvious as they progressed. The main difference between them and the previous group (a) was that interacting with the interface required a higher degree of concentration and created a noticeably greater cognitive strain. This, in turn, affected their mental availability and disposition to seriously undertake parallel actions. For example, little benefit was made of the audio explanations presented with new windows since it coincided with a time of convergence and exposure. Furthermore, the students felt regularly hampered by their successive hesitations and constant adjustments to new screen displays. If the outcome of an action fell short of its expectation, the students blamed themselves and their own inadequacies. Such was the case with the introductory windows and to some extent the video interface.
- Interestingly, the students tried to find out if there was an underlying structure to the system or if there was a recommended pathway. Playing it safe, due to their lack of confidence, meant starting with Unit 1 which, in their mind, was linked to an introductory or foundation unit. This notion of progression touched upon with group (a) can be linked to the formation of the mental model of a curriculum and indicates that, as a substitute for a language course, the software should present all the trappings associated with a validated, structured approach, even if the students chose to ignore them afterwards when interacting with it.
- As previously witnessed, the students hardly attempted to complete the exercises. Notwithstanding the additional difficulties linked to being engaged in a new form of interaction, the students saw themselves as passive recipients of knowledge

circulating through a multimedia environment free of its imposed learning constraints. Whilst the students felt mentally exhausted after an hour-long session, their unique sense of personal achievement rested on their interactive performance with the system and not on newly-perceived learning benefits, approaches and intrinsic language acquisitions.

- The discussion, which ensued, corroborated and developed the above points further. What became obvious from this oral exchange was that the students felt they had under-achieved. However, this sense of personal failure was similarly reverberated onto the software, criticized for not being stimulating enough, for not sufficiently sustaining their concentration. Although they had not yet formed a mental model of the system as a learning environment, they had already developed a negative pre-conception of its potentiality.

8.3.5.2 Verbal Protocol 2: Group (b); Tasks 1/2/3

Three tasks were set for this user walkthrough: the first two concerned the retrieval of data in the reference material which required different actions in order to be successful; the third task was fully interactive and required students to realize a telephone simulation.

Refer to User Walkthroughs of ARE for further details in Appendix 2

Only one student used the mouse (recorded observations), the other student took part in the discussion which followed the user walkthrough. The students would take it in turn to operate the mouse for undertaking the tasks.

Analysis of results of Recording Sheet:

Task1: This task undertaken by the students was purposefully simple with only one set goal: to find the meaning of an unknown word identified in one of the activities. Only one sequence of actions is allowed by the application but other alternatives can spring to mind, hence the potential interest behind setting the task.

Quantitative analysis:

- 5 actions were performed within 8 minutes.
- On one occasion the student failed to understand the outcome of the triggered action.
- 2 different ways of looking for the word were tried. The first one failed, the second one was successful.

Qualitative analysis:

- The student experienced no difficulty in performing the task. Interestingly, this was the first time the reference section was accessed. Therefore, not surprisingly, it was observed by the student that, although easy, this action would not have been undertaken if not prompted to do so.
- The student was given a task to perform within an existing exercise. When, by clicking on the selected word, a message appeared, no attempts were made to contextualize the message and understand its meaning. The assumption was that because it was incomprehensible the answer had to be wrong.
- No problems were experienced inside the reference section suggesting that the navigation between the window and support data presented in superimposed text boxes was easy to relate to and mentally acceptable. It highlighted the mooted point that the underlying concept of the window was clearly assimilated.
- Finally, the student observed that the final outcome of the task was disappointing inasmuch as the definition which it delivered was considered basic and hardly worth the effort. This last point is somewhat contradicted, when in the following discussion, both students seemed to agree that such an easy access to an on-line database would create the incentive to look up words. The impression given during this exchange was that the mental model formed by the students was of a mercantile nature: "you only

get what you pay for" or when translated: you might get easy access but the end product is thin and hardly worth bothering with.

Task 2: This task is slightly more complex as it requires the students to look for specific linguistic formulae in the lesson section. The search includes selection of the right unit, activity and exercise. Furthermore, it requires going through the exercise to select all telephone expressions.

Quantitative analysis:

- 10 actions were performed by the student within the space of 15-minutes.
- The majority of actions aimed at locating the formulae.
- One title was not understood.
- No attempts were made to access the reference section.
- One attempt was made to extract the formulae from the exercise.

Qualitative analysis:

- The main pattern of behaviour, which transpired here, was that the student was generally at a loss. The task itself was considered somewhat obscure, increasing the sense of insecurity and exacerbating the lack of confidence previously felt. As if by osmosis, the student chose the exercise whose title was incomprehensible, possibly hoping that two incomprehensions would make it right and help find the correct path. As a result, the student went deeper into an activity, systematically clicking on the forward arrow up until the end of the line was reached. Ultimately, the appropriate window was found by luck.
- The first exercise encountered (wrong for the requested task) was quickly abandoned when it was realized that typing was required. This attitude, previously observed, is rife amongst users of multimedia platforms. In this case, the mental model formed of

the main advantage of multimedia over traditional means of delivery was that typing was excluded from it completely.

- Even when mouse-driven, the exercise which could provide the formulae was hardly attempted, suggesting that the cumulative effects of navigational anxiety and IT insecurity were such a strain on the student that, in order to redress the balance and win one over the computer, all the possible shortcuts were used to avoid undertaking the exercise whilst producing the goods. In a way, it was as though the task was totally dissociated from the learning environment promoting it to become an isolated and personalized challenge between the student and the machine. The mental model formed in this case was that the environment was computed and therefore mechanically based which meant, by extension, that it was limited and stupid. As a result, winning over a machine might have provided some satisfaction but was ultimately of little learning benefit to the student. Worse still, the more inadequate one feels, the more desperate one gets to redress the balance of powers.

Task 3: This task is the most comprehensive as it involves the students in finding the requested activity and undertaking the targeted exercise with a view to testing its functionality.

Quantitative analysis:

- 15 actions were performed within the remaining time of approximately 20 minutes.
- The second student intervened once to give the password.
- On 3 occasions, the outcome of the triggered action did not match the student's expectation.
- On one occasion, the student simply clicked the mouse button at random in field boxes.
- Only the last 3 actions were entirely linked to the simulation exercise or only 20% of all the actions undertaken.

Qualitative analysis:

- The mental model previously formed on the basis of the power game between man and machine was very much present in the initial actions performed by the student. From the first hurdle of remembering the password to even doubting the apparent simplicity of the operation, hiding tricks and further difficulties, the impression was that the student was on the look out and expecting trouble. Indeed, trouble was identified in the wake of the fifth action when the preparatory window for the simulation was displayed unexpectedly. It only needed to look complex for it to project visions of unremitting hard work. Again, the subactivity was conveniently skipped but, interestingly, since the system allowed it to happen, the student felt comforted in the knowledge that it could not have been so vital after all.
- The constant state of near panic between action and outcome meant that the student who had not fully understood the oral explanations felt, yet again, lost trying to understand what task was required in the simulation. As a result the first action triggered an error message, the second one simply replayed the first frame of the video and the third, expressing all the built up frustration, led to random clicking in the area where it was felt something should happen.
- Only when the mechanistic dimension of the simulation was appreciated, the student was able to relate to the exercise, form a model, albeit a basic one, of the interaction and express a degree of satisfaction. This satisfaction, which related to the student's own sense of technical achievement, was short-lived as the choice of answers given led to the abrupt end of the simulation. The fact that the student gave up at that stage would suggest that, if anything, there was little, if any, feeling of learning achievement.

8.3.5.3 Verbal Protocol 3: Group (b); task 4

One task was set for this user walkthrough: it exclusively concerned the preparation of and interaction with the interview simulation. This activity was essentially chosen because it was felt that the whole assessment exercise, relying on voluntary cooperation, needed to gather a new momemtum, which could be best, generated by an activity whose approach had previously proved popular. Due to the comprehensiveness of this activity, this user walkthrough was conducted over two one-hour sessions.

Refer to User Walkthroughs of ARE for further details in Appendix 2.

Only one student used the mouse (recorded observations), the other student took part in the discussion which followed the user walkthrough. The students would take it in turn to operate the mouse for undertaking the tasks.

Analysis of results of Recording Sheet:

Quantitative analysis:

- 33 actions were performed within the allocated time of 50 minutes.
- 2 error messages were triggered.
- Within the first 5 actions, 3 did not correspond to their expectations.
- 26 actions were directly related to the simulation exercise itself or the equivalent of 79% of all the actions undertaken.

Qualitative analysis:

- This time the student was far more relaxed, almost exuding confidence, and could even formulate personal comments on the design of the interface whilst interacting with it. It was only the spectre of the error message, which brought reality back into focus. However, the overall performance was noticeably better than in the previous simulation with 79% of directly targeted actions as opposed to 20% and there was a definite element of pleasure permeating and influencing the conduct of the simulation. The essential difference this time was that the student was not challenging a machine but quite clearly the character interacted with in the video. In this respect, the student was taken in by the contextualization process and was interacting within it, almost oblivious of the fact that the only language of communication was French.

- However, if the simulation worked and fulfilled its linguistic role, it failed at the level of providing contextualized knowledge since the student was goaded, not so much by the recognition of the intrinsic quality of the activity, but by a desire to settle an old score with the interviewer whom she instantly disliked. As a result, it was not so much an exercise in how to get a job, but more a game without rules in which the student could take malicious pleasure in giving all the wrong but satisfying answers. For once the student was distracted away from the machine-driven task and artificiality of the interface with all its constraints and stimulated into forming a personal mental model of the interface which was related to attitudes vis à vis authority, a physical appearance and quite possibly a previous experience.
- Finally, none of the preparatory and peripheral subactivities designed to improve the comprehensiveness and usability of the simulation were attempted following a now well-known pattern. Only the facility provided to check results was used, no doubt driven by curiosity, to see how bad the score was.

8.3.6 Summary of Identified Mental Models

The students' limited IT experience and confidence led to the formation of mental models, which, although corresponding to group (a) due to the overall profile of the students, showed some slight but noticeable variations. In particular, the students tried to make more sense of the system, not simply concentrating on its functionality but also on its underlying structure, therefore emphasizing the previously presented mental model of the structured curriculum within a comprehensible learning environment. In turn, this strained cognitive approach led to passive learning interaction and ultimately a negative model of an interface, which had to be blamed for the poor achievements and unsatisfactory delivery. Although the three previously identified categories were used in order to facilitate a comparative approach, the mental models were essentially formed in the learning environment and the interface as an interactive construct. This is possibly due to the fact that the students never felt sufficiently confident and capable of formulating overt criticisms aimed at the screen display.

The computer as a physical interface:

- The students thought there had to be a logical way to use the system. They looked for a recommended pathway. In their efforts to understand and interact with the interface, their functional and structural models became blurred. In other words, the students referred to either model indifferently often necessitating the recall of the "how to use" approach or functional model in order to form and relate to the "how it works" or structural model (Preece *et al.*, 1994: 134). An overwhelming impression which emanated from this user walkthrough was that it was a struggle between man and machine resulting in an increased cognitive load overshadowing the contextualized language environment presented by the system as well as the expected reaction to and interaction with the interface.

The learning environment:

- The students wanted to associate the software with their concept of the language course, although they could never find themselves in a position to clearly identify its structured approach and learning outcome. It felt as though the students had adopted, from the onset, the traditional but similarly rigid model of the teacher-led classroom situation, which had simply been transposed to the screen. Artificially and possibly surrealistically, such a projected learning environment was not seriously questioned in the absence of the teacher and the full benefit of student control. This ambivalence and confusion could be at the root of the recurrent under-achievement when in the exercise mode.

- If the students sought explanations related to the functionality of the software, they never attempted to understand what appeared as incomprehensible elements of its knowledge base, almost invalidating the whole learning process underpinning the design of the application.
- Only when in control of the underlying mechanism, did the students relate and form an appropriate model of an exercise. Inevitably this led to fulfilment and satisfaction.

The system as an interactive construct:

- The students saw themselves as passive recipients of knowledge within a multimedia environment, which, if difficult to manipulate, was free of imposed learning constraints. As a result, they felt it was their prerogatives to undertake the exercises or not. As it happened, they never did do so.
- The students saw the correlation between typing and multimedia as anathema. Typing had to be excluded from multimedia.
- The students often blamed themselves for their inadequacies but ultimately rounded on the computer as the main culprit for the predicament they had found themselves in. This developed a negative image, based on the students' preconceived ideas of computers, detrimental to their interaction and formation of new more beneficial models of interactive learning systems.
- The students, due to the required mental efforts, never distanced themselves from the concept of the machine. As a result, their interaction could have been compared to a direct challenge between them and the unfairly superior machine (concept of the power game). Ultimately, they felt vindicated in their pervasive belief that the contextualized environment was mechanically based, therefore limited and stupid.

- On one occasion, the mental model formed in the interaction was triggered by a physical element of a simulation activity and based on personal attitudes and experience. Even if somewhat negative feelings and motives fuelled such an ad hoc interaction, the aim of the interactive platform to stimulate and generate authentic communicative competence was, for a short period of time, achieved.

8.3.7 Audit

Not surprisingly, the audit, which followed the user walkthrough, returned a critical verdict on the application. In order of preference, students felt that guidance and support via the on-line help facility as well as flexibility and control in terms of navigation could be rated as very satisfactory. In the "moderately satisfactory" category came appropriate functionality, multimedia extensions, error prevention and correction, visual clarity and consistency. In "neutral" came informative feedback and applicability for language learning. Finally, adaptability and explicitness were felt to be moderately unsatisfactory. This would seem to indicate that the application offered great navigational potential making students feel in control of the application whilst providing context-specific guidance to help them use and understand the application. However, this impression is diametrically opposed to how the information is presented and structured and how it is meant to work within the parameters of its design. Linked to this last point is the feeling that the system lacks clear aims and objectives supported by recommended pathways or approaches for best learning outcomes. Finally, the visual display, which could have been the application's strong point, is considered generally unattractive, somewhat dull and is only saved by the use of videos.

In only 7 cases out of 21 (or 33%), usability was judged unproblematic as opposed to 6 cases considered very problematic (or 28%) including understanding how the information on the screen related to what had been done, finding the required information, losing track, aimlessness and lack of clear indicators corroborating the suggestion made earlier and by the students themselves that this application was not sufficiently supporting the self-access mode.

8.4 Summative Evaluation of France InterActive (FIA)

8.4.1 Description of Software

France InterActive (FIA) is a student-centred hypermedia language learning environment for *ab initio* learners of French in but also out of higher education. It is designed to present a hypermedia course based on the "communicative competence" approach to language acquisition (Ingraham & Emery, 1991) combining a rich, interactive knowledge base within the imposed constraints of the more easily recognizable linear structure of a taught language course. FIA consists of twenty modules, each of these comprising four units. Each fifth module is designed to review the material previously covered in the four preceding units and so on (Ingraham & Emery, 1991). Each unit is designed as a discrete entity corresponding to approximately one hour of student interaction. However, supplementary tutoring supporting these modules is recommended by the designers. By the end of the first half of the course, consisting of ten modules, students are meant to have acquired the basic linguistic elements forming part of the language's survival kit. The second half of the course concentrates on strengthening vocabulary, grammar and appropriacy (Ingraham & Emery, 1991) to provide students with a sound foundation on which to build greater linguistic competency and fluency.

Typically, a unit comprises a central visual illustration of linguistic elements introduced in the form of a video and video-related activities and exercises divided into three specific categories covering the functional, grammatical and lexical competencies. An oral introduction indicating what is expected in terms of seeing, doing and learning outcomes as well as an introductory window displaying the map of the unit are systematically provided at the start of each unit.

8.4.2 User Interaction

Students are actively encouraged to interact and therefore to communicate in French through a learning process which engage them in acquiring linguistic functionality as well as rules governing them emphasizing their socio-cultural dimension within the embedded contextualized language environment.

What fundamentally differs from other hypermedia applications is the hybrid navigational concept built into the interface design which prioritizes the tactical, student-controlled, hypermedia interaction at the unit level whilst discouraging the more strategic, structural navigation across units throughout the knowledge base. Therefore, students would be expected to select a unit, explore and interact with its "hyper-information" (Ingraham & Emery, 1991) then exit the application before being in a position to look at or interact with another unit, thus actively restraining the scope of the students' navigational path to retain some conceptual control as well as an element of predictability.

The version used for this user walkthrough was provided on a demonstration CD-ROM. Whilst it only contained a representative selection of units and presented a limited functionality in the reference section, it was considered adequate for the proper conduct of the experiment. However, in the absence of any attached documentation, both students and experimenter quickly became confronted with the above-mentioned navigational stumbling block when exploring the application. Although the problem was just as quickly resolved following subsequent clarification by the designer, it led to the formation of unexpected mental models and triggered attitudes and reactions on the part of students which were deemed of a sufficiently significant value to be incorporated into this research.

8.4.3 Verbal Protocols

The summative evaluation of FIA consisted of a total of six verbal protocols, undertaken by two final year students of French with good IT expertise, some multimedia experience and a high degree of confidence otherwise known as Group (a), two second year modular students with some IT expertise, some, limited, multimedia experience and average confidence in Group (b) and two first year student of French with some IT expertise, no multimedia experience and average to poor confidence.

8.4.3.1 Verbal Protocol 1: Group (a): Exploratory Session

Refer to User Walkthrough of FIA in Appendix 2 for a full detailed breakdown of actions, outcome of actions and resulting student observations.

Introduction: a brief description of the application was given to the students including required level of linguistic competence, the stated learning aims and objectives and the purpose of the user walkthrough designed, in this case, to enable the students to freely interact with the system with a view to developing a feel for its interactive unit-based structure. Additionally, the students were given the necessary instructions in order to start and enter the application.

Analysis of Results of Recording Sheet:

Quantitative analysis:

- Bar the random clickings and the exercise-based actions, the students performed 28 actions leading to outcomes within the session, which lasted 50 minutes.
- The students expressed 10 very positive comments directly related to the interface design.
- Conversely, they made 17 negative remarks on specific aspects of the design.
- On-line Instructions were called once whilst exploring the functionality of the interface.
- The experimenter intervened once when the students became entangled into a loop.
- The students only explored one unit, looking essentially at its functionality as opposed to its knowledge base and interactive potential.

- Apart from the "Video-Texte" mode, none of the exercises were attempted.
- There were 2 noticeable stumbling blocks affecting the students interaction: the "Stop" function and the design of the "Stop" window.

Qualitative analysis:

On the basis of the observations made by the students, a qualitative analysis showed that:

- The students readily opted to look at and interact with the application from a user interface design point of view. In so doing, their critical gaze focused on the quality and functional potential of the screen display, commending the design on: explanations given in pop-up boxes when titles scanned; the translations provided; the clear oral and visual unit introductions; the clearly mapped architecture; the authenticity of the video material and the good synchronization of the sound anchors in "Video-Texte" mode.
- Similarly, they criticized the design on a number of aspects including the perceived lack of linguistic consistency in the introductory frame, the patronizing nature of the "Stop" video clip, the quality of the video film, the slow and unfriendly rewinding control and the rigid and unimaginative design of the reference material.
- Overall, the students were genuinely impressed by the clear and structured design approach. However, the positive inclination felt by the students towards the application receded somewhat when they hit what they considered to be a serious navigational problem preventing them from moving freely between units. Worse still, this was compounded by the ambiguity created by the term "Stop" and its outcome, which the students strongly reacted against. Aside from the video film which was, on the whole, well received, the students were generally more critical of the interface in the second half of the experiment than in the first half.
- The observed reaction against the patronizing nature of the "Stop" video clip ("C'est fini pour aujourd'hui" and "Au revoir") is worthy of special attention. The students

immediately and physically reacted against the above clip suggesting, firstly, that they felt offended by such a condescending tone and attitude which they thought was insulting and, secondly, that the design objective to give a computer interface a more human and friendly face could easily backfire if user requirements were inadequately targeted, as in this case.

- Interestingly, the students made several, unprompted references to the underlying language environment and the degree of contextualization of its knowledge base, being naturally attracted by the multimedia potential of the platform, whilst indirectly supporting the view that one of multimedia's functions was to develop such useful environments. Students' comments focused on the mixture of French and English, the static nature of some displays, the need for the better integration of peripherals and the need to develop closer links and a better fluidity between the reference section and the interactive lesson section. However, raising such concerns during the interaction also suggested that the contextualization process had been thwarted or simply affected by aspects of the interface, which had brought the students back to the reality of the physical interface.

8.4.3.2 Verbal Protocol 2: Group (a): Task 1

On the basis that the navigational functions originated from a conscious design decision and not, as it was first believed, from the built-in limitations of the demonstration disk, the task which was set for this second user walkthrough was designed to recreate the hour-long, unit-based setting for which the software was initially conceived.

Both students could easily recall their previous interaction with the application and, as a result, there was no need for the experimenter to provide them with introductory explanations. However, the above point was explained so that the students fully understood that what they had perceived as a particularly crucial design fault, undermining its design credibility, stemmed, for pedagogic and technical reasons, from a design decision made by the design team. The students appreciated the correction, understanding the reasons supporting the existing design but, interestingly, suggested that it was unrealistically reductionist as a valid design concept. Their views was that whilst it would probably be fair to assume that prospective students could be locked into units presented in a controlled and monitored sequence as part of a class-led activity, a designer could not plausibly impose his way of using such an hypermedia application without undermining the interactive potential and therefore the whole multimedia concept on which it was built.

Analysis of Results of Recording Sheet:

Quantitative analysis:

- 55 actions leading to outcomes were performed within the 45-minute session.
- 6 overtly positive comments were made as opposed to 3 negative ones.
- 6 different types of interactive exercises were attempted out of a potential 10. They included the video, the video-texte, the video quiz, the interactive dialogue "A l'agence de voyage", the grammar exercise "Ordres et Contre-ordres" and the vocabulary exercise "Mots-clefs".
- Aside from the video which was fully watched, none of the above mentioned exercises were completed. 5 attempts were made in the video-texte mode, 4 in video quiz, the dialogue with the travel agent was completed but only half the answers were recorded by the student, 4 attempts were made in the grammar part and only 2 in the vocabulary exercise.
- One action (in dialogue mode) led to an unexpected outcome.

Qualitative analysis:

On the basis of the observations made by the students, a qualitative analysis shows that:

- Overall, both students demonstrated through their comments during the discussions but similarly during the interaction that they felt much happier with the application. Reasons for this were threefold: firstly, the explanations given to them by the experimenter helped them to better relate to the designed structure, secondly, the interaction which ensued was virtually trouble-free and finally, the student interacting with the software (B in this case) seemed to be genuinely taken in by the interactiveness of some of the exercises.

- The positive comments which were made focused on the quality of the sound, the design and value of the video-texte, the video quiz which tested comprehension as opposed to memorization and the interactive potential of both the dialogue and the "Ordres et contre-ordres" exercises.

- The negative comments concentrated on the quality of the video screen, the lack of a visual dimension in the dialogue mode and the poor use of multimedia's interactive potential in the vocabulary exercise. Additionally, it was felt that, although the interaction was interesting, the dialogue with the travel agent was relying too much on the sequential and rather intricate use of buttons. It was, indeed, in this mode that the student encountered his first and only unexpected outcome resulting in having to repeat the previous part of the dialogue. Conversely, the noticed lack of immediate feedback following a recording by the student, designed to increase the authenticity of the interaction, was not considered encouraging. As a possible repercussion, the student did not manage to muster the necessary motivation to record all the answers.

- This notion of feedback, or more generally the response by the machine to the student's input, was an interesting one insofar as it elicited a number of mental models by the student. Aside from this basic human need, it showed and reinforced a well observed attitude developed by students when interacting with machines. That is to say: if machines are any good, then they must be good at processing the information given to them and, therefore, naturally good at giving an immediate and accurate feedback which is, after all what the teacher cannot systematically do. Furthermore, students might indeed like or prefer a fully contextualized multimedia platform but, in this transitional phase, are still very much conditioned by their experience with computer-based CALL exercises relying on the common input-scored output approach. Interestingly, the man-machine interaction is often considered a success by the user when the latter manages to secure a large degree of, if not full, control over it. In CALL, recordings often put students into a more vulnerable and insecure position which is made unbearably worse, in terms of the student's own confidence but also in terms of the perceived artificiality and futility of the exercise, if an immediate response / feedback is not made available.

8.4.4 Summary of Identified Mental Models

On the strength of the above analyses, it was possible to identify mental models elicited from the students' interaction and patterns of behaviour. These models, formed by students, closely related to their real life experience and the context within which the experiment was taking place. As in previous walkthroughs, they were classified under the following recognized headings comprising the computer as a physical interface, the learning environment and the system as an interactive construct.

The computer as a physical interface:

- The students were very confident and, aside from the navigational difficulty encountered with the "Stop" function, were always in a position to form functional mental models of actions to be performed within an easily recognizable Windows-based environment. If anything, their existing models were so specific that they would have welcomed, at times, a greater adherence to design conventions.
- Throughout the user walkthrough, the model of the computer as a physical interface was stronger than its model as a language learning environment, insofar as the students' model of a multimedia environment, supporting language immersion and full interactivity, never entirely matched the built-in hypermedia dimension of FIA, thought of as being too mechanistic whilst displaying authentic, but poorly projected, material.

- The authenticity of the material was such that, had it not been for the poor quality of the pictures, the video presentations of the knowledge base would have been provided the multimedia platform with real linguistic contextualization potential.
- The students' clearest recall of the physical interface, based on their first session, was of the "Stop" video-clip terminating the interaction which, with hindsight, was thought to be hilarious. Funny attributes can, indeed, attract a much greater recall power, however, in this case, the hilarity was double-edged as it was negatively felt and, if anything, only served to disenfranchize the students as non-target users.
- Finally, the model of the computer as a physical interface was clearly formed when its processing powers were expected to deliver an improved machine response, which, in itself, would have justified its very existence.

The learning environment:

- The students never discussed or seemed to appreciate the application's pedagogic approach. Moreover, they steered clear of a language-based interaction, opting for a more neutral user-interface design position. Therefore, the instinctive model which they formed was that of an experiment, albeit a valid and authentic one, within which they performed as projected target-users as opposed to an interactive language session taking place in a real learning context within which they would perform as students.
- Deciphering their impressions and reactions, models pertaining to their learning environment could still be identified. These ranged from their conditioned assessment-based motivation supporting a more sophisticated scoring device mechanism and synonym for commitment to the need for a machine-driven but teacher-led approach which would process their own language inputs.
- Finally, the nearest the students came to forming a model of the application within the learning environment was when it was explained to them that its underlying structure had been designed for use in class on a progressive, unit-based approach. The role the students had adopted in this user walkthrough was interesting in this instance as it led

them to suggest that this approach was incompatible with a multimedia-based learning platform.

The system as an interactive construct:

- As a result of the above point, the students were in a position to develop an accurate structural perception of the system, which was only undermined by its limited navigational functionality. In this respect, the students' model of multimedia-based interactivity was often brought back to the two-dimensional physical interface, either because of restricted movements, or cumbersome mechanistic devices. As an interesting, albeit speculative adjunct to this structural model, it was almost possible to perceive a tangible correlation between student interaction and behaviour. Whilst the students' interaction evolved from the spatial multimedia-structured environment to a more restricted unit-based presentation, so too their attitudes and overall behaviour started to shift from an initial position of great expectations to, increasingly, one of class-based, traditional predictability. In fact, they expected the machine to perform more and more like a conventional teacher in a frustrating and limited simulation exercise.

8.4.5 Audit

Not surprisingly, the audit session was seen as a natural continuation of the two user walkthroughs insofar as both students had already taken a semi-conscious user interface design viewpoint from the very beginning of the experiment. From this would-be expert stance, they gave a high rating to the *Visual Clarity* and *Consistency* of the application as well as its *Adaptability* within the parameters of the unit and its use of *Multimedia Extensions* viewed as appealing, good and professionally delivered. Similarly although less importantly due to a rather uncommitted position, a Very Satisfactory verdict was returned for *Error Prevention and Correction.* Considered Moderately Satisfactory, the *Informative Feedback* was seen to be lacking something to be desired. The student felt that the Stop feedback, for instance, was not helpful, and, generally, instructions were too vague especially when the sequence of actions was complex as in some exercise modes. By the same token, the *Functionality* of the application was also thought of as Moderately satisfactory, possibly to indicate that improvements could still be made or that their needs and requirements had not been fully met. Interestingly, whilst both students felt that the purpose of the design was unambiguous, they, conversely, criticized the lack of clear explanations concerning the adopted language learning methodology and its appropriate use which only offered an imposed pathway for best learning outcomes. As a result, *Applicability for language learning* was rated Moderately satisfactory. A similar rating was given to *Student Guidance and Support* because instructions were seen as being insufficiently clear at times or simply too succinct and general and not context-specific enough. However, the most ubiquitous criticism focused on the difficulty previously experienced by the students when trying to bypass the Stop function in order to explore the platform. As such, the organization and structure of the application were not considered clear enough and *Explicitness* was, therefore, given a Moderately unsatisfactory rating. Similarly but unsurprisingly, this rating was also given to *Flexibility and Control*, since the structure was not viewed as flexible enough. Finally and in spite of the overtly critical stance adopted by the students, they generally thought that there were few usability problems, returning only five Minor problems and three Major Problems out of twenty one usability criteria. Corroborating this last point, the students indicated that changes could be made to improve the application concentrating on its multimedia and interactive potential, especially in the reference section, the learning objectives, the flexibility and adaptability of its structure and the quality of its pictures.

8.4.5.1 Verbal Protocol 3: Group (b): Exploratory Session

Refer to User Walkthrough of FIA in Appendix 2 for a full detailed breakdown of actions, outcome of actions and resulting student observations.

Introduction: a brief description of the application was given to the students including required level of linguistic competence, the stated learning aims and objectives and the *purpose of the user walkthrough designed, in this case, to enable the students to freely interact with the system with a view to developing a feel for its interactive unit-based structure. Additionally, the students were given the necessary instructions in order to start and enter the application.*

Analysis of Results of Recording Sheet:

Quantitative analysis:

- Bar the screen scanning as well as closing and starting the application again, the students performed 25 actions, which led to physical outcomes within the 50-minute session.
- The students accessed 2 units, looked at the video film in both cases and explored one interactive exercise in the first unit and the 2 video-related exercises in the second unit.
- On 7 occasions they expressed noticeable satisfaction compared with 10 occasions when the students expressed frustration or negative comments.
- The experimenter intervened once when the students became entangled into a loop.
- At no stage did the students feel the need to call on Instructions or Help, nor did they look at the introductory unit providing all the necessary explanations.
- On one occasion, the action taken (when in the recording mode) did not lead to the expected outcome.
- The "Stop" function and design were seen as a stumbling block and setback.

Qualitative analysis:

- In spite of the problem experienced by the confusing and frustrating "Stop" functionality, the students' motivation and concentration were thoroughly sustained throughout the session. This was corroborated by the students themselves who, at the end of the session, indicated that it had been fun and that it was a good application.

- Unlike Group (a) which overtly concentrated on the functionality and design of the application based on a single unit exploration, this group attempted to get a more global feel for its structure, exploring two units, although hampered by navigational functions which were not considered helpful or indeed properly designed.
- Similarly, the students related to exercises, not as pedagogical entities, but as intrinsic elements which were, by nature, integrated into a context-based language environment. Hence, they formulated negative comments regarding the seeming lack of links or correlation between the subject matter of the unit and the theme used in the first exercise opted for. Furthermore, they expressed surprise when the feedback which they were expecting to get on their own interaction, however limited, was not forthcoming, suggesting that their efforts were not recognized or that they were not even considered acceptable partners within the given context.
- The students particularly liked the use of both oral and visual presentations, the visual explanations given in pop-up boxes when titles were scanned, the translations provided, the video films and the authenticity of the video material.
- Above all, the students were very impressed by the technically superior design of the Video-Texte and Video Quiz, which enabled them to anchor textual material within the visual support.
- Finally, the students easily saw the pleasure potential this software offered, once the navigational problems had been ironed out, but the degree of language exposure was much greater than the level of interaction carried out by them.

8.4.5.2 Verbal Protocol 4: Group (b): Task 1

Similarly to verbal protocol 2, the task which was set for this second user walkthrough was designed to recreate the hour-long, unit-based setting for which the software was initially conceived.

Both students could sufficiently recall their previous interaction with the application to start and gain access to the relevant material. As a result, there was no need for the experimenter to provide them with introductory explanations. However, the need was felt to clarify how the designers had initially intended their application to be used, highlighting the notion of controlled autonomy which emphasized the unit-based course structure whilst allowing students to freely explore and interact within the hypertextual confines of each unit. The students appreciated the correction, reminiscing over the navigational hurdles they had been confronted with in their previous interaction.

Analysis of Results of Recording Sheet:

Quantitative analysis:

- The student almost systematically clicked once before clicking twice on the required function.
- Bar inconclusive single clicking and mechanistic actions carried out to complete interactive exercises, the student performed 44 actions within the session, which overran by half an hour.
- On 11 occasions, the student clearly expressed satisfaction with the potentiality of the interaction and / or the quality of the interface design.
- On 8 occasions, the student raised some question marks related to perceived weaknesses in the design.
- On one occasion, the student felt the need to seek guidance from "Instructions".
- 4 actions did not lead to expected outcomes.
- 2 error messages appeared.
- The experimenter intervened once when the student appeared unnecessarily puzzled by the unexpected reaction of the computer.

- Bar one, all the exercises were attempted. All the video-based exercises and the interactive dialogue were completed whereas none of the grammar exercises were completed.
- Following the error message related to recording, the recording facility was not used anymore.
- No attempt was made to access additional information in the reference section.

Qualitative analysis:

On the basis of observations recorded during the verbal protocol, the following qualitative analysis seems to suggest that:

- The student's motivation and enthusiasm were satisfactorily sustained throughout the session, which was voluntarily extended to complete as much of the task as possible. Overall the student was impressed by the original design and interactiveness of exercises especially the video-based ones considered all-time favourites.
- Conversely, the student was, at times, unclear as to what was expected to be done and this flawed usability, as perceived by the student, seemed to raise some concern. One such concern related to the sense of loss or confusion or even helplessness when faced with a new window introducing a new interactive exercise. Mention was made that not all the oral instructions had been fully understood, suggesting that the juxtaposition of both oral and visual presentations made it difficult to fully grasp the message. By the same token, the suggestion was made that functions could have been made easier if explanations had been systematically provided in the form of pop-up text box triggered by scanning over them with the mouse pointer.
- Although concerned by the interface design, the student never seriously felt capable of or willing to directly and critically confront the usability and applicability of the interface suggesting that roles and expertise were clearly established from the start. After all, the approach was new, innovative and stimulating generally and the feeling

was that the student was humble as well as grateful.

- Interestingly though possibly coincidentally, the student stopped using the recording facility provided by the application in the wake of the apparent malfunction in "Ordres et contre-ordres" generating an error message. However, this took place towards the end of the session and the student was certainly aware of the time and was possibly anxious to look at, if not complete, all the exercises.
- The most striking aspect of this verbal protocol rested on the conscientious approach adopted by the student to perform the task. If the design gave the student full autonomy within the unit, the navigation was consistent and systematic so as to cover as much of the unit as possible. As a result, the student started at the beginning, completing all the video-related exercises, then proceeded to move on from left to right in the "Plan" window, accessing the dialogue first followed by the grammar exercises done from top to bottom. If time had not run out, the student would have certainly attempted the last exercise of the unit in the vocabulary section on the right of the screen display. In this respect, the mental model elicited by the student could easily have been associated with conventional reading skills, which, instinctively, directed the focus of attention from left to right and top to bottom. This point was somewhat strengthened by both students when they indicated, in the final discussion, that the software was not ideally suited for free, uncontrolled browsing suggesting that it was potentially designed for classroom use.
- Finally, a rare mention was made of linguistic outcomes and the seeming lack of global reference marks and lists to enable students to check their progression. This consideration was interesting in so far as it further reinforced the image the students had developed of the software associating its functionality and usability with that of a support, albeit a very good one, for a traditionally structured and easily identified classroom-based language programme.

8.4.6 Summary of Identified Mental Models

On the strength of the above analyses, it was possible to identify mental models elicited from the students' interaction and patterns of behaviour. These models, formed by students, closely related to their real life experience and the context within which the experiment was taking place. Therefore, the previously chosen classification was adopted and models were identified under the following headings: the computer as a physical interface, the learning environment and the system as an interactive construct.

The computer as a physical interface:

- The students were generally confident when interacting with the application. Their prior knowledge of and experience with the Windows environment meant that they were generally in a position to adequately form functional mental models of actions to be performed.
- For the first time, the students' level of language proficiency might have been a potential handicap when interacting with the interface's built-in simultaneous audio and visual presentations. Unaccustomed by this duality and concentrating on the impact of the visual display, the students' unidimensional sensory model was impeding the satisfactory absorption and understanding of the given data due to temporal information overload. This highlighted a potential design problem affecting the multimedia dimension of a hypermedia interface, although largely overlooked in this case, when progressing from a language audio-laboratory to a multimedia presentation.
- Interestingly, when the students were told that the hypermedia knowledge base was voluntarily presented in a unit-based, therefore linear, structure commensurate with that of a traditional course, they subconsciously reverted back to adopting an appropriately traditional linear approach which systematically and conscientiously attempted to carry out the task. This behavioural modelling, previously noticed, not only strengthened the view that a definite correlation existed between structural models and interactive patterns but suggested that a process of identification was taking place by osmosis.
- The students were generally impressed by the use made of multimedia extensions,

especially improvements made by the video. As a result, they remained positive, aware of the innovative and stimulating aspects of the interface. In this particular context, the novelty element played an important part inasmuch as students were somewhat mesmerized by the technological potential as well as comforted by the fact that they, too, could successfully interact with it. The mental model they were forming stemmed from and superseded their old technological model of multimedia based on preconceived ideas and assumptions linked to poor approachability.

- Finally, although predisposed towards interacting within a hypermedia-designed language context, the students were too often reminded of the limitations of the physical interface. Hence the reason why the structured presentation became omnipresent in the second session at the expense of the hypermedia potentiality. In other word, the functional model was overpowering the structural model as developed by the students.

The learning environment:

- Whilst the students saw and appreciated the display of the pedagogical remit of the selected unit, they never attempted to seek information pertaining to or elucidating the aims and objectives of the hypermedia platform. As a result, there were never any attempts at investigating the overall pedagogical approach adopted for the software. However, mention must be made that this passive attitude essentially stems from the overwhelming teacher-led learning model predictably and possibly conveniently adopted by students all too often relying on the concept of progress by exposure.
- In this particular user walkthrough, mental models elicited by the students, which could be linked to the learning environment, were closely associated with the physical interface insofar as the students reacted differently to the platform in both sessions. In the first instance, the students, helped by the authenticity of the material, clearly tried to construct a context-based language environment, exploring its knowledge base whilst promoting its hypermedia potentiality. In many respect, the students' interaction was stimulated by the triggered language exposure

- In the second instance, the student's interaction changed drastically on the strength of a mental model linking the system's built-in control with a structured, classroom-based approach. Progression within the unit therefore became linear and systematic, whilst exercises were attempted and to a large extent completed.

The system as an interactive construct:

- The students quickly and easily related to the concept of hypermedia and expected the platform to respond to their first exploratory navigation adequately. Hence the degree of circumspection and noticeable frustration when navigational difficulties occurred during the first session as well as the disappointment when the contextualization and interaction were felt to be limited. In many respects, the mental model of an hypermedia system as formed by the students was already three dimensionally interactive.
- The two different mental models adopted by the students affected their view of the system as an interactive construct. On the one hand, the students felt naturally attracted to the hypermedia structure of the knowledge base and, had it not been for the navigational complications, would probably have explored different parts and interactive exercises of the platform.
- On the other hand, when told of the design concept behind the application, the students became predictable and docile in their interaction. The unit was, immediately perceived as a set of exercises, which had to be completed, and each unit had to be completed before attempting the following one. This projected rigidity, easily associated with that of a language programme conducted in language laboratory conditions, encouraged the students to revert back to a similarly rigid interaction better suited to the newly perceived platform.

8.4.7 Audit

The students' positive attitude and disposition towards the application was very much reflected in their assessment of the *Clarity* and *Consistency* of the screen design and the use of multimedia extensions which were all rated Very Satisfactory. In any case, even if at times the students did not seem to fully relate the questions to their own perceived interactive experience, their comments certainly confirmed that these aspects of the interface were not considered design issues. However, *Informative Feedback*, the *Explicitness* of its structure, its *Functionality* along with *Error Prevention and Correction* were all deemed to be only moderately satisfactory. In many respects, this poorer rating stemmed from the frustration, which was clearly experienced during both user walkthrough sessions, when coerced into a unit-based navigational pattern. As a direct result, the students felt that the system was too rigid generally, and that given its unusual rigidity, it should have been made more explicit from the start both in terms of overall architecture and strategy. This point was further and unequivocally made in *Flexibility and Control* and *Applicability for language learning,* which were both given a Moderately Unsatisfactory rating. Finally, aside from the lack of guidance on how to use the application and the rigid structure considered major problems, the students returned a generally positive verdict indicating that the usability of the system was either without problems (12/21) or presented minor problems (7/21). General questions on the usability of the application generated answers from students on a par with the above-mentioned rated assessment.

8.4.7.1 Verbal Protocol 5: Task 1 (part 1)

Refer to User Walkthrough of FIA in Appendix 2 for a full detailed breakdown of actions, outcome of actions and resulting student observations.

Introduction: a brief description of the application was given to the student including required level of linguistic competence, the stated learning aims and objectives and the purpose of the user walkthrough designed, in this case, to enable the student to concentrate on one unit only with a view to undertaking and attempting to complete its range of interactive exercises.

In this particular instance, the student who had volunteered had not taken part in any of the previous user walkthroughs. This explains, to some extent, why the task had to be split in two sessions since it was the student's first contact with the software and therefore first attempt at interacting with it.

Analysis of Results of Recording Sheet:

Quantitative analysis:

- Bar duplicating single / double clicking actions, 18 actions were performed within the session truncated to 45 minutes.
- In many instances, the required double-click action was preceded by an aborted single-click action.
- The experimenter intervened 9 times in all providing reassurance (3), explanations (6).
- On 6 occasions, the action taken did not lead to a satisfactory outcome.
- On 2 occasions an error message appeared.
- On 1 occasion the student did not understand the outcome of the action.
- On-line instructions were called once.
- The hour-long session was curtailed by 15-minutes by the student.
- On 3 occasions the student expressed her satisfaction at aspects of the interface.
- Conversely, the student was never overtly critical of the interface.

Qualitative analysis:

On the basis of the observations made by the student, a qualitative analysis shows that:

- The student was generally and almost persistently apprehensive both vis à vis the interaction and the nature of the task itself in terms of its comprehension and expectation. This was best illustrated by a lack of confidence throughout the session and best expressed by an apologetic stance highlighted at the end of the user walkthrough regarding the failure to complete the task.
- As a result, the interaction was slow, hesitant but thought-out insofar as the student carefully scrutinized the screen display before each new move and strove to read all the information, which had been provided. The adoption of this cautious approach suggested that in an unknown territory, such as this, a rigorous, systematic progression was likely to be more productive. For instance, even though the experimenter explained that the introductory unit was purely designed to present the computer and the structure of the units, the student opted to look at it first. Therefore, it enabled her to better relate to the underlying concept of the application and understand its functions. However, it similarly prevented the student from fully undertaking the assigned task.
- This approach was further exemplified by the need to resort to on-line instructions when the introductory audio explanations presenting new interactive activities were not fully understood or registered. In turn, this suggested that the synchronous visual and audio presentations, as in the previous user walkthrough, were too cognitively demanding for the student to relate to. As a result, the student's concentration was impaired and the registration and comprehension of the given information affected in the process. Interestingly, these computed links between windows corresponded with the only interactive moments when the student was not in control anymore, "attacked" or even "bombarded", as it was undoubtedly felt, on these two crucial auditive and visual fronts. This could be easily remedied by designing a delayed audio presentation or by giving the student the chance to listen to, therefore to control, the explanations again, once the visual dimension had been fully appreciated.
- At the interface level, the student's frustration was often conveyed via the mouse, as its only physical, therefore vulnerable, link. This was expressed by the minimal use and movement of its pointer on screen and, by contrast, bouts of fierce double-

clickings when the single click had failed to trigger the expected outcome suggesting that the man-machine relationship, with all its inadequacies and limitations, was omnipresent.

- In spite of the above mentioned apprehension, satisfaction and amazement were expressed when the student made new discoveries such as the use of the right-hand mouse button or, an English translation of explanations given in French or, more importantly, when watching the video film for the first time.
- Finally, the student never felt to be in a position to openly criticize the design or functionality of the interface, conscientiously and subconsciously linking errors and inconsistencies to her own limited competence.

8.4.7.2 Verbal Protocol 6: Task 1 (part 2)

Refer to User Walkthrough of FIA in Appendix 2 for a full detailed breakdown of actions, outcome of actions and resulting student observations.

This task is the continuation of Task 1(part 1) carried out by the same student. No further introductory explanations were volunteered by the experimenter nor were they solicited by the student. Therefore, this user walkthrough started directly in Module 2 Unit 1.

Analysis of Results of Recording Sheet:

Quantitative analysis:

- Bar exercise-related actions and random clicking, 31 actions were performed within the allotted time.
- 4 actions led to unexpected outcomes.
- On 6 occasions the experimenter felt the need to intervene: reminders (2), confirmation (1), explanations (3).

- On 2 occasions the student was very complimentary.
- The student never openly criticized the interface design.
- On 1 occasion the student required access to Instructions.
- All the exercises were accessed and attempted. None were completed aside from the video, which was watched again in full.

Qualitative analysis:

On the basis of the observations made by the student, the following qualitative analysis shows that:

- Even if the student was still generally apprehensive, she was more confident of herself. This, in turn, translated into a greater understanding of the interface with its expected interaction and also, to some minor extent, a greater comprehension of the previously played audio explanations.
- However, the student interaction was still slow and often hesitant, especially in the interactive exercise mode. These hesitations were often triggered by the bitty comprehension of the new audio explanations presenting these modes. As a result, the student had to resort to the on-line instructions provided which were conveniently read in the English version (possibly defeating the object of the exercise) or relied on the experimenter for initial clues. Similarly, the experimenter felt the need to intervene on a number of occasion to provide greater guidance and support as well as to ensure that the unit could be adequately covered.
- Interestingly, from a user interface design viewpoint, the student was never in a position to fully grasp the meaning and requirements of an exercise by simply looking at its screen display when the audio explanations had not been sufficiently understood. The degree of frustration this situation led to was often recorded in the superior attitude expressed by the student when showing off her linguistic ability in the subsequent, automated actions within the confines of the exercise, once its

premise had been understood.

- Mention of the discrepancy between the linguistic level of the student and that of the expected user of FIA should be made. On the one hand, it enabled the student to concentrate on the interaction and the interface generally, whilst on the other hand, it influenced or even corrupted some of the student's observation. For example, it was noticeable that the student's motivation had risen substantially when interacting in the video-texte mode and this motivation lingered to some extent in the following exercises. Therefore, it could, perhaps, be argued that if the student had found this linguistic motivation at an earlier stage, she would have been in a stronger position to better appreciate and benefit from the application.
- The previously mentioned difficulty to perform a successful double-click action persevered and affected the whole of the interactive session.
- The student was full of praise for the Video-Texte mode, which enabled her to read and understand the written scenario of the video and select parts of it to trigger their anchored video playback. This enthusiasm led to a protracted time spent on this activity.
- Throughout both user walkthroughs, the student expected or encouraged the experimenter to intervene. In this respect, the student was behaving in a manner not uncommon to that which is customary in class-based language laboratory sessions when students often resort to or simply expect help and support from the teacher. As a result, the student interaction with the interface was repeatedly interrupted or broken by the student seeking attention from the experimenter away from the screen, attempting to create in the process a triangular relationship within which the task could be realistically undertaken. This point was further corroborated by the student's views on the application, briefly explained at the end of the session, which confirmed that the software was primarily perceived as support material for a structured language class in the same way as exercises previously performed in language laboratory conditions.

8.4.8 Summary of Identified Mental Models

On the strength of the above analyses, it was possible to identify mental models elicited from the students' interaction and patterns of behaviour. These models, formed by the student, closely related to their real life experience and the context within which the experiment was taking place. As such, they were classified under the following, previously recognized headings comprising the computer as a physical interface, the learning environment and the system as an interactive construct.

The computer as a physical interface:

- The student's general apprehension almost always reduced the physical interface to a two dimensional screen, which provided textual material designed to be read. In turn, instructions, in the form of on-line help or explanations would trigger interaction, suggesting that the interface was essentially an extension of the well-known text format.
- Similarly, such an emphasis on the visual dimension of the interface meant that its impact was particularly noted especially when the physical interface promoted a display combining both moving images with sound. In this respect, the overwhelming mental model elicited by the student was that of the language laboratory as the only known and somewhat limited combination between machine and language. As a result, the interface was only perceived as potentially rewarding when considered adequately deciphered.
- Finally, the mouse, seen as an awkward device and a source of perpetual frustration, represented the main physical expression of the interface, adding to its artificiality since the interaction was too often brought down to a protracted and unsatisfactory clicking operation.

The learning environment:

- The student's learning approach was academically conventional insofar as it was systematic, linear and primarily relied on textual material to relate to and understand the expected interaction.
- Interestingly, such an attitude was strengthened by the unit-based, controlled interaction proposed by the system design. Therefore, the student rightly felt that the exploration was quantified, limiting initiatives to simply choosing between the exercises within the parameters of the selected unit. In turn, this clearly imposed progression, almost inevitably, encouraged the student to associate the unit with a known learning environment and to react and interact with it as if it were perceived as support material for a fictitious lesson.
- The learning process was noticeably enhanced when motivation was high, such as when the student was particularly impressed by the useful combination and precise synchronization of the sound track of moving images and the visual display of the written transcript.
- Ironically, the above mentioned combination of both visual and sound presentations was seen to be sorely lacking in the design of the interface. On repeated occasions the student was seen confused and disoriented by audio introductions when accessing a new window as a result of poorly captured information and a display which was not considered to be sufficiently self-explanatory.
- Finally, the student was unwittingly reacting as if she had been in a class, expecting the appropriate amount of regular, if not protracted, tutor support that she was used to in such normal learning situations. As a result, the previously established rules of the user walkthrough were not easily maintained since the experimenter, who was supposed to play the part of an objective and passive observer, was constantly solicited to intervene or, indeed, to participate.

The system as an interactive construct:

- Strikingly, the interaction was hampered by poor mouse-clicking skills, which tended to reduce it to simple physical actions. In turn, such a systematic interpretation of the user interface strengthened the preconceived mental model of the student depicting computer, software and interface as integral parts of one machine pitted against her.
- The student strove to establish a triangular relationship involving both the computer and the experimenter in a tutoring capacity, suggesting that a straight one to one contest was bound to be tilted in favour of the computer or that the degree of insecurity felt when interacting was best tackled with the appropriate support. In any case, the computer was not considered as a fully-fledged tutor to be used in a self-access mode in the mental model elicited by the student.
- The cautious and systematic approach adopted by the student included exploring on-line help and information. However, the student felt under some pressure to explore as much of the unit as possible in order to fulfil her assigned task. As a result, the task, meant to take one hour to complete, took two sessions and, although largely attempted, was not completed. The noticeable discrepancy arising out of this user walkthrough highlighted the fact that resorting to electronic help could become a time-consuming operation as opposed to calling on the more traditional tutoring provided on demand in language laboratory. It certainly suggested two distinct interpretations or system images: seeking explanations and clarifications was considered an integral part of the student's interaction, whereas, it was, probably, merely seen and therefore designed as a necessary, albeit separate, adjunct which, as such, was not included in the expected student interaction.

8.4.9 Audit

The audit session of this user walkthrough was inconclusive inasmuch as the student declined to take part in it, explaining that she did not feel in any way competent or confident to make a valuable contribution regarding the design of the software.

9 Towards a Taxonomy of Mental Models

Mental models, identified in user walkthroughs and group discussions, being system-based, a taxonomy of such models was established, based on a generic presentation encompassing and relying on the diversity of hypermedia interfaces from which these representations originated. For this purpose, the same standard classification comprising the computer as a physical interface, the students' known learning environment and the system as an interactive construct was retained, albeit widened to consider hypermedia CALL potentiality as a whole. This classification was then further divided into mental models elicited by students with existing expertise and confidence in IT, and multimedia in particular, and models developed by students with little experience and confidence. This approach was adopted to highlight the noticeable and consistent discrepancy between reactions and responses from these separate groups as they interacted with the given software. No additional sub-categories were felt necessary as few variations were noted across language levels. Indeed, although students at all levels were involved in this experiment, there was never enough evidence to suggest that the varying levels of language ability were a sufficiently determining factor to justify finer tuning.

9.1 The Computer as a Physical Interface

Experienced Students

- Students were always in a position to form functional mental models of the Windows-based interface and its intrinsic icon-based command mechanisms. Therefore, they easily identified and interacted with interface features, such as those related to the manipulation of windows. Furthermore, the concept of the node and links was clearly understood at local level at least if not always at the more global, net level. The students' comprehension of the mechanistic functions of the interface, based on their accurate recall of known multimedia interfaces, facilitated the construction of all relevant, albeit idiosyncratic, functional mental models.

- Conversely, structural mental models were never clearly elicited, or their formation was never seen as being encouraged or simply guided by the interface. As a possible consequence, all exploratory interactions were conducted at random and navigational routes seemed to be taken without obvious or clearly thought-out objectives. The students' multimedia and Internet experience meant that they understood the hypermedia platform to be more a *hyperbase*, providing free access to an information base, than a *hyperdocument*, which presented an imposed structure.

- Attitudes and reactions *vis à vis* the hypermedia interface essentially triggered the formation of functional models for the most part linked to the students' prior understanding, vision and pre-conceived ideas of multimedia software based on past experience. In this respect, students generally found it difficult to relate to both hypermedia and multimedia interactions simultaneously when such a combination was encouraged or simply made available. Interestingly, students would not easily mix these two modes either by subconsciously circumscribing their interaction within the hypermedia interactive domain of an application or by concentrating on the multimedia dimension of a referential database.

- The students' mental model of a multimedia platform was spatial, inasmuch as they easily and willingly related to the concept of travelling or navigating in space and between pre-defined spaces. If the three-dimensional navigational potential of hypermedia might be overstated in this case, the students, quite unequivocally, could not accept that it conformed to the same conventions and rules as the two-dimensional textual presentations. As such they rarely related to screens as frames or nodes in the way some authors seemed to within the design process.

- Overwhelmingly, the students were brought to make negative comments on the physical interface when its design or functionality was considered responsible for reminding them of its flawed, limited or simply two dimensional reality. In this respect, hypermedia, as they experienced it, did not match their functional model of multimedia.

- Design shortcomings, perceived as obstacles to free, interactive movement, were clearly and unequivocally identified. These included the use of inadequate colour schemes, inappropriate metaphors, simplistic graphics, authenticity and veracity of audio-visual material, non-standard designs when conventions existed, such as recording functions, inconsistency of required interactive modes switching from keyboard to mouse, and the imbalance between media extensions favouring the visual element at the expense of others such as audio links. Students felt particularly strongly about design decisions which undermined their expected interaction or which jeopardized the formation of an authentic language environment.

- Students were quick to establish a working reciprocity with the interface with which they needed to identify in order to be seen to be interacting with it. Unexpectedly though, students often reacted personally to the interface and could not easily contemplate being associated with an interface which was perceived as hurting their established design tastes and conventions as well as, more importantly, their self-esteem and position. Therefore, the interface design became to be regarded as primordial in sustaining both motivation and interaction suggesting a strong duality between identification and stimulation. As a result, a weakness in the design, an omission in the database, an information perceived as being condescending or erroneous, unrealistically expressed or artificially displayed invariably undermined the following student computer interaction and involvement.
- The use of recall was never made obvious and hardly came into play when students elicited mental models directly linked to the design of the interface. Recall was only explicated when making reference to striking design features, which had been perceived as being outrageous or generally unacceptable.
- Ultimately, user interface design issues were considered of the utmost importance within the specific domain of CALL, as a result of the students' unsuspected and deeply rooted sensitivity towards poor, unprofessional, designs, which, according to their comments and snide remarks, seemed to have encapsulated their experience with CALL-related material. If anything, the students indicated that they were longing for a professionally designed interface, therefore, implying by default that an 'authored' interface was not.

Inexperienced Students

- The Windows environment was recognized and taken for granted. However, the students' knowledge and understanding of its functionality were noticeably limited. This often required longer deciphering periods when confronted with new icons or when interacting with the interface.
- The overwhelming model formed by students was of a two-dimensional interface, which provided the necessary, although largely unfathomed, functionality.
- The students' main referential criteria were drawn from their language laboratory experience. Although generally apprehensive of the new multimedia interface, its novelty acted as a stimulant and generated sustained motivation. Such systematic comparisons with previously experienced and better known audio-based language exercises led the students to develop mental models reminiscent of the artificially established man-machine relationship. Therefore, it reduced the interface to a colour monitor and a mouse, seen as its necessary, albeit painfully operated, interactive extension and go-between. It also confirmed the supremacy of the image and the impact of the visual display over its audio counterpart This last point was particularly obvious when the students interacted with video material, which was, systematically, absorbing their concentration for protracted periods of time, whilst encouraging, or justifying, passivity.
- Strikingly, structural models of architectures or of how systems worked were never clearly elicited. Functional models of how to use an application would always predetermine the student interaction and overshadow other considerations. In this case, the cognitive overhead triggered by the need to interact within an unfamiliar environment was clearly evident and a recognized obstacle to realize the expected interaction and fulfil satisfactory goals.
- Consequently, models of the architecture of the interface, being based on the extent of the student interaction, were systematically incomplete and inaccurate. As such, students could remain oblivious of large parts of the hypermedia environment until task-based exercises widened their focus and increased their awareness of previously

unexplored, but similarly not requested, interactive areas of the structured domain.

- Noticeably, the concentration required to interact with the visual interface coupled with the need to absorb simultaneous audio explanations potentially highlighted students' vulnerability when linguistic abilities and proficiency were called upon. Therefore, beyond the audio laboratory model generating uni-dimensional sensory interaction, the combination of synchronized multimedia presentations, computer skills and levels of language proficiency could be a major, if largely unaccounted, factor in creating temporal information overloads limiting and slowing the expected interaction.

9.2 The Learning Environment

Experienced Students

- Learning models elicited by students were invariably rooted in their known learning environment with its own, clearly established, almost perennial criteria such as a structured approach, a rigid and compulsive framework, a method of assessment, a learning feedback and support mechanism.
- Worse still, there was very little evidence to suggest that the students felt the need, not the urge, to learn anything from either the material they interacted with, or their own interaction. Interestingly, the construction of a well-entrenched model based on the structured and assessed learning approach, coupled with its repudiation created a negative duality, which would prompt them into adopting a neutral, uncommitted and ultimately passive role. Subsequently, this passiveness was often camouflaged as a provocative ploy to test and challenge the authority and power of an application.
- Irrespective of the learning hypermedia platform interacted with, students failed to identify learning aims and objectives of applications. Notably, their existing model of the learning environment did not allow them to relate to the perceived unstructured and unrestricted, user interface. Additionally and interestingly, they could not sufficiently differentiate the hypermedia approach and delivery from their traditional,

unappealing, text-based learning model.

- If the conceptual model of the learning process, as conceived by authors, essentially relied upon sustained information exposure and student interaction, it failed to generate a mental model commensurate with this original system image. Indeed, students' critical stance showed the strength of their disenchantment and distant involvement when left to their own devices, in the absence of an explicit learning framework in a supposedly new environment relying on a traditional delivery. In such a learning context, which brought the worst of both worlds, students only felt disenfranchized. Indeed, their mental model suggested the need for a clearly established student input and interface output towards achievable and quantifiable goals through an interactive mode which would have done away with traditional, therefore "boring" means of delivery such as the ubiquitous textual material.
- Whilst the pedagogical potentiality of hypermedia applications was dismissed, students often took systems to task to ascertain their authoritative strength and test the true capacity of an application. Students resorted to techniques ranging from making deliberate mistakes to insubordinate reactions to command and error messages. The students' mental model elicited in this case was that of the deeply rooted and crucial relationship between master and learner, although somewhat exacerbated by the knowledge that the would-be master was a mere machine with a flawed and inadequately designed user interface.
- The previously mentioned mental model of the learning environment, in turn, highlighted the students' model of the multimedia database and its learning potential. By contrast, multimedia was considered ludic, in terms of access, control, delivery and entertainment values as opposed to the more hypertext-based interaction which ambiguously and insidiously gave students control of, therefore the onus on, their action, whilst implicitly forcing them into a structured and disciplined approach.
- Furthermore, multimedia was seen to provide immediacy, which facilitated and encouraged information exposure. Last but not least, the mental model of multimedia seemed to promote the view that multimedia interaction was passive as opposed to hypermedia considered pro-active and involving. For example, multimedia was

clearly associated with interactions such as controlling a video or seeking information in a referential database. Conversely, hypermedia was more clearly identified through its interactions, such as language exercises and live recordings, which, as a result, were reluctantly or partly attempted.

- The hypermedia interface, according to students' mental models, highlighted inadequacies and limitations of the design as well as its functionality. Therefore, hypermedia had to be machine-driven but, at this stage in its development, also needed to adopt a teacher-led approach providing a structured framework and greater feedback.

Inexperienced Students

- Students compensated for their seeming inadequacies and general lack of confidence by adopting a systematic and linear approach to their interaction, reasonably and realistically exploring the language environment. Their learning model, at this level, suggested the endorsement of a progressive but safe exposure to new learning material inculcated by proper learning practices.
- Mental models of the learning platform as formed by the students were very much influenced by their functional and two-dimensional interaction, which was often conveniently compared to comprehension exercises performed in audio language laboratory conditions. As a result, the students' model was not so much a learning as an environmental one, conditioning their behaviour and navigational progress throughout the interaction.
- In addition to the above system image based on the known language laboratory, the students associated the structural dimension of the software with their own existing concept of the language course, although they never adequately identified its three-dimensional architecture and learning outcomes. From the onset, the students interacted with the interface as if it were a screen transposition of a traditional classroom model of support material albeit two-dimensionally presented, conducted in the absence of the teacher and with full student control. As a result, students often

superficially "surfed" over the learning material in the knowledge that they would not be checked or assessed. In turn, such a conditioned attitude affected the students' motivation and, ultimately, their achievements. Consequently, the students rarely attempted to seek explanations when particular elements of a knowledge base were perceived as incomprehensible further undermining their progress.

- Interestingly, when the interface clearly stipulated that the student interaction and language progression had been conceived on the basis of the unit, the student behaviour changed radically. Such an approach forced students to adopt a more clearly structured and identified classroom-based learning model within which progression became essentially linear and systematic, whilst exercises were attempted and to a large extent completed.
- Students felt the need to assert and enhance their linguistic competence in order to establish clearer demarcations and reaffirm their own superiority, albeit limited, *vis à vis* the machine. However, the system was never challenged in the same way as experienced students had done, inasmuch as the computer was not compared to or associated with the position or role of the master tutor.
- The novelty and attraction of the multimedia presentation, supported by the authenticity of the audio-visual material whenever this was relevant, helped students construct context-based language environments, exploring the knowledge base whilst, subconsciously, exploiting the hypermedia potentiality. Nevertheless, there was a fine line between its output and necessary input. In order to justify the need for additional cognitive overheads resulting from the complexity of the interface, the gains to be made from such a novel approach had to be seen as worthy of it or arguably superior to those produced by more conventional methods.
- Generally, inexperienced students adopted a more assiduous attitude than their experienced counterparts. However, this assiduity concealed a latent vulnerability and unassertiveness which, when over-exposed, quickly and damagingly translated into despondency, resignation and disaffection.

9.3 The System as an Interactive Construct

Experienced Students

- The students were, generally, well equipped, in terms of expertise and experience with a variety of system designs and multimedia platforms in particular to fully relate to the expected spatial, language-based, contextualized environment. In many respects, they felt noticeably frustrated in their attempt to transcend the physical barrier as their mental model of multimedia was often reduced to a man-machine interaction due to what was perceived as a limited and unsatisfactory functionality and interface design.
- On few occasions was the use of recall observed within a succession of user walkthrough sessions. Although students would recognize an application, which had been previously used, they never seriously or accurately remembered openly aspects of detail linked to such past interactions.
- The initial mental model of the interactive construct of an application, as formed by students, was that of a multimedia database. At times, they felt conveniently encouraged to conceive the structure in those terms as in the case of *A la Recherche d'un Emploi* whose title suggested that practical advice and referential information were going to be provided in the form of a multimedia database.
- The students never accurately formed mental models of the hypermedia structure of an application on a par with their multimedia models and related system images. This was compounded by the fact that at no stage were the students encouraged to explore or to investigate the hypermedia-based, pedagogically oriented architecture of a platform.
- Therefore, mental models of hypermedia systems were established by default and based on criteria essentially pertaining to a multimedia environment. As a result, these mental models of hypermedia, and by extrapolation of all hypermedia systems, emphasized the nature and quality of the knowledge base overshadowing all structural considerations and concerns. Thus, hypermedia was noticeably visualized and described as a multimedia database qualified on the basis of criteria such as rigour, consistency, authenticity, veracity, reliability but also breadth and depth within an

identifiable and attractive language environment.

- Only once was this structural differentiation between hypermedia and multimedia made when the design of a hypermedia platform was felt to be too restrictive and, therefore, incompatible with a multimedia-based learning environment. However, such a structural model was only developed on the perceived navigational limitations of a particular system.
- Finally, the combined experience of multimedia and the Internet, meant that the students were always in a position to fully exploit hypertext links embedded in the interface. By extension, the students expected these links to be designed within the nodes as a minimum requirement and a recognized design convention. Failure to provide such an interactive facility led them to further dismiss the application and highlight its limitations.

Inexperienced Students

- Overall, students interacted with applications in a methodical and systematic fashion. The overwhelming model, which they projected, suggested that they primarily relied on and responded to instructions.
- Inexperienced students rarely went beyond the straightforward man-machine functionality and the two-dimensional screen display so absorbed were they by the cognitive load created by the interface. Only once, was the interactive dimension of an hypermedia system integrated into the mental model of an application as a result of perceived navigational difficulties and limitations.
- The mental model of the computer being that of a machine, students often felt the need to secure the involvement of the experimenter within their interaction. In so doing, they tried to establish a triangular relationship involving the experimenter and the computer suggesting that a straight one-to-one contest between the student and the computer was bound to be unfair or, simply, not plausible.
- The students interpreted student control in the form of a negative or minimalist

model. As a result, the language environment presented by the hypermedia platform was seen as freed from imposed learning constraints, by dint of having control over them.

- The formation of two different mental models affecting the students' views of systems as interactive constructs was noticed. On the one hand, the students once developed a model encompassing the whole of the chosen architecture of a system, albeit not explicitly nor accurately, and naturally felt free to explore its knowledge base at random. On the other hand, navigational complications and restrictions affected students' models in such a way that they adjusted and explicitly related to the structure of the application, which, due to its limitations, had become easier to focus on.
- The model of the interaction changed drastically depending on whether on-line explanations and clarifications were seen as being a necessary and, as such, an integral part of it or if these electronic adjuncts were considered a mere support rarely called upon.

10 Audit Analysis

The audit, which constituted the final session of the evaluation, was designed to enable the students, who had taken part in the user walkthroughs, to reminisce over their interactive experience and express their views on the strength and weaknesses of the given application on the basis of a checklist of selected evaluation criteria. Not only were these customized checklists considered valuable in showing how interfaces met such a comprehensive list of criteria, but, more so, this approach was adopted as a useful and practical vehicle to convey how students, themselves, related to the importance and relevance of these criteria and how they responded to them. In so doing, the checklist was conceived as a kind of photographic developer, primarily setting design pointers for students to focus on whilst interacting with the software to trigger recall factors or to support and prove their case. Above all, this analysis attempted to prioritize and highlight the critical nature of students' verdicts in order to identify how their concerns, their awareness of design inadequacies or their sheer indifference to aspects of the interface expressed themselves. Ultimately, it was hoped that this analysis would provide further data on students' reactions and attitudes stemming from a purposefully structured feedback session.

One audit was organized for each group of students, group (a) with experience and group (b) without experience, for each application undergoing the evaluation process. Not surprisingly, experienced students were, generally, more articulate than their inexperienced counterparts, who often did not feel sufficiently competent or even qualified to openly criticize a piece of software with which the poor interaction was linked to personal inadequacies rather than identified design flaws. Indeed, this feeling of incompetence was somewhat reinforced by a noticeable and recurrent inability to fully understand and relate to the questions in the checklist which were often criticized for being too jargonistic. This last point was not helped by the fact that the majority of inexperienced students enlisted for just one user walkthrough, either out of limited interest, general suspicion or daunting cognitive overloading, unwittingly generating a steeper learning curve for themselves. On this premise, it was decided to follow the presentation adopted for mental models and clearly separate both analyses.

The checklist, adapted from Ravden and Johnson (1989), was revised to make it more appropriately concise for students with a low boredom threshold but also to incorporate new multimedia and language learning issues, particularly relevant to this experiment. Each checklist was divided into three sections. The first section comprised questions related to all identified aspects of the interface, themselves separated into ten subsections covering the following design criteria: a) *Visual Clarity*, b) *Consistency* c) *Adaptability*, d) *Informative Feedback*, e) *Explicitness*, f) *Appropriate Functionality*, g) *Flexibility and Control*, h) *Multimedia Extensions*, i) *Applicability for Language Learning*, j) *Error Prevention and Correction* and finally k) *Student Guidance and Support*. The second section was designed to highlight major and minor usability problems found in the hypermedia CALL applications. Finally, the third section concentrated on eliciting general questions related to the usability of the application.

Section one generated four types of answers. The first and foremost type indicated if specific problems had been identified or not under the above mentioned design criteria. Therefore, questions were formulated in such a way as to produce answers which were either *Always*, *Most of the time*, *Some of the time* or *Never* and subsequently translated as Very Good, Satisfactory, Unsatisfactory, Very Poor. The second type of answers was channelled via comments made by students as they were focusing on specific questions. The third type encouraged students to provide general comments under each criterion and the fourth type required students to give a verdict ranging from Very satisfactory to Very unsatisfactory on the given evaluation criterion. Refer to Appendices 3 and 4 for further details.

10.1 Information provided by Group (a) Checklists

The following analysis was based on results stemming from four audits specifically related to Télé-Textes, Up to Standard, A la Recherche d'un Emploi and France Interactive. Refer to Appendix 3 for detailed breakdown of results.

10.1.1 General comments regarding results across checklists

- Most questions were attempted with the noticeable exception of those concerning the *Error Prevention and Correction* criteria which, generally, were deemed not to be relevant to the evaluated software either because the criterion was not considered a design issue or such cases had not arisen within the interaction. In one instance, only one question was answered out of eight amounting to just 12.5% of expected returns.
- The wide range of answers indicated that the students had clear opinions and views on the evaluated software, suggesting that they fully grasped the meaning of the questions, related to them, identified the given problems and used the sessions to channel their previously acquired impressions. The first section, for example, returned a damning verdict on *Télé-Textes* comprising almost 70% of negative answers, whereas, the audit for *France InterActive* produced over 70% of positive answers in its first section.
- Whilst results from Sections 1, 2 and 3, encompassing answers, specific comments and general criterion-based verdicts largely corroborated, an interesting discrepancy between these results and those linked to usability problems was noted on several occasions. It was as though students hesitated to identify problems as "Major" resorting to the more manageable "Minor" category, which topped almost 80% in one instance. Conversely, 68.59% of negative answers in Section 1 of another audit only generated 4 major problems or 18.18% of answers under usability problems. In a striking, although rather incomprehensible example, the students entered 78.84% of positive answers in Section 1 but went on to indicate 17 minor usability problems out of 22 and a record 6 major usability problems. This last record could easily stem from a freak result due to a flagging degree of concentration on the part of the students but, more interestingly, it could similarly indicate an attitude developed by the students. Although, in this case, they could not seriously or unremittingly fault the system in

question, the high percentage of usability problems which they identified at the end of the audit session suggested that they were still affected by a lingering and damaging antagonism towards the platform.

10.1.2 Specific comments regarding individual checklists

Refer to Appendix 4 for details of the quantitative analysis of results.

10.1.2.1 Télé-Textes:

The audit showed an overtly negative feedback related to visual clarity, adaptability, informative feedback, explicitness, appropriate functionality and student guidance and support. The only positive response concerned multimedia extensions suggesting that it was not the technology, which was at fault but, essentially, the design of the application. In this particular case, the positive answers, amounting to 27.31%, almost matched the low percentage (22.73%) attributed to "No problems" under usability problems. Conversely, 68.59% of negative responses in the first specific question section, only led to 4 major problems or 18.18% of all usability problems. This discrepancy could be interpreted as meaning that if the overall verdict was generally damning, it was not altogether completely dismissive. After all, the students did like the conceptual idea behind the application and saw its potential. Finally, their rather forceful and unequivocal attitude towards the interface design surely ought to indicate, equally forcefully, that the application did not leave the students indifferent or uncommitted. Such a powerful reaction, taking place as it did in the first user walkthrough, was undoubtedly commensurate with the high degree of expectation and subsequent frustration.

Ample evidence of this is provided in the often-aggressive comments students made in the second and third sections of the audit: a: *very poor*; b: *generally consistent though filing system confusing, poor design*; c: *should be a lot more specific about what it's trying to do*; d: *interface not obvious and help (if that's aide) non-existent*; e: *should be a* *lot clearer, you end up getting the gist but it's not good enough*; f: *inadequate, too much functionality or not enough; g: navigation frustrated, control are OK but largely irrelevant*; h: *the video is central to application but badly integrated*; i: *presumably you learn as you go along, don't know how this works, not clear, what is purpose of it*; j: *largely irrelevant with what has been done*; k: *not a crucial issue here but little help is available, don't understand aide, not activated in some cases, too general.*

Summing up, the only asset recognized by the students was its access to authentic video material with transcription. Otherwise, the video was not sufficiently exploited, the design was too ambitious with too many different and obscure exercises which, anathema to multimedia, had to be typed. The interface was too cluttered, messy and generally poor. There was this prevailing and overwhelming feeling of aimlessness not conducive to an interactive learning situation. Finally, the students' suggested remedies concentrated on a better use of technology, better audio-visual facilities, more flexibility and more interactive links.

10.1.2.2 Up to Standard in French

In sharp contrast with *Télé-Textes*, the majority of answers were positive (59.97%), including in particular visual clarity, consistency (100%), but also explicitness, appropriate functionality, applicability for language learning and student guidance and support. Interestingly, if visual clarity and consistency were very well perceived and generally welcomed in the wake of *Télé-Textes*, multimedia extensions were qualified with an outstanding 0 rating. In parts, this attitude could be explained by the students' immediate recognition of the interface, reminiscent of a more conventional, albeit limited, but previously experienced screen display. However, because the interface was so instantly identified and classified as traditional, therefore restricted and static, it completely failed the multimedia test. In many respects, Up to Standard in French was seen as the opposite of the *Télé-Textes.* Whereas the students reacted strongly to *Télé-Textes*, they became despondent with Up to Standard in French. Their assessment, this time, showed that, bar the fact that it was not considered multimedia, it was a reasonably well designed application with a generally unproblematic usability (63.64%).

Interestingly, this despondency was often channelled through the comments made under each design criterion: a: *don't care much for pictures, old fashioned, doesn't do anything*; b: *consistent but doesn't always work well*; c: *recording functions should follow standard protocols, structure easy enough to identify but is it just about aural comprehension enhanced by exercises?*; d: *clear generally, feedback for exercises limited but useful*; e: *fairly explicit generally, becomes predictable after understanding of the functions of a unit*; f: *works fine but functionality limited, probably out of its depth when assessing recordings in exercises*; g: *shows rigidity, often frustrating*; h: *more could have been made of multimedia, sound recording poor generally, visual display limited, interaction only enhanced by exercises*; i: *a mixture, aims clearly stated but not sufficiently clearly defined, self-study?, help of tutor?*; j: *not an issue here*; k: *trouble-free.*

Summing up the students liked the clear screens, the fact that it was well, solidly built, that it had an appealing colour scheme, was generally stable and was, in a limited way, a valuable learning tool. However, it was not interactive enough, not sufficiently flexible and too limited. If motivation was to be sustained in a self-study mode, it needed to clearly show what it was meant to be providing in terms of language input and output within a proper multimedia environment.

10.1.2.3 A la Recherche d'un Emploi

The results of this audit are both potentially interesting and puzzling. On the one hand, the majority of answers in the first section (78.84%) were very positive, especially Visual Clarity (87.5%), Consistency (100%), Adaptability (100%), Informative Feedback (100%), Appropriate Functionality (100%), Multimedia Extensions (83.33%), Error Prevention & Correction (87.5%) and Student Guidance & Support (75%). This surely indicated that at the level of design criteria, the students could not easily fault the application. However, despite such globally positive verdict, evident in the first section and in answers to question 10, they went on to return the most damning and negative assessment of the system in Usability Problems, within the framework of the four user walkthroughs. In all 27.27% of potential usability problems were considered major relating to reading the information on screen, the colour scheme, aimlessness, low boredom threshold and lack of clear learning indicators whilst 77.27% were classified as minor problems. Out of 22 potential problem areas, only two were thought to be trouble-free: working out how to use the application and the Help facility. In other words, the students were indicating through the audit that, individually, questions directly linked to design criteria generally led to satisfactory or very satisfactory answers, but that the application was not worth the sum of its parts and therefore was simply unusable in its present state. The students felt particularly critical since they became increasingly frustrated in their attempts to comprehend and exploit the perceived potentiality of the application. For once, A la *Recherche d'un Emploi* was seemingly offering both a new, well thought-out hypermedia approach in language learning and different parameters in interface design as opposed to the previous two applications that they had interacted with.

In this particular case, finer tuning was necessary to find the root cause of the dissatisfaction. Indeed, if the general comments under each criterion were generally satisfactory, the more specific comments made by the students against the answers that they had given, could shed some light on detailed aspects which fed their irritation. a: *poor colour schemes*; b: *typing a problem*; d: *messages not always displayed, information not always clear, seen too many error messages*; e: *problems with stages reached in application*; f: *video functionality a problem*; h: *multimedia extensions could have been better*; i: *level of language not obvious; support material missing though it should not be a text book*; k: *not always responding to expectations*.

Summing up, the students seemed to like what the application could offer, although not what it ended up delivering. This was particularly obvious when freedom of movement and references were entered as best aspects of the design since the process of identification had become somewhat blurred by then. Not surprisingly, the focus of their criticisms in the general question section centred on the usability of the application as a learning platform. They queried the nature of some exercises considered far-fetched, crude, patronizing at times, not adapted to their needs. Also queried were the aims and objectives of the system, was it trying to teach French or skills to get jobs or simply to stimulate learning? Similarly, they criticized the explicitness of the interface and its design, which should have made grammar more appealing. Ultimately, the students were reinforced in their well-entrenched, pre-conditioned views that what was academically designed was, by essence, dry and boring and still hugely contrasted with commercially-based products.

10.1.2.4 France InterActive

Overall, the students returned a satisfactory verdict (71.61%) on the basis of the answers provided in the first section of the audit. Furthermore, *France InterActive* obtained the highest percentage of Very Good answers with 48.68%. Of particular interest were Visual Clarity (100%), Consistency (100%), Informative Feedback (100%), Appropriate Functionality (100%), and Multimedia Extensions (100%). At the opposite end of the assessment spectrum, it was worth noting the 0 rating for Flexibility and Control due to the design decision to impose a unit-based student interaction. Coming in the wake of *A la Recherche d'un Emploi*, it was pleasing to note that this initial feedback corroborated with the general usability of the application, bar three major problems identified with the unnecessary coercive nature of the imposed interaction and its associated interface. This time, the application obtained the best score of all evaluation sessions with 59.09% of the interface showing no usability problems.

On this basis, comments were generally positive or interpreted as being helpful, suggesting that the students, for once, considered the system redeemable, "professionally delivered" and, possibly, worthy of their attention and help. Identified were the need for more support for clearer, less complex information, more consistency, and less familiarity in the presentation of the information, a complete redesign of the "Stop" function, more precise instructions and clearer learning objectives.

To conclude with points made in the general question section, the students felt the application was clearly set out, had a good and motivating interface with authentic material, good multimedia capabilities and interactive potential. The worst parts of the application were the rigidity of its structure, the quality of its video pictures and the "awful" design of the Stop function. Encouragingly, the students felt that despite its flaws and problems, the application felt very good, even if improvements could still be made as in introducing more multimedia extensions in the reference section to make it less bland and boring.

10.2 Information provided by Group (b) Checklists

The following analysis was based on results stemming from four audits specifically related to *Télé-Textes*, *Up to Standard*, *A la Recherche d'un Emploi* and *France Interactive*. Refer to Appendix 4 for a detailed breakdown of results.

10.2.1 General Comments regarding results across checklists

- Most questions were attempted, although at times the students clearly indicated that they did not understand the questions or know what aspects of the application they were evaluating. This was all the more apparent in *Error Prevention & Correction* and, to a lesser extent, in *Student Guidance & Support*.
- Overall, the majority of answers were safely found in the satisfactory column. As previously mentioned, inexperienced students rarely felt in a position to express strong or critical views on evaluated applications. When Very Satisfactory and Satisfactory answers were added together, the students always returned a strikingly positive verdict. However, not unlike results generated by Group (a), these verdicts based on Section one of the audit were often poorly supported or, even, directly contradicted by answers given in Question 10 and in the identification of usability

problems. Yet again, this could coincide with the lack of understanding, previously referred to, or indicate that the answers were, more often than not, given haphazardly, inaccurately or mechanically.

- It is worth noting that, in all four audits and regardless of reactions, the students never felt that the applications were seriously applicable for language learning. This most negative response was followed by the lack of adaptability and explicitness. This result could support the view that the cognitive load, in terms of the learning curve and ease of use, was sufficiently overwhelming to overshadow the applications' learning potential and benefits.

10.2.2 Specific comments regarding individual checklists

Refer to Appendix 4 for details of the quantitative analysis of results

10.2.2.1 Télé-Textes:

Results from the audit were somewhat contradictory. The specific question section returned a positive verdict with 54.09% of answers showing general satisfaction against 38.71%. However, answers to question 10 indicated greater reserve with a total of four satisfactory positions and three neutral ones against six unsatisfactory returns. Additionally, the students only found six problem-free usability criteria out of a total of twenty-two possible areas, compared to sixteen minor and three major identified problems. One plausible interpretation is that the sheer number and range of specific questions tended to blur issues when attempting to draw general conclusions based on percentages. Indeed, a closer look at answers showed that the students were overtly satisfied with *Informative Feedback* (85%), *Appropriate Functionality* (71%), *Flexibility and Control* (100%) and *Multimedia Extension* (83%). Conversely, they were unequivocally dissatisfied with *Clarity* (62.5), *Adaptability* (86%), *Explicitness* (89%) and *Applicability for Language Learning* (62.5%).

On the other hand, even if Question 10 highlighted a convenient tendency to seat on the fence, the students still identified *Clarity*, *Adaptability* and *Explicitness* as unsatisfactory. Ultimately this position was similarly strengthened under Usability Problems when major problems were thought to be linked to a lack of understanding regarding tasks, information on screen and clear learning indicators.

Further evidence was provided in comments made by the students in the course of the audit: a: *too much on screen*; b: *felt consistent apart from the types of exercises displayed in Dossiers*; c: *may be it was us, but it was a bit of a struggle*; d: *didn't use much, nothing was sufficiently specific*; e: *must be thick but didn't really know what this application was doing or what we were supposed to be doing*; f: *there is just too much to be done, not sure functionality is understood*; g: *too technical, don't really know what we are talking about*; h: *video material OK*; i: *apart from enabling you to access and play with video, not sure what they try to achieve*; j: *not in a position to say anything useful*; k: *could be more specific, helpful.* These suggested that they felt somewhat inadequate because of their lack of experience, which had made the interaction and related questions complex, but also because they had not quite grasped the purpose and usefulness of the application.

Not surprisingly, these points were corroborated by the last comments made in the final section when the emphasis was most definitely on the complexity and lack of explicitness of the application and the need for greater supervision and control to instil greater learning value and potential.

10.2.2.2 Up to Standard in French

The majority of answers in the specific question section returned a positive verdict (53.30%) against 33.53% of poor answers, confirming the previously established tendency, although the percentage of no answers was the highest in the whole of the audit with an overall 9.25%. This uncommitted or neutral position was particularly noted in the students' assessment of its applicability for language learning, which showed 50% of no answers. Above all, students seemed to unequivocally appreciate the consistency of the platform (100% Very Good), followed by its informative feedback (85%), multimedia extensions (83%), visual clarity (75%) and student guidance and support (75%).

Noticeably, students disliked its flexibility and control (100%), adaptability (71%), explicitness (66%) and appropriate functionality (57%).

This time, answers to question 10 tended to support the position adopted in the first section with half the answers being satisfactory against a third negative and one sixth neutral. Finally, the students only found two major problems, losing track in the application and a lack of clear learning indicators, but 50% or 11 minor problems showing some degree of dissatisfaction with the way their interaction had progressed.

In many respects, comments were comparable to earlier ones made about *Télé-Textes*, although the students were different. In both cases, they reflected the students' uncertainty and general uneasiness when criticizing without due authority or credibility: a: *not bad altogether*; b: *consistent but could be due to ignorance*; c: *not clear enough, at times frustrating*; d: *quite good but not always relevant*; e: *what is it doing? It's obvious at one level (exercises) but generally it's not clear*; f: *OK, though we struggled at times*; g: *too inflexible really*; h: *video, animation would have been nice*; i: *objectives not clear enough, limited, better with book in class?*; j: *not in a position to answer really*; k: *some questions are a bit obscure, yes there was guidance and help, though not always what you wanted.*

In the final section on the general usability of the application, students clearly linked the best aspects of the application to their known territory of the aural comprehension, unimpressed by anything new or remotely showing some multimedia potential. Similarly, they blamed its limitation on their own inadequacies suggesting it was probably more straightforward than they thought if they had known how to use it. In this respect, the learning curve was preventing them from appreciating the application as a valuable learning tool. Finally, they would have liked it to be more attractive, more explicit, more original and more multimedia.

10.2.2.3 A la Recherche d'un Emploi

Results from this audit showed that the first specific question section returned an even more positive verdict with 64.20% of answers against an overall 33.53% of poor assessments. Strikingly, students isolated adaptability, explicitness and applicability for language learning as unsatisfactory. Most questions were answered with a record low of 2.27% of no answers.

Answers to question 10 largely corroborated the above position with a total of nine good verdicts against 3 unsatisfactory ones.

However, as in previous audits, the students still found over 67% of usability problems, including six major ones in the areas of guidance on how to use the application, understanding how the information related to actions, finding the information, loosing track, aimlessness and lack of clear learning indicators. Such a discrepancy with earlier and more specific answers could have certainly indicated a freak result or a growing lack of concentration on the part of students who had complained on several occasions during the audit that it was too long and too technical. Similarly, it could equally have conveyed a more spontaneous reaction suggesting that the application had failed to provide them with a proper structured framework, an adequate support and clear learning objectives.

Generally comments were more informative suggesting a greater display of confidence. These were: a: display a bit dull, some colours unattractive; b: pretty consistent, though there shouldn't be any typing to do in some of the exercises; c: it's not clear what it's trying to do, you have many OK but that's about all; d: the feedback is OK as overall functions are concerned, it becomes a bit iffy when doing the exercises; e: recurrent problems, application doesn't make it clear enough what it is trying to do and how it goes about doing it; f: at times, functions are complex to use; g: navigation is OK; h: videos are great, though background and characters are dull, sound explanations are too fast, we should have control over it; i: learning outcomes not clearly explained; j: this wasn't an issue; k: generally good.

Finally, comments made in the final general question section reiterated that the best aspects of the application were the videos and simulations whilst the worst ones concerned some unexpected exercises within which answers had to be typed.

Additionally, there were many parts thought of as being confusing and characters in video clips which were considered irritating. Ultimately, the application required greater support, especially if it were used in self access mode, needed to be more adaptable, closer to the students' needs, more attractive and better integrated as well as presented.

10.2.2.4 France InterActive

France InterActive met with the students' most unequivocal approval. 73.30% of answers were satisfactory as opposed to 19.90% generally negative ones. Worth noting were the striking identification of poor flexibility and control (83.34%) and poor applicability for language learning (62.50%). This verdict was matched by answers to question 10 with seven positive answers out of eleven and, unusually, equally on a par with the subsequent identification of usability problems returning 54.54% of no problems and only two major problems (lack of guidance and an inflexible, rigid application structure).

Comments were generally parsimonious but to the point suggesting that the students had a better grasp of the questions within the context of their interaction and experience. Nonetheless, they felt like adding a note of warning concerning the initial use and understanding of the application in general and its exercises in particular. Finally, the students pointed out that the application could have been made with greater self-access potential and more multimedia material.

11 Student Requirements

In many respects, the provision of student requirements must be seen as the logical outcome of this protracted data gathering exercise focusing on the identification of relevant and reliable representations. As such, student requirements have been gathered by means of short meetings or verbal exchanges with the students concerned, often taking place immediately after the scheduled user walkthroughs and discussions in an attempt to maximize the impact of and impressions on the interface interacted with.

These student requirements aim at providing a valuable design support reflecting the widest possible range of perceived features in an hypermedia CALL environment on the basis of the students' experience. Ultimately, they are proposed to generate greater understanding and a more precise representation of student needs and abilities, helping, in the process, to contribute to the provision of student-centred data supporting the language learning environment design process.

11.1 Experienced Students

11.1.1 Contextualization

- Screen design came under close scrutiny in user walkthroughs, discussions and audits. None of the applications, which had been chosen for the experiment, were considered to have a fully satisfactory screen display. In one case, the display was perceived as irredeemable, in another, the design, although generally acceptable, was sufficiently flawed to distract at first, then to annoy, only to end up disenfranchizing the students beyond salvation.
- Similarly, although unsurprisingly, experienced students always adopted a critical position regarding the scope and potential of the designed user interaction. Whilst generally confident with the functionality of the selected applications, they focused on the structure, content and degree of user control presented to them.

- Interestingly, the students felt the least comfortable when confronted with the issue of language learning potential and process. What unequivocally transpired was that they did not have much knowledge of learning methodologies and, worse still, what they were expected to be doing as learners when confronted with a new, potentially ambitious, context of use and approach. Furthermore, the students felt that none of the applications, with which they interacted, made aims and objectives sufficiently clear, thus unwittingly reinforcing the students' pre-conceived ideas or blurred notions as to what a learning environment really was. Possibly as a result, they often reacted strongly to what they perceived as a poor match between the teacher's role played by the computer and its limited designed delivery and usability. This attitude and its consequences in terms of student interaction, motivation and involvement became a focal point of this study on requirements.
- Finally, it must be pointed out that, from an experimenter's perspective, all the requirements were genuine, even if some felt predictable and somewhat 'prompted' by the nature and context of the exercise.

11.1.2 Screen Design

1. **Produce a good, professionally designed screen display**. Students felt weary of what they perceived as 'authored' applications, which according to their own experience was synonymous with 'in-house' amateurism. The emphasis was clearly placed on the notion of professional design, indicating that only a robust, well thought out application could possibly attempt to generate sustained interest, motivation and appropriate identification.
2. **The screen display must be consistent**. The question of consistency was not a recurrent issue at the level of the display itself, suggesting that screen design was generally consistent, bar a notable example. Interestingly, it was raised more alarmingly when looking at imbedded interactive functions. Students were more polarized by the alienating nature of the displayed design which, often, did not seem to correspond to their needs and aspirations, losing credibility in the process.

3. **The screen display must be clear and uncluttered**. This requirement was considered very important. The general impression was that clarity and simplicity were absolutely paramount. A number of comments were directed at what was seen as a tendency to cram on the part of authors, possibly as a compensatory measure. User walkthroughs provided ample evidence of this deeply felt attitude.

4. **The screen display must be stable and reliable**. Stability and reliability were similarly thought of as essential, especially within a context where the design was considered too ambitious in terms of the required expertise and technological constraints. Therefore, it was felt futile and counterproductive to design a screen display which was likely to be prone to "crashing" or to unduly slow the processing, to the point of undermining the interaction.

5. **Colour schemes must be carefully chosen**. The choice of colours should not be left to the taste and whims of individual designers in order to avoid odd, over-personalized, combinations, which can be offensive, disruptive and prevent the satisfactory presentation of the information.

6. **The screen must only display relevant and useful features**. Displays for displays' sake are a waste of space. For example, static icons and 'pretty but dead' pictures, which simply fill the screen, are frustrating, wasteful and time-consuming.

7. **Icons, symbols and graphical representations must be compatible and standardized**. Designers should pay more attention to adhering to known conventions and protocols to avoid unnecessary complexity and disorientation. See, for example, video recording controls and approved protocols identifying hypertext links in the WWW environment.

8. **Multimedia presentations must be adequately displayed**. Appropriate multimedia displays must be found to accommodate and enhance all the multimedia extensions. Students repeatedly criticized the way sound files were used as well as the imbalance and the generally poor synchronization between the different media. This last point was particularly well documented in user walkthroughs when students interacted with video presentations.

9. **In a multimedia environment, limit textual representations as much as possible.** Multimedia should not require a text-oriented approach. Students felt that such text-based platforms and metaphors were counter-productive. The hypermedia platform relied on a multimedia presentation which, being spatial, was not helped by two-dimensional reminders.

10. **Multimedia extensions are only appreciated if purposeful.** As such, the quality of moving images is paramount if they are to fulfil a role and function. Images must be attractive and appropriately synchronized with the sound track if they are to enhance comprehension. The quality of pre-recorded material as well as task-based recordings must be of the highest standard.

11. **Treat students like normal human beings.** Condescending and poorly thought-out on-screen designs are particularly distracting and, students felt that they were often disenfranchized by the insensitive approach adopted in good faith by the designer.

12. **Ensure that the reference database is fully integrated and responsive.** A reference section must not simply be an add-on. Its design must be on a par with that of the lesson section and make full use of the available multimedia functionality. This was particularly felt with grammar supports seen, in design terms, as unattractive dead ends.

13. **Ensure that errors or bugs do not creep in if you want to retain teaching status, credibility and students' trust.** The authoritative, expert knowledge presented via the interface is seriously undermined if errors, omissions or inconsistencies are found, since the acquisition of knowledge is based on trust. The example of a glossary falling short of even providing all the terms used in the application was given as a reminder.

14. **The material used must be attractive and identifiable.** If contextualization is so crucial to the interactive potential of hypermedia language learning environment, then the material and data used to shape it must be plausible, relevant, attractive and, above all, authentic if students are to relate to it.

15. **Display contextualized on-line help.** It was felt that the help facility was too often generic or not sufficiently well designed to allow students fast and easy access to the

required information.

16. **On-line information must not be systematically provided in a written form.** Students thought that on-line information had to be better integrated onto the screen. This point has further ramifications with the use of text, the question of originality and the display of references previously dealt with.

17. **Provide relevant and helpful task-based feedback instead of warnings and locking mechanism.** Students showed their frustration at the way the computer could restrict their movement when some or parts of some exercises were not completed.

18. **Do not attempt to design an interface with a view to making the computer look and respond more like a human.** It is ridiculous and irritating, especially when knowing about the computer's own processing limitations and technological flaws.

19. **Multimedia is not by its very nature attractive. It must be made so by design.** Multimedia, and by extension hypermedia, are not terms, which could be naturally and sufficiently spellbinding, to coax and attract students. More so than ever, exposure to hypermedia interfaces is such that the quality of the design is crucial to convince students of the new technological potentiality and validity.

11.1.3 Interactive Potential of Interface

20. **The interactive mode must be consistent.** If the mode of interaction is driven by the mouse, then it must clearly remain mouse-driven throughout the entire application. The students thought that this design approach was generally adhered to, although, some interactive tasks required the use of the keyboard which was generating confusion. This was not meant to criticize keyboard usage, suggesting that keyboard-based shortcuts were more than welcome.

21. **The students must always have access to multimedia functions.** If multimedia extensions are imbedded into the design of the interaction, the student must always have control over them. For example, audio instructions, presenting a new window, must be made available on request in audio and visual forms.

22. **The students must be given full control over their interaction**. The nature of the designed context suggests that the student interaction must not be computed in a prescriptive fashion. If restrictions are applied, they must be clearly stated and justified. However, the point was made that suggestions and guidance were particularly important and necessary in view of the interactive potentiality involved, especially in self-access mode.

23. **The students must be allowed unrestricted movement**. Explicit navigational devices must be provided to allow for free movement including vertical as well as horizontal (back / forth) directions. Backtracking must always be possible.

24. **Ensure that the students' motivation is maintained throughout the interaction.** This point was raised several times and is implicit in a number of requirements, especially those related to the attractiveness of the screen display and purposefulness of the interaction.

25. **Interactive links must be designed to facilitate access to the relevant information**. Enhance access by providing dedicated functions to complete specific tasks.

26. **The feeling of being locked in must never occur**. Clear indications must always be given if restrictions apply. Unpredictable and incomprehensible outcome of actions are potentially very damaging.

27. **Interactive aims and objectives must be clearly stated**. The potential complexity of the environment means that designers must be specific about what their objectives are, in terms of the scope of the interaction and learning outcomes.

28. **The interface must provide clear, obvious, interactive support**. The exploration and subsequent contextual interaction must be facilitated by adequate functional support, be it navigational or through its set tasks.

29. **Provide visual maps of the structure**. The overall structure of the application must be provided and made available on request to facilitate the construction and mapping of an accurate structural mental model.

30. **Provide optional introductory information related to the concept of the design and context**. Clear explanations regarding the expected interaction, including its

designed limitations and overall scope must be provided to students on request at the start of the interaction.

31. **The functionality must be both adequate and appropriate but not overwhelmingly complex**. Avoid the design of convoluted actions and the proliferation of buttons whenever possible, especially when the student interaction is based on repetitive tasks.

32. **The functionality must be reliable and consistent**. Students expressed some concern about design choices and technological limitations perceived in some complex design scenarios, like simulations, when the reliability of the functionality was questionable.

33. **The functionality must support a more intuitive interaction**. This requirement is linked to the complexity of the functionality previously expressed. It focuses on the "low technological ceiling" and long-winded interactions, which are constant reminders of the limitations of the systems.

34. **Ensure that multimedia material is interactive**. If video material is used, it must be clearly and interactively integrated in the interface.

35. **Ensure that the support material provided in references, grammars etc. is also interactive.** This problem was previously raised in consistency and functionality and addresses the frustrating impact of getting into 'dead-end' databases.

36. **Multimedia must not be about typing in text**. This requirement was previously addressed.

37. **Well known functions such as cut, copy and paste must not be taken for granted**. A system should be an autonomous entity and parts of it should not rely on the assumption that the required functions and subsequent actions are already known to the students. All functions must be properly introduced and explicated especially within a context, which is not easily identified.

38. **Ensure that the students' motivation is maintained throughout the interaction**. The students' motivation must be maintained otherwise the boredom threshold is easily reached and very detrimental to a satisfactory interaction.

39. **Provide an overview of progress on request**. An overview of progress made through the application must be available on request.

40. **Provide a tracking device**. An optional tracking device could be useful. (Some students disagreed with this requirement, as tracking could be wrongly used as a method of assessment.

41. **Provide an adequate and relevant context for the designed environment**. Make more use of the multimedia functionality in the reference and help sections.

42. **Pair students together whenever possible**. The students felt that they got as much, if not more, out of the exchange between themselves whilst interacting with the computer and suggested that authors should see the computer as part of a triangular relationship and build it into the design somehow. Reasons given were that a one-to-one with a machine was uncomfortable, that they were not accustomed to it since they had never experienced it and that it was more fun with someone else.

43. **There must be complete compatibility between the design of the expected functionality and its technological delivery**. An original idea such as simulation is only any good if it is realistically and satisfactorily achievable.

44. **Make exercises relevant and realistic**. If exercises are designed to depict and reproduce real life situations which students can relate to, they must be plausible and recognizable.

45. **The interaction must be self-sufficient**. The application must be completely self-sufficient and provide all the necessary support to interact with it.

11.1.4 Applicability for Language Learning

46. **Learning objectives must be clearly delimited and explained**. The students indicated that the lack of learning objectives coupled with the inability to gain full control as well as reach a meaningful interaction was a major factor towards their de-motivation and unproductive output.

47. **State clearly the expected learning outcomes**. To stipulate what the gains are likely

to be and what students are reasonably expected to complete and achieve within an identifiable and quantifiable interaction would be helpful.

48. **State clearly the target level of language proficiency**. The required level of language proficiency must be clearly stated, as well as expected attainment thresholds.

49. **State clearly the adopted learning strategy**. If the interface design is based on an adopted learning strategy, the given methodology must be presented and made explicit.

50. **A hypermedia system must be a completely self-sufficient learning platform**. No supplementary support material must be required to perform the necessary learning tasks.

51. **Provide introductory suggestions of language learning approaches with their recommended access modes**. Modes of access must be clearly recommended to suit the expected user interaction given the adopted learning strategy and level of language required. However, the students stressed that these were, and should remain, mere recommendations and students should always have the final say.

52. **Provide task-specific guidance**. Adequate and relevant forms of student guidance must support tasks.

53. **Feedback for language tasks must be relevant and accurate**. This point was raised in the previous section on the interactive potential of the interface. A well-designed feedback facilitates access whilst preventing students' despondency.

54. **Ensure that the multimedia content is adaptable to students' needs**. If a foreign language environment is to be designed, the multimedia material used must be authentic and relevant to students' experience, reality and future applications.

55. **Specify the type and range of linguistic material used**. The application must specify what linguistic material it is providing and what rationale it has adopted for its presentation.

56. **Increase the language learning potential**. The combination of audio and visual extensions must be fully exploited.

57. **Highlight the difference between a hypermedia and a conventional presentation**. If hypermedia CALL is to offer a new learning methodology and greater potential, then designers must create new criteria to base it on

11.2 Inexperienced Students

11.2.1 Contextualization

- The students never seriously felt in a position to overtly criticize the screen design, so overwhelmed were they by the cognitive load required to interact with the applications, as well as their own feeling of inadequacy in this field.
- Interestingly, their navigation was often more structured than that of their experienced counterparts, possibly for fear of getting lost but also because they felt the need to cling onto a known approach and safe methodology within such an alien environment.
- Finally, language learning requirements unmistakably reiterated the points made by experienced students, whilst strengthening the need for a sense of purpose or a learning *raison d'être*, necessary to justify the previously mentioned, increased cognitive load.

11.2.2 Screen Design

1. **The screen display must be easy to understand.** Students felt that learning what they regarded as computer skills in addition to the target language was a major deterrent, especially since the learning curve was steep. Therefore, the screen had to be self-explanatory and easy to use.
2. **The screen display must be simple**. There must not be too many functions on the screen and they must be clearly identified.
3. **The screen display must be clear and uncluttered**. A busy screen was thought of as counterproductive and its impact on students as overwhelming and negative.

4. **The screen display must facilitate learning**. Design approaches must be found to make it easier and faster to learn how to use new applications.

5. **Display a help facility at all times**. The students felt that they were confronted with a steep learning curve, having to grapple with French as well as understand and relate to the software.

6. **Instructions must be succinct**. Instructions must clearly indicate what to do and must display specific advice and guidance on request. When appropriate help is to be provided on screen, there must not be too much information to read at any one time. Learning how to use computers is too time-consuming.

7. **Design a map to be displayed on request**. The design must clearly display the organization and the structure of the application to students whenever necessary.

8. **Design recognizable commands**. Design controls, such as those used in the language laboratory, which are familiar and easily recognized by students, must be used whenever possible.

9. **Make the design adaptable to the different levels of student needs and expertise**. Students felt that applications simply catered for computer literate users. They thought that the screen display should provide alternative levels of usability to enable inexperienced as well as experienced students the same, immediate degree of understanding and appreciation.

11.2.3 Interactive Potential of Interface

10. **Provide clear objectives**. The students must be clear about what the application is supposed to be offering in terms of content and expected interaction. Students felt very strongly about this particular point inasmuch as they needed to be in a position to justify the very real efforts they were putting into it, simply to get to know and interact with the interface.

11. **Provide clear functionality**. The functionality must not be too complex if it is to be understood by students.

12. **Provide appropriate feedback**. Feedback must be designed so that it is always appropriate for the tasks to be performed.

13. **Provide a versatile Help facility**. Students felt that a generic, system-based help command was not useful and extremely impractical. The Help facility had to provide task-specific support.

14. **Provide understandable, jargon-free explanations**. Students felt strongly that all jargon should be banned and that clear explanations with examples ought to be given to help students perform the given tasks.

15. **Instructions must clearly indicate what actions are required**. The application must clearly present its material and explain how this material is to be used.

16. **Provide clear orientation**. The application must always indicate or suggest what to do next. It must also enable students to look at what has been done and where they are.

17. **Provide a flexible interaction**. The application must not assume that all students are computer literate. If all targeted students are at a given level of language proficiency, their computer skills and experience vary greatly.

18. **Multimedia must provide a new, attractive, interactive, environment**. Students did not really know what it could be but felt that since multimedia was a lot less friendly than the traditional method of delivery, there ought to be something else to make it a worthy proposition.

19. **Increase the visual quality of multimedia presentations**. Multimedia must be more about synchronizing moving images, sound track and the written language.

20. **Provide means to enable students to better control their actions**. If students are to be given full control over their actions and multimedia functions, facilities must be provided to enable them to pace and better manage the necessary interaction.

11.2.4 Applicability for Language Learning

21. **Provide clear learning objectives**. The application must be clear as to what it is trying to achieve.
22. **Provide clear explanations regarding the learning approach**. The application must display and explain the adopted learning methodology suggesting ways of approaching the material and routes to take.
23. **Provide recommended pathways**. The application must recommend pathways or approaches for best learning outcomes.
24. **Provide recommended actions**. The application must provide recommended modes of access and appropriate approaches.
25. **Provide clear learning markers**. There must be clear learning indicators, presenting and assessing the material to be acquired.
26. **Provide supervision**. Students felt strongly that, however sophisticated applications were or would become, the computer would not and could not replace the tutor. The view that multimedia should remain a supplementary resource exploited with proper tutor supervision and support came across loud and clear.
27. **Provide a greater sense of purpose**. The application must be a language learning resource and not an IT resource to teach computer skills to students. Finally, the application must be convincingly different from the traditional, classroom-based approach.

12 Usability Field

12.1 Usability features

By their very nature, usability features are specific to a proposed design solution and intrinsically related to a targeted environment and user requirements. However, although it would be inconceivable to identify hypermedia-based usability features generically and exhaustively, it was felt that an approximation established on the strength of best features was not only possible but also particularly indicative of potentially desirable usability features.

On such a premise, students were prompted to highlight and select the best, most salient, design features provided by the four applications with which they had previously interacted.

First and foremost, the targeted environment is Windows-based, therefore the designed Graphical User Interface (GUI) is conformed to Windows standards and the interface is entirely conceived on a visual display using Windows-based features.

Télé-Textes

Best features:

- Provides a good, genuine and stimulating multimedia introduction to contextualized information.
- Presents and uses real authentic video material in the form of news reels.
- Shows impressive video material.
- Shows (but does not exploit) potential of video editing and recording facilities.

Proposed solutions to worst features:

- Design clear, uncluttered screen.
- Provide multimedia-based interaction.
- Provide hypermedia links.
- Provide multimedia synchronization.
- Provide consistent, standard, accurate and reliable functions.

Up to Standard in French

Best features:

- Presents a clear and simple screen display.
- Presents an appealing colour scheme.
- Shows students' interactive history in exercise mode, albeit crudely.
- Shows a functionality-based display: the design of the pointer device changes according to its functionality.
- Adapts recognizable audio laboratory-based language exercises to the multimedia interface (even if the resulting design is flawed).

Proposed solutions to worst features:

- Provide directional support.
- Provide an interactive display.
- Use standard and recognizable navigational commands.
- Use standard and recognizable recording controls.

- Record authentic French voices if the desired effect is to design an authentic French environment.
- Develop a proper and exhaustive multimedia information database.

A la Recherche d'un Emploi

Best features:

- Provides hypermedia-based interaction.
- Provides a good multimedia information database.
- Clearly separates the working area from the information database.
- Provides clearly set out diagrammatic displays of unit' structures.
- Provides a good range and variety of interactive exercises.
- Displays written explanations when titles scanned.

Proposed solutions to worst features:

- Seek advice on colour scheme.
- Ensure balance between software and hardware to avoid undue loading times and slow responses of multimedia functions.
- Improve overall structural mapping. Make content map accessible at all times.
- Explain what the objectives are.
- Cater for students with little or no IT experience.
- Specify the context of use.
- Make exercises appealing and relevant to students.
- Create an appropriate and representative title for application.

- Design a coherent mouse-driven interaction.

France InterActive

Best features:

- Provides good explanations in pop-up boxes when titles scanned.
- Provides translations.
- Provides clear audio and visual unit introductions.
- Provides a clear architecture.
- Offers authentic video material.
- Offers a well-targeted video-based interactive activity.
- Provides good synchronization between sound and video recordings.

Proposed solutions to worst features:

- Treat students as normal human beings. Do not patronize them.
- Treat the computer as a machine. Do not allow the computer to imagine it is anything else than a machine.
- Give students the necessary support to enable them to know what to expect when a new window is displayed.
- Ensure that the visual quality of the moving image does justice to its pedagogic message.

12.2 Usability Goals

On the basis of student requirements and above mentioned usability features, design solutions for hypermedia CALL applications should meet the following usability goals at the level of the physical interface, the learning environment and the interactive construct.

The Physical Interface should have:

- clear, uncluttered screens,
- appealing colour schemes,
- a functionality-based display,
- an attractive and interactive display,
- novel, audio-visual presentations supporting textual inputs,
- adequate multimedia synchronization,
- built-in explanations in pop-up boxes,
- context-specific support,
- on-line help,
- consistent, standard, accurate and reliable functions,
- standard and recognizable navigational commands,
- standard and recognizable exercise-based interactive controls,
- a clearly defined language learning / communicating area,
- a clearly separated referential multimedia database,
- a good and systematic visual mapping of the structure and information base.

The Learning Environment should provide:

- a good range and variety of interactive exercises,
- targeted levels of interaction,
- a genuine, authentic and recognizable language learning environment,
- language interactive exercises which are appealing and relevant to targeted students,
- easily recognizable language exercises,
- translation of language material on request
- clear learning objectives.

The Interactive Construct should:

- provide a clear architecture,
- be consistent at all times,
- exploit interactive potential of multimedia,
- provide hypermedia links,
- provide clear directional support,
- stimulate interaction by making the most of hypermedia's interactive potential,
- motivate students by making the most of multimedia's interactive potential,
- develop a proper and exhaustive multimedia information database,
- ensure appropriate balance between hardware and software requirements,
- treat students as normal human beings who dislike being patronized.

These usability goals, themselves linked to student requirements and mental models conclude this substantial part of this research designed to establish a usability field for the purpose of authoring hypermedia CALL applications. On the strength of summative evaluations of a selected range of applications, it has been possible to generate important data on students as targeted users. These findings related to their characteristics, attitudes to the software, reactions against the computer interaction but also their opinions on the interface often linked to recorded interactive idiosyncrasies and need for clearer learning objectives. Such requirements, circumscribing the usability field of the authoring process, will now be instrumental in further shaping the theoretical framework (see Chapter 14) as a useful design support for formative evaluations. Indeed, the main aim of the framework is to facilitate the design process by presenting a conceptual fragmentation of discrete design considerations, which can, therefore, be examined separately or as part of specific design streams and scenarios. Each design consideration will be presented with its relevant student requirements as well as mental models if applicable and translated into high level design decisions and appropriate design solutions supported by suitable design guidelines. In this respect, the following chapter focuses on the previously developed design guidelines and the crucial role they play in linking theory to practice within the design process. It is only on the basis of these design parameters and design supports that the theoretical framework can be fully appreciated as a valuable authoring asset.

13 Design Guidelines

13.1 From Theory to Practice

13.1.1 Problems Related to Hypermedia CALL Authoring

As can be seen from the now established parameters of the identified hypermedia CALL usability field, the design challenge faced by the author is a particularly difficult and complex one to meet. Consequently, this can lead to a number of frustrating design flaws, recurrent interactive faults and misunderstandings on the part of students. Such a challenge has been diagnosed at five different levels.

First and foremost, the authoring platform with its own design objectives and recommendations plays an influential and, to a large extent, a coercive part in shaping the author's initiatives. Even more so, possibly, within the traditionally non-technologically-minded CALL field where authors are far more likely to be unsure of, and therefore influenced by, the new technology. Indeed, if courseware development is predominantly technologically led, then as Levy (1998) rightly points out hardware and software development tools are, according to their strengths and limitations, "variously shaping and directing the design". By increasingly providing a 'ready made' but sophisticated authoring interface with its own built-in interactive controls, such as the object-oriented concept in ToolBook with its tailored programming language, the authoring support can easily impose its own underlying design approach and limitations. Additionally, this authoring dimension is compounded by hardware requirements. For instance, Hubbard (1992:57) stresses that, "ultimately, software designers are 'prisoners' of the available hardware", whilst suggesting that within this restricted design space there is still scope for alternatives.

Secondly, dovetailing into this prevailing technological dimension, hypermedia CALL development, and CALL more generally, is still striving to establish clearly defined and recognized instructional boundaries within which the role, function and purpose of the computer, as well as new interactive learning and teaching approaches would be circumscribed (Levy, 1997). Thus, the technology is still in need to be harnessed by an appropriate and comprehensive methodology, which would encompass both instructional and design considerations.

Thirdly, authors are faced with the task of adopting their language learning goals, strategies and theories with a view to translating them into appropriately designed interactive, learning environments with a varying degree of student control. However, these pre-design considerations or "points of departure" (Levy, 1997, 1998) are, themselves, influenced by a wide range of different instructional theories, goals and learning contexts. Furthermore, authors know, still, remarkably little about the validity of recently adopted but inconclusively evaluated learning methods as well as fundamental student needs and characteristics.

Fourthly, authors are likely to be attracted by discrete design expediencies, in the form of practical design rules, devoid of their theoretical underpinning and appropriate context of applicability. If it is generally agreed that CALL development is 'practitioner-led' as opposed to 'research-based' (Kemmis *et al.*, 1977; Levy, 1998) then this is even more so for hypermedia CALL. Such a practice is unwittingly reinforced by the lack of adequate guidance available on hypermedia design from relevant disciplines. For instance, the hypermedia environment tends to be presented and applied as a case study in the HCI literature, addressing design issues from an already presumed established theoretical foundation. Therefore, hypermedia is often approached from its salient design 'characteristics' such as its architectural potential and related interactive 'hyperspace' dimension, which provide an easily recognizable design hallmark (Hannemann and Thüring, 1995; Nielsen, 1996). However, by only highlighting specific aspects of its environment, the HCI coverage often fails to volunteer further insights into the design process required to facilitate the provision of holistic design solutions or satisfactory remedies for the more empirically minded author.

Finally, design considerations can easily be overshadowed by the excessive cognitive load imposed on authors as a result of the complexity and lack of clarity of the system, generating a poor interactive yield, and their own limited design expertise. This last point, possibly encapsulating and illustrating all the others, is all the more apparent when considering the user interface design, and particularly the screen design. The resulting wide range of screen displays, ranging from the ascetic to the luxuriously colourful and exhaustive data presentations, is, all too often, a reminder that the design process is subjectively informed by personal artistic notions and spontaneous projections. Understandably, the screen display which, in its role as filtering window, must be seen as the author's best illustrative support and ally, hardly gains or even warrants accreditation, let alone consensus, from a generally despondent student population (see Nielsen, 1990; Oren *et al.*, 1990; Shneiderman, 1992).

13.1.2 Proposed Authoring Solution

In the light of above-mentioned problems and limitations, hypermedia CALL authoring needs to be conceptually redefined, in terms of role and function within the design process by clearly delimiting and structuring its knowledge base, its expert input and its design output. Only by regaining the higher theoretical ground will hypermedia CALL authoring distance itself from its academically undefined, technology-led and inadequately supported design position. Therefore, it is proposed to present a student-centred approach in the form of a theoretical framework presenting a comprehensive design support as a potential solution. This framework introduces:

- A thorough conceptual study of the hypermedia CALL field on the basis of high-level design considerations broken down into identifiable and manageable interface design features.
- A new authoring input and output by providing a student-centred methodology and highlighting the critical role played by student requirements and user interface requirements within the design process.

- An adapted environment for presenting design guidelines as a necessary support and tool to translate theory into practice.
- A clear authoring brief within the design process from pre-design considerations to decisions and solutions.

However, prior to focusing on the framework *per se*, a closer look at design guidelines is felt to be necessary with a view to better appreciating their potential, use and support and to shed some light on the previously developed set of design guidelines for hypermedia CALL.

13.2 Design Guidelines within the Authoring Process

If guidelines, derived from clearly established high level HCI principles, are to be applied appropriately, they must not only be applicable to a comprehensive range of authoring issues related to hypermedia CALL but also perceived and, therefore presented, as an integral part of the authoring process. It is solely on this basis that design guidelines, however suited they might be, could fully contribute to the authoring process by satisfactorily guiding the development of the targeted design solution.

Within the structured, principled approach to design, accommodating a theoretical basis, design prerogatives and HCI research findings, the design process is based on a series of design decisions, supported by design rationales and user requirements, circumscribing and delimiting the ultimate design solution. These design decisions can be seen as means of providing broad and practical directions for the design process as well as attempting to bridge the unavoidable gap between usability and design. Therefore, design decisions can be divided into two categories according to whether they support high level principles or simply address specific issues related to established usability criteria. In so doing, they are intricately and intrinsically linked to design principles and design guidelines.

Therefore, an attempt has been made to identify and present the set of design guidelines for authoring hypermedia language learning applications in conjunction with design decisions based on previously established user requirements.

13.3 Design Guidelines

13.3.1 Critical Analysis of Existing Principles and Guidelines in the HCI Literature

"The design of user interface software will often involve a considerable investment of time and effort. Design guidelines can help ensure the value of that investment." (Smith and Mosier, 1986).

Design principles and guidelines are often considered and defined as an important and valuable source of specialist information destined to help the user interface designer during the design stage of the design process. Against the more rigid form of design guidance such as design standards, guidelines are perceived as being "generally instructive and potentially helpful" (Smith, 1988: 884) providing flexible advice subject to satisfactory adaptation. This accessible specialist knowledge essentially stems from expert knowledge or "judgement" according to Smith (1988: 884), the domain of cognitive psychology concerned with human computer interaction and finally empirical data drawn heuristically from experience in user-interface design.

Generally, design guidelines presented in the HCI literature derive from high-level and universal principles and are conceived to provide broadly applicable design advice and insights. However, their intrinsic non-contextual nature and general applicability entail that guidelines cannot, and, indeed, are not conceived to, provide readily available solutions to specific design problems. Careful interpretation and subsequent use by designers within their own design process and context of use can only, at best, provide complementary and helpful advice (Marshall *et al.*, 1987).

Therefore, in order to be effective, guidelines must be "interpretable and usable by a population of designers and other computer personnel with no extensive background in behavioural science" (Granda, 1980). This duality pertaining to knowledge transfer applicability suggests that the usability factor is intricately linked to successful design translations. Smith (1988: 886) defines this translation process as a necessary progression from operational needs to functional requirements followed by design specifications and finally translated into design components. In this respect, guidelines must be seen as an essential part of the system development and design process. Smith (1988: 886) further stresses this point when he stipulates that "the translation from guidelines to rules should be performed as an integral part of the design process, serving to focus attention on critical design issues and to establish specific requirements". However, there is a tendency to extrapolate guidelines away from their application domain, treating them as convenient design shortcuts to generate the creation of specific, practical, design rules, or to quote Preece *et al.* (1994:489) "cookbook-style" guidelines thus providing ready made, directly applicable instructions and solutions to design problems. Therefore, as can be seen, two presentational extremes, in the form of high-level principles and guidelines at one-end and design rules at the other, can be identified.

In addition to the vast array and types of available guidelines, Gould and Lewis (1985) rightly warn that "existing guidelines are often based on informed opinion rather than on data or established principles. As such, they suggest that "guidelines should be viewed as an informal collection of suggestions, rather than as a distilled science." Similarly, Preece *et al.* (1994:490) observe that guidelines can misrepresent the very theoretical basis on which they are founded. Highlighting their interpretative dimension, Clarke (1992) defines guidelines as representing "a hypothesis or a generalization" which, in turn, leads to the establishment of reliable principles. What can certainly be affirmed at this stage is that the nature of the original domain, be it psychological theory or experiential evidence, the degree of interpretation from general applicability to specific design instructions and the varying presentational styles adopted, inevitably mean that design guidelines appear in many different guises. As such they can be found from many sources such as specialist journals, general handbooks and company guides (Preece *et al.*, 1994).

Therefore, even if guidelines are valuable and useful tools with a definite potential to help designers to concentrate on specific design issues, they should, nevertheless, be used with caution. Firstly, they are, by their very nature extracted from empirical evidence as they are helping to put into practice broad and complex human factors principles (Marshall *et al.*, 1987). Such experiential dimension in addition to the sheer range of areas and concepts covered, can make the initial identification process somewhat problematic. Difficulties arising out of such an approach are further compounded by the strong overlapping element within guidelines stemming from human factors concepts. Moreover, the comprehensive and professionally coherent nature of guidelines, linked to their adaptability and design tool status, makes their formulation imprecise or, at times, plainly unintelligible to the unskilled author turned software designer. Finally, given the multiplicity of ill-defined user interface designers, special attention must be paid to the many potentially contrastive interpretations, which could result from such vast and seemingly authoritative recommendations.

Nevertheless, in spite of such shortcomings stemming from the informal nature of the domain and difficulties linked to implementation, it must be stressed that design guidelines are pivotal in the proper transmission of expert knowledge within the design process. Indeed, guidelines, if adequately exploited, have the potential to convey the necessary expertise to bridge the problematic gap between theory and practice. It is very much from this perspective that the unique role and potentiality of guidelines have been perceived. If it is generally agreed that "the best kinds of guidelines are general principles" (Preece *et al.*, 1994), it is equally realistic to admit that such high-level principles are unlikely to suggest and convey much expert knowledge to the neophyte author. Similarly, at the other extreme, the convenient use of readily applicable design rules and specific style guides, by disregarding the wider design issues within the design process, are also unlikely to be conducive to good, evolving design outputs. However, it is strongly believed that design guidelines could fulfil their important transitional role, were they to be presented as a tailored design resource, supporting both identified design issues and their underlying theoretical validity as well as related design ramifications and implementations within the broader design context. These considerations have been taken into account when deciding upon the form design guidelines for authors of hypermedia language learning applications should take. On this premise, it was felt that a useful and environmentally acceptable set of guidelines would combine three main characteristics: a strong cognitive psychological basis derived from established principles, a general applicability to a comprehensive spectrum of specific authoring issues and, last but not least, an adaptability to the needs and level of expertise of the targeted authors.

13.3.2 Sources of General Design Principles and Guidelines

Previous research into design guidelines was conducted in three stages. Initially guidelines were derived from selected high-level principles (Smith and Mosier, 1986; Marshall *et al.*, 1987; Gaines and Shaw, 1984; Brown, 1988). Secondly, by a process of selection and elimination, general design principles were grouped under high-level principles according to relevance and applicability. Finally, these guidelines were transposed to the previously created usability field related to hypermedia authoring. In order to ensure their usefulness and acceptability it was felt that they should: a) present a strong cognitive psychological basis derived from established principles, b) cover a comprehensive range of specific authoring issues and c) be adapted to the needs and level of expertise of the targeted authors. These three characteristics were subsequently evaluated with the checklist method designed by Ravden and Johnson (1989) and user walkthroughs. Furthermore, they were put to the test on an authored design solution within the same language learning environment.

The primary set of high-level design principles and guidelines was drawn mainly from Brown (1988), Marshall *et al.* (1987), Mayhew (1992), Shneiderman (1992) and Smith and Mosier (1986). These documents provide a thorough and comprehensive collection of generally applicable design principles and guidelines which, once interpreted and subsequently translated into specific rules by user interface designers, become potentially valuable design tools to be used in the design process. Differences in styles and formats of guideline presentations are highlighted by Gaines and Shaw's (1984) original and practical checklist of *proverbs* conveniently summarizing advice and techniques supporting computer dialog.

Brown (1988) proposes a set of *practical suggestions* and guidelines to help interface designers. These are presented under the following headings: *Designing Display Formats, Effective Wording, Color, Graphics, Dialogue Design, data Entry, control and Display Devices, Error Messages and Online Assistance, Implementation of Human-Computer Interface Guidelines.*

Gaines and Shaw's guidelines (1984) are presented in the form of general 'proverbs' which, despite showing their age in a number of cases and resulting obsolescence due to technological achievements in the last ten years, are nonetheless useful and interesting. Of particular relevance, they provide design issues and considerations, encompassing technological advice ironically still valid at present, not addressed elsewhere.

Marshall *et al.* (1987) offer guidelines "cast into a framework of concepts introduced as 'sensitive dimensions' in human-computer interaction design". Guidelines are derived from broad psychological principles through a process of simplification, which filters, groups, interprets and translates them, through examples, into guidelines. These guidelines are then presented under fourteen 'sensitive dimensions': *Design of procedures and tasks; analogy and metaphor; training and practice; task-user match; feedback; selecting terms, wording and objects; consistency; screen design; organization; multimodal and multimedia interaction; navigation; adaptation; error management; locus of control.*

Shneiderman (1992) identifies three design principles clearly separated from specific and practical guidelines. The first one "Recognize the Diversity" concentrates on user characteristics. The second one provides "The Eight Golden Rules of Interface Design" comprising: Strive for consistency; Enable frequent users to use shortcuts; Offer information feedback; Design Dialogs to yield closure; Offer error prevention and simple error handling; Permit easy reversal of actions; Support internal locus of control; Reduce short-term memory load. The third principle covers strategies for preventing errors.

Smith and Mosier (1986) present guidelines for design of user interface software which, according to Vanderdonckt's "Tools for Working with Guidelines" Bibliography (1998), are "probably the most famous and significant advance in compiling human factors". It comprises 944 guidelines in six discrete functional areas: *data entry, data display, sequence control, user guidance, data transmission* and *data protection.* General issues related to human factors are discussed and guidelines are proposed with adjoining examples, exceptions, comments, and possible references.

Finally, Mayhew (1992) presents design principles and guidelines supporting an extensive range of features of the user interface design, *comprising the high-level conceptual model, dialog styles, organization of functionality, screen layout and design* to *error handling* and *user documentation.* In so doing, Mayhew stresses the need to concentrate on both the guidelines as well as their underlying theoretical basis, in order to provide better accessibility and greater insight.

13.3.3 Hypermedia Design Guidelines

In spite of the recent and noticeable increase in the development and use of hypermedia applications, few studies have so far been conducted into the reading, let alone the authoring, of hypermedia or hypertext within the confines of HCI (Nielsen, 1990). Aside from the short existence of the software, such a dearth of informative and supportive material can be attributed, initially, to a lack of adequate and reliable evaluation data of existing hypermedia developments and experiments. Secondly, it must be stressed that the dual study and evaluation of the usability for end-users reading the interface as well as the authors developing the hypermedia structures add to the difficulty. Indeed, such a test which would purport to evaluate the quality of the authored interface in tandem with the assessment of its learnability and usability becomes problematic if tested criteria do not yet exist to fully appreciate "what makes a good hypertext structure in the first place" (Nielsen, 1990). This design problem becomes even more relevant when hypermedia development is brought into the field of education.

Similarly, specifically applicable guidelines in the hypermedia field, concentrating on hypermedia-based issues such as architectures and interactivity, are not prominent in the HCI literature. On the whole, they take the form of advice and recommendations tailored to suit and remedy the specific design need and deficiencies of authors. Often based on combined personal experience and HCI expertise, these proposed suggestions and guidance are typically provided as part of an approach designed to make the hypermedia author *aware* of problems and possible solutions which, if applicable and verified, could become potential guidelines.

Interestingly, such recommendations and guidelines seem to fall into four reasonably distinct categories depending on how narrow or broad a view of the interface the author of the document takes and his/her areas of expertise.

The first category is the most ubiquitous inasmuch as it covers the well-documented and supported field of multimedia design and visual displays. Therefore, guidelines falling under this category address multimedia design issues within the two-dimensional, micro perspective of the screen display including functions and interactive information forming a necessary part of the "local coherence" as described by Thüring *et al.*, 1995: 58). These design elements can, themselves, be more clearly identified either as basic, still, multimedia components or dynamic time-based media (Boyle, 1997). Static multimedia components within screen design broadly include textual material and graphics and primarily concentrate on the aesthetic impact of the presentation and the coherent use of space (Boyle, 1997; Clarke, 1992; Thüring *et al.*, 1995). Additionally, the textual information can be further divided into sub-design components such as positioning, general and specific appearances, types of compositions and visual effects including fonts and font sizes. Similarly, graphic design considerations tend to focus on still images such as bitmaps or paint graphics or draw graphics. The emphasis, in this sub-category rests on the visual composition, such as colours and colour compositions, integration and application of the graphics within the broader hypermedia environment. Conversely, dynamic time-based media comprise animation, sound and video presentations. Here the main design concerns lie in more technologically-based digital sound and video captures but also in design considerations such as time-controlled synchronization, composition and integration within the hypermedia environment.

The second and third category, which squarely belong to the field of HCI, view the interface and the human interaction respectively three-dimensionally. When primarily concerned with the interface, the emphasis rests predominantly on the design of hierarchies, *access structures* (such as searching mechanisms, link buttons, commands) and *information structures* (mental models of structures, navigation aids) (Dillon, 1991) (see also Hardman and Sharratt, 1990; Martin, 1990). When the interface is seen as intricately linked to and encompassing purposeful user interaction with the system, special considerations are given to design objectives, users, user tasks and learning concepts related to both the interface and the information data provided (see Dillon, 1991; Hammond, 1993; Nielsen, 1990; Shneiderman, 1992). Of particular interest, Shneiderman (1998) first identifies authoring features covering functions, links, commands, multimedia display facility and authoring usability. On such a premise, design considerations, derived from experiential evidence and based on users, structure, links, interaction and authoring skills, are proposed. Ultimately, authoring strategies are suggested in order to create a hypertext environment.

Finally, the fourth category of advice and potential recommendations, which could be called hypermedia and teaching, essentially deals with experiential evidence and issues raised by authors and researchers from the teaching profession in the course of their practical authoring experience and research activities. These issues tend to address more specifically the teaching and learning processes but also the role and context of use of the computer as well as the validity of hypermedia technology in education (see for example Emery and Ingraham, 1992; Fox, 1992; Hammond, 1991; Levy, 1997; Marcus, 1993).

14 Theoretical Framework

14.1 Rationale

As previously mooted, the authoring process necessary to design hypermedia CALL applications, by encompassing many discrete and overlapping concepts, considerations and expertise, is particularly complex. Moreover, this overall contextual complexity is compounded by current authoring practices, still generally favouring pragmatic approaches to the use of new educational technologies (Kemmis *et al.*, 1977). Similarly, this low level of abstraction (Levy, 1998), by focusing on specific solutions to tangible or poorly enunciated problems, is preventing authors from seeing the 'interface design wood for the feature trees'. In turn, this lack of distance between authors and the interface can only lead to a poor overview of and, therefore control over, the process itself, as well as a reduced reflection and resulting objectivity.

Conversely, higher levels of conceptualization can be supported by existing theoretical and methodological frameworks designed to assist authors organize such "disparate elements", which "may include the theoretical base, user characteristics, the syllabus, the user interface, the content, the interaction and the hardware and software" (Levy, 1998). Since the main emphasis in this thesis is to clarify the theoretical base and highlight a process from theory to design, special attention must be paid initially to existing conceptual positions, which vary depending on the adopted theories underpinning these frameworks (Levy, 1997; 1998). In this respect, the main characteristics and limitations of these existing conceptual frameworks are presented within the context of this research with a view to identifying perceived deficiencies in hypermedia CALL.

14.1.1 Theoretical Frameworks: A Critical Analysis

In an attempt to highlight a transition from theory to practice within the conceptualization of CALL, most of the existing theoretical frameworks adopt a common hierarchical approach based on three clearly identified, developmental stages. These non-prescriptive schemata are essentially designed to help authors reflect on and relate to the variety of diverse factors as well as their overall coherence when constructed as an entity, starting from the higher theoretical ground to reach design considerations, objectives, strategies and implementation. Accordingly, Richards and Rodgers (1986) adopt a method "theoretically related to an *approach*, organizationally determined by a *design* and practically realized in *procedure*" (p.16). Whilst this methodological framework is overtly oriented towards language teaching methods, it is, interestingly, taken up and revised by Hubbard (1992) who turns the design component into a central position in order to "accommodate the special nature of CALL materials development" (Hubbard, 1992: 45). Whilst language teaching still forms the basis for the theoretical underpinning of the method, all the components and considerations now feed into the design stage. However, despite such a prominent place within the framework, conceptual as well as practical aspects of the interface design feel overshadowed or reduced by the overwhelming weight of instructional theories. Furthermore, the explicit nature and position given to linguistic assumptions made at the level of Approach restrictively link the conceptualization process to a specific computer delivery making it incompatible with others such as the use of the computer as a tool (Levy, 1997: 196)

An interesting approach to design is also present in the framework by Hedberg *et al.* (1994), although it is based on a more "organic and iterative approach than traditional instructional systems design and attempts to frame the design process in a constructivist framework" (p.17). In this particular design model, emphasis is placed on the learning process and outcome within the design process, progressing from the definition of a *Project Space*, in terms of needs, tasks and learners to an *Instructional Strategy Analysis*, showing visual representations, to, finally, an *Interactive Analysis*, with complete design scenarios.

Away from instructional theories, Shneiderman (1998: 52) proposes a context-free, design framework based on the theories and models approach, providing the design tools, such as high-level explanatory and predictive theories, mid-level principles on users, tasks and interactive styles and, finally, practical design guidelines. Unfortunately, if Shneiderman's approach is generally applicable, it, nonetheless, requires a thorough theoretical as well as practical grounding in the field of user interface design for authors to use it and adapt such design tools and techniques appropriately. Nonetheless, in purely design terms, it comes closest to presenting a clear transition from theory to practice, if the domain and context of use are sufficiently harnessed and mastered.

However, problematically, none of the above mentioned frameworks seem to provide a satisfactory transition from theory to practice, partly because they adopt a deliberate stance towards language teaching and learning theories at the expense of theoretical and practical design considerations (Hubbard, 1992; Richards and Rodgers, 1986), but also partly because they are difficult to adapt (Hedberg *et al.*, 1994), or simply not sufficiently applicable (Shneiderman, 1998). Interestingly, Jacobson (1994) specifically addresses the question raised by the difficulty to link theory to hypermedia design, research and application within instructional settings. His answer rests on the development of a Theory-To-Design framework establishing both theoretical orientations and design implications. Firstly, Jacobson (1994) identifies the role of theory within the perspective of scientific research in *theory construction and testing*, associating the instructional artifact with that of a "means to an end" (p.143) in contrast with the notion of *prescriptive artifact design*, which, fulfilling a pedagogical purpose, is seen as an end in itself. Therefore, whilst *theory construction and testing* helps to clarify the design space (see also Levy, 1998) as well as identify the development of the instructional artifact to test a given theory, the *prescriptive artifact design* component of the framework is designed to "determine various design features for instructional artifacts such as hypermedia systems" (p.143). Secondly, beyond the design space and role of theories, the assumption is made that, in any case, there must be a relation between theory and practice. This transition from theory constituents to specific design attributes is considered in the second component of the framework *link theory elements to specific design features* (p.142). Of particular interest is the notion that a theory of learning, or a combination of two or more, has the potential to generate a greater awareness and understanding of the design of its learning environment. Nevertheless, whilst there is considerable value in adopting and supporting such a theoretical perspective and implementation, it must also be stressed that the difficulty still initially resides in developing coherent, exhaustive and reliable learning theories applicable to new and complex technology-based learning situations. In this respect, much research needs to be carried out in the area of *theory construction and testing* to form, experiment with and assess learning theories within the appropriate platform. Finally, the limited impact of instructional theories in design, as shown by existing evidence, is a reminder that, short of producing a comprehensive checklist of theory-related design features and criteria, this type of theoretical approach, although laudable and attractive in research terms, is inevitably flawed from a purely design perspective.

To sum up, a number of methodological and theoretical frameworks can be identified in HCI, hypermedia for learning and in CALL. However, none are either directly related to hypermedia CALL nor adopting an overt design bias towards the conception and ultimate implementation of a student-centred interface. In this respect, the following framework proposes to remedy this problem.

14.2 Hypermedia CALL Authoring Framework

On the premise that authors, by dint of their pedagogical experience, can and must play an important role within the initial but crucial conceptual phase of the process, the following points must be stressed.

- As a discipline within language learning, CALL is still not properly equipped to harness the new technology at the level of pedagogy and design. As Hubbard (1992: 40) rightly points out "CALL does not have a coherently defined methodology".

- A structured approach to designing the CALL interface is still largely reduced to simply resorting to readily available but not necessarily applicable design tools, such as design guidelines.
- The transition from learning and design theories to practice, within the process as a whole, is still particularly ill defined, encouraging an experiential and empirical approach to design.
- Little capital is made of the vantage position enjoyed by academic authors who combine both a language teaching expertise necessary to support authoring objectives and inform the design process as well as first hand knowledge of students as prospective users. Therefore, academic authors need to be involved in the design process, not as graphic designers or programmers, but in their capacity as subject specialists to bridge the gap between conceptual and mental models towards the realization of a satisfactory system image. As such, they must be seen as an asset and a necessary input for the proper establishment of user-interface requirements. These requirements, based on the conceptual model of the design, student requirements as well as usability features and goals, are central to the process.
- If user interface requirements, as main design benchmark, are primordial within the authoring process, little conceptual and contextual support exists to promote their importance and facilitate their understanding as well as elaboration at authors' level.

14.2.1 Principles

The proposed framework purposefully adopts a new approach to authoring the hypermedia CALL interface by being theoretically rooted in Human Computer Interaction whilst being tailored to hypermedia CALL authoring in terms of requirements, process and tools. However, if the emphasis is on user interface design, the framework must be seen to be working in conjunction with existing, but more general, methodological frameworks in language teaching feeding into it.

The framework operates at two fundamental levels: it is initially designed to facilitate the *rapprochement* between both conceptual and mental models by focusing on the broad and finite design features identified as pertaining to hypermedia CALL whilst attempting to relate these elements to student requirements. Secondly, it is intended as a design tool conceived to bridge the gap between the theoretical and practical dimensions of hypermedia CALL authoring, by further integrating previously contextualized design guidelines and linking the usability field to design solutions, whenever possible.

The framework, which is specifically related to hypermedia CALL and based on original evidence, is non-dogmatic and adaptable to authors' needs accordingly. The authoring process generated by the framework is iterative. Refer to Section 4.2.3 entitled Main Characteristics of Design Process and Figure 4.1 for further details.

14.2.2 Aims

The framework should provide a valuable insight into a structured approach to designing a hypermedia CALL user interface. In so doing, it should act as a catalyst, encouraging authors, with little or no design experience to:

- concentrate on their role as academic authors within the design process,
- look at critical design considerations,
- focus on design features which can inform and influence their conceptual model,
- relate student requirements to the elaboration of a system image,
- promote the use of design tools with a view to designing a novel but, similarly, valid and applicable user interface,
- facilitate the use of design guidelines by providing a contextualized as well as a manageable and focused approach,
- provide an easy to use hypertext-based framework in a readily recognizable environment.
- provide a useful checklist for evaluation purposes.

14.2.3 Objectives

The framework is designed to provide:

- A design support for authors to help them think in terms of design informed by instructional theories but also, and more critically, user interface design considerations, criteria and relevant design features.
- A practical and adjustable set of pointers enabling authors to elaborate and refine on their conceptual model of the system to be designed.
- An appropriate design context for integrating and implementing design guidelines within the process itself.
- A manageable duality combining a high level theoretical point of departure as well as a practical design tool.
- An html environment for easier reference, orientation and use.
- A useful checklist for formative and summative evaluations,
- A structure and valuable multi-disciplinary material to generate discussions at the conceptual level of design.

14.2.4 Overall Framework

All aspects of the circumscribed process have been systematically covered with a view to presenting as comprehensive and critical an analysis as possible. These comprise:

- an HCI overview of design considerations within the design process,
- the specificity of hypermedia and the authoring platform with its intrinsic design scope and limitations,
- a theoretical underpinning of hypermedia for learning with a particular emphasis on language learning strategies,

- a cognitive and design approach to design issues related to hypermedia for learning.

At the first initial level, the framework strives to facilitate the elaboration of user interface requirements by focusing on the conceptual model developed by the author and by providing a framework to help match both conceptual and mental models. The overall HCI representation of authoring concerns, entitled Conceptual Framework, maps out the various options and considerations open to hypermedia CALL. As such, it is the central element at this conceptual stage of the process and is presented diagrammatically for easier assimilation (see Figure 15.1).

At a second level, the framework provides a HCI approach relating the conceptual model based on identified, macro and micro design elements and cognitive issues to high level design decisions and practicable designed solutions established on the basis of user interface requirements, mental models and supported by appropriate design guidelines. These design solutions can then be evaluated against student requirements as part of the iterative design process and rectified accordingly.

For practicability, these high-level design decisions and design solutions are presented in relation to identified authoring considerations, design features and design trade-offs when applicable.

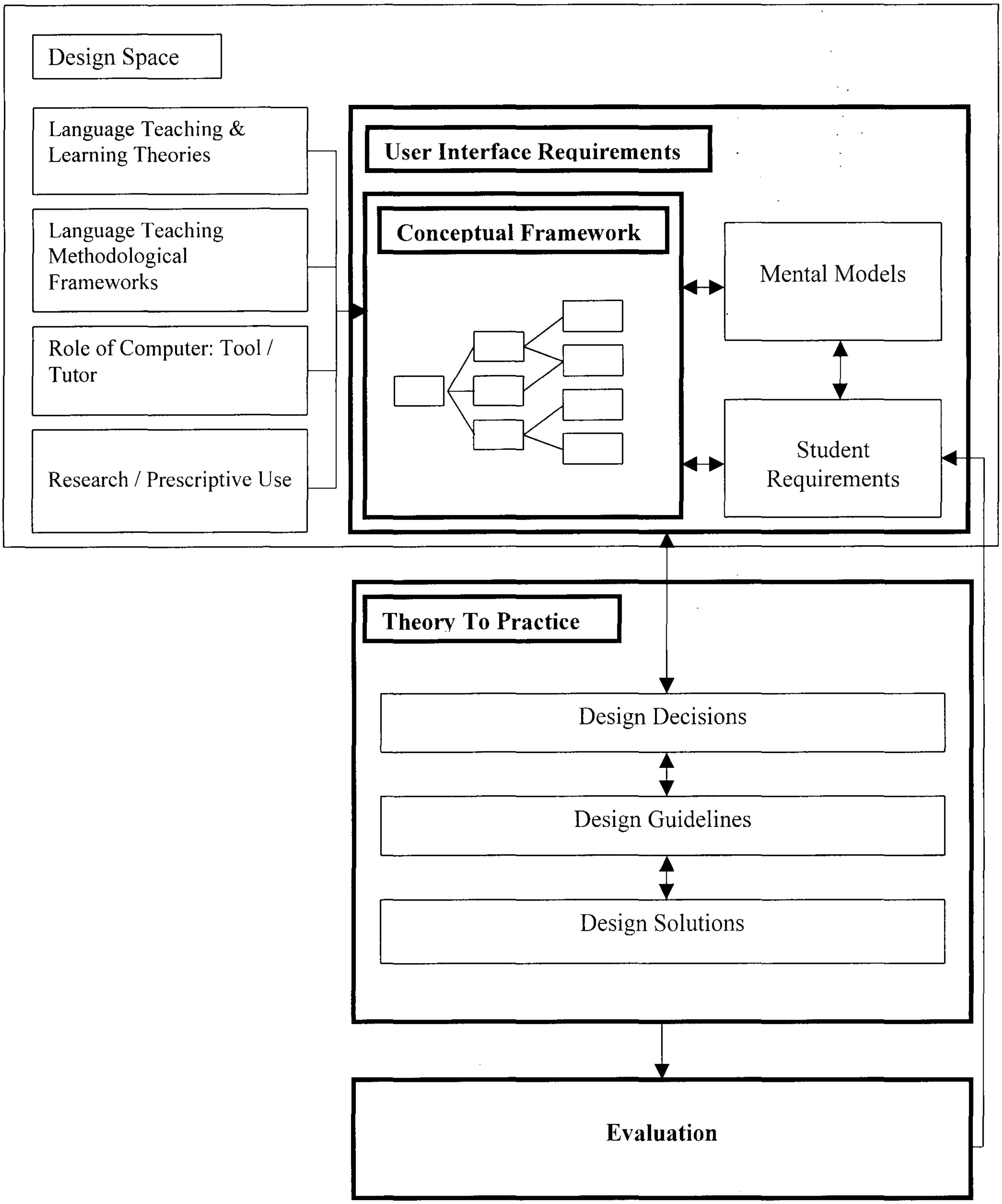


Figure 14-1 *General diagram of framework*

14.3 User Interface Requirements: A Diagrammatic Approach

14.3.1 User Interface Requirements

The Statement carrying user interface requirements plays an important and pivotal role within the design process, as it stems from and represents the outcome of the pre-design, conceptual phase. As such, it is seen as being instrumental in flagging the design stage and helping designers to focus on the functionality, usability features and usability goals of the interface to be designed. Refer to Section 4.3.7 for further information on user interface requirements. However, whilst the strategic importance and role of such a Statement is kept in mind, with what it implies in terms of conveying mental models and student requirements, its presentation, by dint of the generic nature of the targeted hypermedia interface, will retain a broad conceptual base and perspective.

Bearing in mind the complexity and size of the proposed framework, it was thought best to present user interface requirements on the basis of design components, in the form of identified design considerations with relevant mental models, student requirements, design guidelines, design trade-offs, whenever appropriate and design solutions.

14.3.2 The Conceptual Framework

Adopting a top-down approach, the logical starting point for this fragmented representation consists of high level considerations and centres on the validity of the overall concept. Therefore, it was decided that at the root of this design approach there would be three essential conceptual considerations:

- **Coherence**: As a structured output, the system to be designed must be meaningful, therefore be understandable. This conceptual consideration falls under the all-embracing principle of coherence. This coherent conceptualization or design model (Norman, 1986: 46) is identified at macro and micro levels. The macro level, also referred to as strategic or global level (Thüring *et al.*, 1995) encompasses the context of use within which the information base is to be structured, its adjacent learning strategies, the nature of the content of the information base, its structural architecture and macro components. Conversely, the micro level, also known as the local or tactical level, comprises the provision and support for the environment to be designed, component and node links and content presentation in terms of selection of information and interface design (Hardman, 1995).

- **Cognitive Issues**: The system must be usable, therefore learnable and manipulable. In this case, such a consideration falls under the broad heading of cognitive issues. Whilst greater coherence is designed to increase the overall readability factor of the hypermedia CALL environment, cognitive issues focus on reducing the cognitive overheads generated by the triggered student interaction. These cognitive overheads can be recognized at the micro level of the user interface, emphasizing its usability features, the unobtrusiveness and stability of its functionality as well as the clarity and meaningfulness of its screen display. Similarly, this high level approach must include macro considerations regarding the student interaction in terms of navigation, exploration and assimilation. Ultimately, comprehension is predicated upon maximum use of mental resources unhindered by undue concentration on the interactive task presented by the interface. At a further level, concerns with the student interaction include the need to establish a match between tasks, learning objectives, student competence and ICT expertise. In this respect, the cognitive load is intrinsically determined by the nature and degree of approximation of that match.
- **Technological capabilities**: Finally, the design of the system must be feasible. In other words, the language environment to be designed must be supported by the chosen authoring platform. This practical and confined, albeit crucial, consideration falls under technological capabilities. Technological capabilities must be appreciated and determined at two different levels. On the one hand, the specificity of the hardware configuration must be considered to ensure compatibility and viability with the selected authoring platform, in terms of the adequacy of processing speed, memory capacity and range of desired authoring features. On the other, design approaches and guidance provided by the platform must be identified for better

exploitation or to avoid undue design interference with the hypermedia to be authored. Professional advice, provided by software companies, often proposes a bottom-up, step-by-step design approach presenting pragmatic solutions to specific design difficulties. Furthermore, these authoring shells provide design scenarios, themselves, built on the strength of adopted, overriding metaphors, such as the book, the page, the stack of cards or the flow line.

14.3.2.1 Structure

The root and branch approach has been adopted to identify and present these design considerations, which are, therefore, decomposed into relevant parts, themselves broken down into even finer elements and design features (see Figure 14.2). Purposefully, such a decomposition process aims at fragmenting the design space with a view to making it more manageable and manipulable. In so doing, identified design components are presented as discrete elements all interlinked together within an html environment, thus facilitating the elaboration of design paths with aggregates and natural ramifications. For ease of use, all the root and branch links are clearly represented in a customized tree structure (see Figures 14.2; 14.3; 14.4) and all ramifications are shown and activated by hypertext links in the html environment (refer to Section 14.4).

Navigating through the network is not conditional upon prescriptive routes since the three broad branches, identified as coherence, cognitive issues and technological capabilities, are not presented in a sequential or synchronized way. The aim of the framework is to enable authors to arrive at as many correspondences between design considerations as possible. Ultimately, the greater the overlap, the closer the match between conceptual and mental models will be, but also "the 'fit' between the computer's capabilities and the demands of language pedagogy' (Wyatt, 1988: 86).

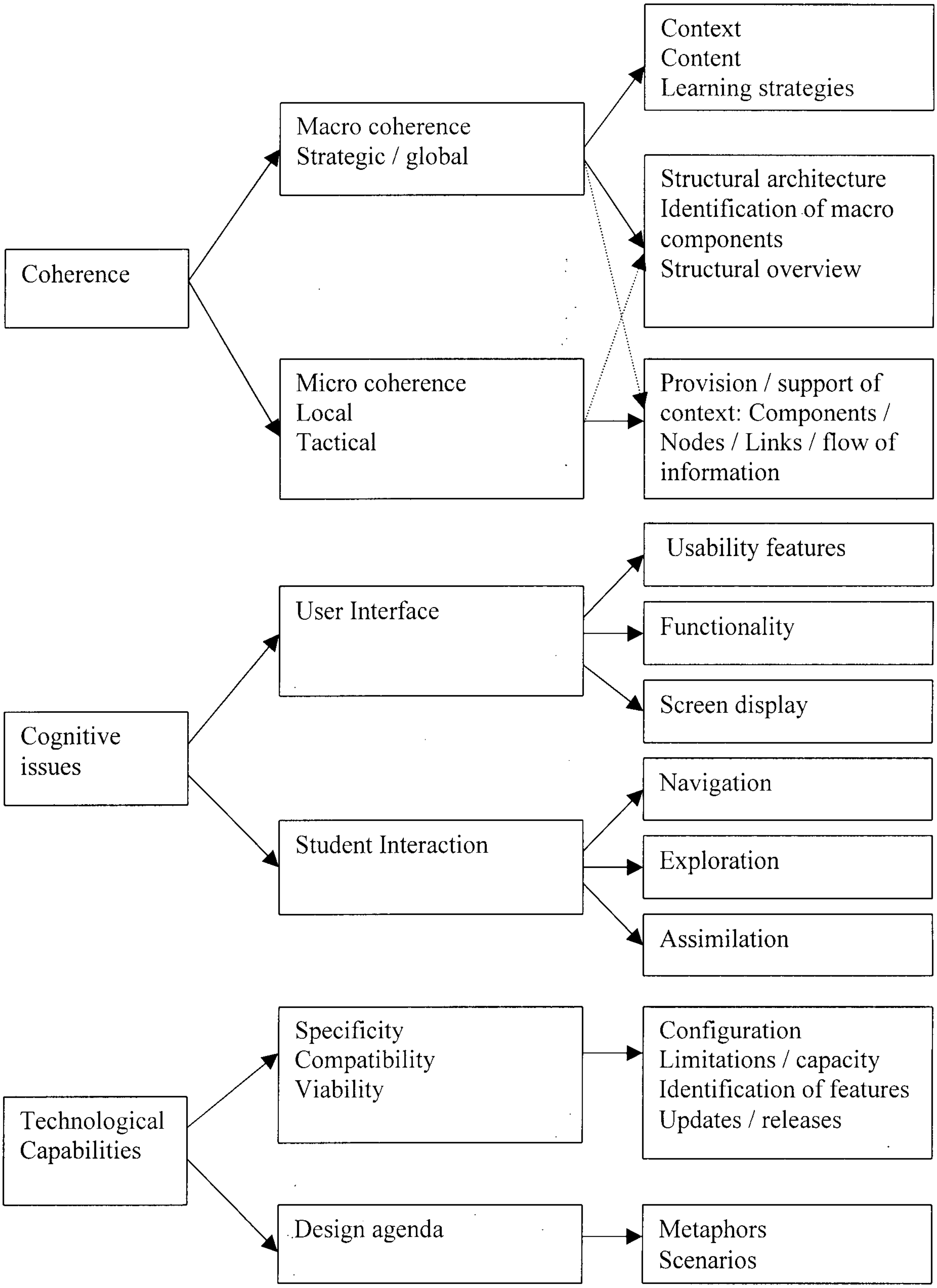


Figure 14-2 *High-level components of theoretical framework*

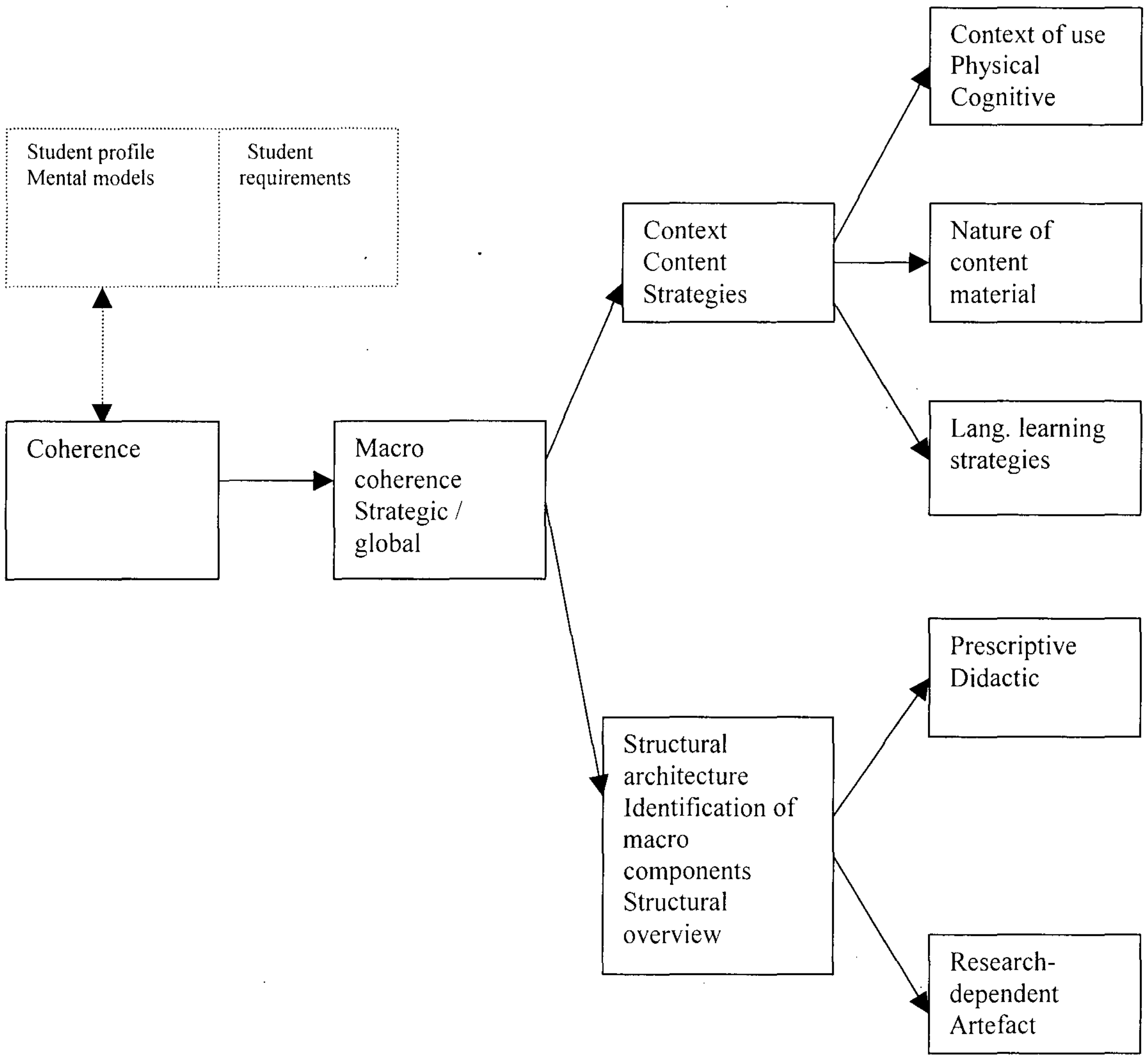


Figure 14-3 *Overview of the macro coherence stream*

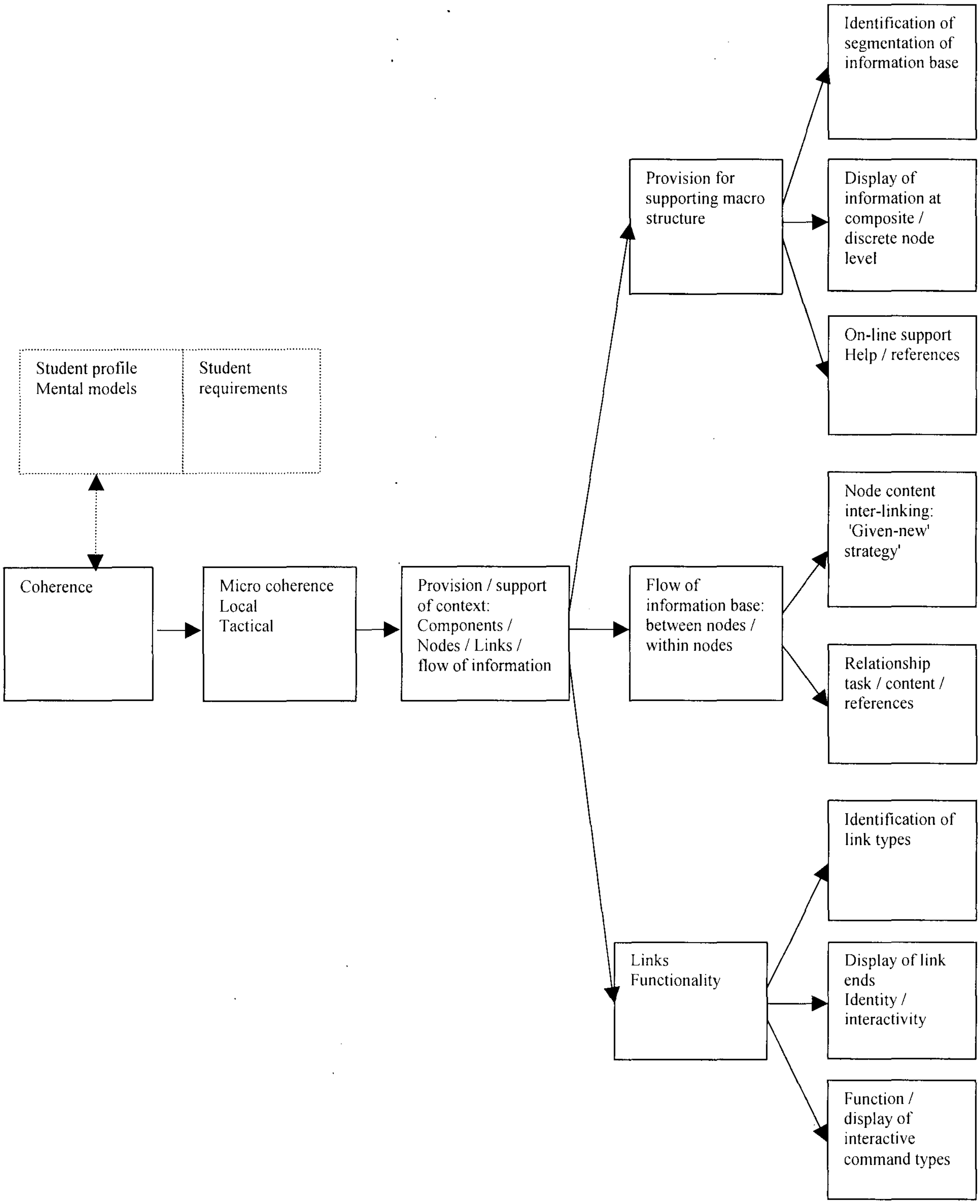


Figure 14-4 *Overview of the micro coherence stream*

14.4 Hypertext-based Presentation of Conceptual Framework

14.4.1 Getting Started

The conceptual framework is available on the CD-ROM attached to the back cover of this thesis. To run, load the disk and double-click on Home.htm in the file directory of the appropriate CD-ROM drive.

14.4.2 Description of Environment

The interactive conceptual framework has been designed within the Microsoft Explorer 4 environment and adopts html protocols for both the design and interactive behaviour of embedded hypertext links. To increase its usability and improve navigation, the screen is divided in two discrete areas. On the left-hand side, a Java Applet provides a tailor-made flow line which links all the identified design considerations according to the previously discussed root and branch approach. To open hidden links click on the plus sign next to a design consideration. Conversely, to conceal displayed links click on a minus sign. To open the content of a linked node, click on its title for the information to appear on the right-hand side of the screen. The split screen can be adjusted to increase or decrease the size of the area. The window within which the flow-line structure of the framework is provided can be scrolled for easier exploration.

The right-hand space is dedicated to the content material of the linked nodes. Each node represents a hierarchically determined link, based on the level of abstraction or application of the appropriate design consideration, and provides two types of embedded hypertext links. The first type links up the displayed design consideration with related nodes within the framework itself. The second type of links provides access to further information within the thesis itself, such as mental models, student requirements, experienced and inexperienced students, design guidelines and references. To facilitate assimilation and increase usability, an additional information base comprising design decisions, design solutions and design trade-offs has been added to the database.

Navigation can be realized by means of above-mentioned links or by facilities provided by the browser, such as Back and Forward.

15 Evaluation

The evaluation of the proposed theoretical framework for authoring hypermedia CALL is based on an assessment of its outcome against the objectives set out in the original statement:

- to show that previously developed design guidelines represent an effective design support when they can be related to specific design considerations and specific user requirements,
- to circumscribe the conceptual input authoring must generate within the overall design process,
- to provide a theoretical underpinning for the consideration and appreciation of mental models within the authoring process with a view to creating a greater match between conceptual and mental models towards a more accurate system image.

On this premise, the evaluation follows and completes the original evaluation process, which focused on the comprehensiveness and ease of use of the guidelines and which identified presentational problems related to the context of use and the conceptual dimension inherent within the design process. Indeed, authors evaluated the guidelines according to the immediacy of the design reciprocity they seemed to generate. As a result, practicable guidelines linked to the screen display tended to be more highly rated than those rather more important guidelines dealing with macro functions and conceptual design considerations. Refer to Appendix 7 for further details regarding the first evaluation process.

It is this imbalance, stemming from an assumption regarding design guidelines but also, and more crucially, a misconception concerning the authoring input and models, which is at the origin of the above-mentioned objectives and, ultimately, behind the proposed framework. Therefore, a three-pronged evaluative approach has been devised in order to consider the applicability of the design guidelines, the potentiality of the framework in considering and integrating user requirements and mental models within the process itself and, finally, the degree of emphasis placed on the transition from theory to practice.

The following evaluation seeks to:

1. assess the general applicability in terms of support coverage, relevance and pertinence, of the guidelines.
2. examine the closeness of the match between student requirements as well as mental models on the one hand and design considerations and guidelines presented by the framework approach on the other.
3. look critically at the extent to which the framework presentation redresses the imbalance between theory and practice, with particular emphasis on the transition from considerations to decisions and solutions.

15.1 Applicability of Design Guidelines

A summary of guideline reference numbers and relevant sections is provided here to facilitate the deciphering and understanding of the following framework overview table. (Refer to Appendix 6 for further details regarding guidelines).

Table 15-1 *Guideline reference numbers*

Sections	**Numbered Guidelines**
Pre-Design Considerations:	
Technical and Practical Authoring Requirements	1.Market; 2.Approach; 3. Specifications; 4.Potential; 5.Planning; 6.Expertise.
Aims and Objectives:	7.Learning Context; 8.Learning Strategy; 9.Learning Goals.
Task Requirements:	10.Task Support; 11.Learning Environment; 12.Usability Study; 13.Student Requirements; 14.Student Support; 15.Task Metaphor.
Structure Planning:	16.Organization; 17.Conceptualization; 18.Mapping; 19.Navigation.
User-Interface Design Considerations:	20.Compatibility; 21.Effectiveness.
Design Considerations	
Screen Layout:	22.Optimization; 23.Presentation; 24.Customization; 25.Standardization; 26.Consistency; 27.Clarity; 28.Colour; 29.Design Process.
On-Line Text:	30.Characters; 31.Presentation; 32.Length; 33.Scrolling; 34.Emphasis; 35.Contrasts.
Images:	36
Animation:	37
Sound:	38
Video:	39
Structure:	40.Consistency; 41.Orientation; 42.Data Recognition; 43.Information; 44.On-line Help; 45.Data accessing.
Interaction:	46.Linguistic Interaction; 47.Interactive Match; 48.Quality; 49.Add-Ons.
Evaluation:	50

Table 15-2 *Framework overview*

Design Considerations	**Student Requirements**		**Design Guidelines**
	Experienced Students	Inexperienced Students	
14.3.6 Coherence (a1)			
14.3.7 Context, content and learning strategies (c1)			
14.3.8 Interactive Construct: Role / Function (e1)			
14.3.9 Research / Testing Artefact (f1)	-	-	-
14.3.10 Learning Tool (f2)	22/23/26/50	17/20/27	11/46/47
14.3.11 Instructional Environment (f3)	13/17/27/57	10/15/22/26	11/13/47/48
14.3.12 Mixed Learning Environment (f4)	22/23/27/28/45	10/15/17/20/24	11/13/46/47/48
14.3.13 Collaborative Learning Environment (f5)	22/23/27/28/41 42/45	10/15/17/20/24 26	7/13/46/47/48
14.3.14 Physical Context of Use: Access Modes / Environment (e2)			
14.3.15 Self-Access (f6)	15/24/25/27/28 30/39/45/46	10/13/20/25	7/8/10/11/13/14/20
14.3.16 Educational Setting: Classroom Access (f7)	-	-	7/8/10/14/20
14.3.17 Cognitive Context of Use: Learner Group / Interactive Output (e3)	11/14/18/44/48 54/55	9/17	13/20/42/45
14.3.18 Nature of Content Material (d2)	44/54/55/56	18	16/21
14.3.19 Language Learning Strategies (d3)	47/48/49/50/51 56	21/22/23/25	8/9
14.3.20 Instructional (e6)	See 14.3.19	See 14.3.19	See 14.3.19
14.3.21 Constructive Learning (e7)	19/22/24/42/50	18/20/22/23	8/9
14.3.22 No Learning Strategy (e8)	21/22/23	11/17	16
14.3.23 Structural Architecture / Identification of Macro Components (c2)			

Table 15.2 *continued*

Design Considerations	**Student Requirements**		**Design Guidelines**
	Experienced Students	Inexperienced Students	
14.3.24 Browsable / Learning Tool (e9)	10/12/23/25/26 45	18/20	16/17/18/19/40/41/43
14.3.25 Mixed: Learning Environment: Controlled / Free Interaction (e10)	20/23/25/26	17/20/23/24	16/17/18/19/40/41
14.3.26 Instructional (e11)	-	15/21/25/26/27	16/17/18
14.3.27 Research-Dependent Macro Components (d5)	-	-	-
14.3.28 Micro Coherence			
14.3.29 Identification of Segmentation of the Information Base (e13)	1/6/8/9/10/12 16	1/19	22/23/24/30/31/32/33/34/35/36 37/38/39
14.3.30 Display of Information at Composite / Discrete Node Level (e14)	2/3/4/5/6/7/8/9 16/19/29	1/2/3/4/7/8	24/25/26/27/28/29
14.3.31 On-Line Support / Help / References (e15)	12/15/16/17/29 39/40/41/52/53	5/6/7/12/13/14 15/16/25	43/44
14.3.32 Node Content Inter-Linking (e16)	4/20/21/33/35	1/4/9	42/43
14.3.33 Relationship Task / Content / References (e17)	8/12/21	19	42/43/45
14.3.34 Identification of Link Types (e19)	7/15/25	4/5	41/43/44
14.3.35 Display of Link Ends / Identity / Interactivity (e20)	7	8	25/26
14.3.36 Function / Display of Interactive Command Types (e21)	4/32/33/37	8/9	22/24
14.3.37 Cognitive Issues			
14.3.38 Usability Features (c4)	17/19/30/31/34 38/51/53	9/17	11/12/13/14/15/20/21/40
14.3.39 Functionality (c5)	30/31/32/33/34 36/37/43	11	10/20/21/45/46/47
14.3.40 Screen Display (c6): Consistency / Clarity / Meaningfulness	1/2/3/4/6/7/10 14/44	1/2/3/4	20/21/24/25/26/27/28/29
14.3.41 Screen Display (c6): Content Presentation	1/2/4/9/14/19 44	18/19	28/29/35/36/37/38/39/40
14.3.42 Navigation (c7)	20/21/22/23/26 29/32/34	7/16/20	19/44
14.3.43 Exploration (c8)	10/12/27/29/33 35/39/40/44	7/16/21/23/27	18/43/44/45/46/47/48

14.3.44 Assimilation (c9)	11/13/14/18/24 41/44/49/50/53	9/10/14/21/22 27	42/45/46/47/48/49
14.3.45 Technological Capabilities (a3)	1/32	-	1/2/3/4/5/6

- All guidelines were used at least once.
- All design considerations within the framework were covered by the guidelines, although support was felt to be wanting in the area of language learning strategies and their implications on design in terms of specificity and availability.
- Of the three main high level considerations, at the root of the theoretical framework, cognitive issues were best supported by design guidelines followed by micro coherence at screen level, identification of macro components at screen level and, finally, content, context and strategies.
- On the assumption that applicability can be measured, the following figures, extracted from the above table, can, by themselves, be indicative of the varying usage factor associated with the design guidelines within the framework.

Table 15-3 *Usage factor of design guidelines*

Guideline	Usage	Guideline	Usage	Guideline	Usage	Guideline	Usage	Guideline	Usage
1	1	11	5	21	4	31	1	41	3
2	1	12	1	22	2	32	1	42	4
3	1	13	6	23	1	33	1	43	6
4	1	14	3	24	4	34	1	44	4
5	1	15	1	25	3	35	2	45	5
6	1	16	5	26	3	36	2	46	6
7	3	17	3	27	2	37	2	47	7
8	4	18	4	28	3	38	2	48	5
9	2	19	3	29	3	39	2	49	2
10	3	20	6	30	1	40	4	50	1

Presented differently, by section or in order of decreasing use, these figures give an indication of the degree and type of impact, in terms of breadth and depth, design guidelines can have when harnessed and underpinned by a structured and student-centred theoretical framework.

Table 15-4 *Measured impact of guidelines*

Guideline	Usage	Guideline	Usage	Guideline	Usage	Guideline	Usage	Guideline	Usage
47	7	18	4	19	3	38	2	6	1
46	6	21	4	25	3	27	2	12	1
43	6	24	4	26	3	39	2	15	1
20	6	40	4	28	3	9	2	23	1
13	6	42	4	29	3	49	2	30	1
45	5	44	4	41	3	1	1	31	1
48	5	7	3	22	2	2	1	32	1
16	5	10	3	35	2	3	1	33	1
11	5	14	3	36	2	4	1	34	1
8	4	17	3	37	2	5	1	50	1

- Interestingly, what transpires from these figures is that conceptual design considerations play a far more prominent role than screen design considerations. In order of impact, Interactive Match comes first, followed by linguistic interaction, structural information, compatibility and user requirements. Of all the sub-sections presenting the design guidelines, User-Interface Design Considerations and Interaction score the highest average total of 5 entries. Structure follows with an average of 4.3, then Structure Planning with 3.8, Task Requirements with 3.1, Aims and Objectives with 3, then Screen Layout with 2.6, to end with Text, Images, Animation, Sound, Video and Technical and Practical Authoring Requirements scoring 1.
- Without trying to appear too scientific in a qualitative and fundamentally subjective domain, it is, nevertheless, possible to note and appreciate that these results are radically different from those based on the use of guidelines by authors in the previous evaluation. Whereas, for instance, Aims and Objectives as well as Task Requirements were found to be difficult to comprehend and exploit when put to authors, the same sub-sections now seem to fulfil a much greater and clearer high level task within a theoretical framework approach established on the basis of student requirements. Of particular importance is the fact that, the majority of

these requirements, and, indeed, impressions stemming from mental models, call for a high level conceptual solution as opposed to a pragmatic, task-based and ultimately cosmetic answer.

- This suggests that the application of design guidelines varies according to its context of use. As a readily available and convenient design support, guidelines are resorted to as a design expedient for advice and reference but also for reassurance towards greater credible creativity. This "cookbook-style" approach, as referred to by Preece *et al.* (1994: 489), prevails in CALL in view of its general hands-on, practical approach to design and, as a result, tends to confuse and, therefore, identify design guidelines with screen design guidelines. Conversely, these results here strengthen the view that a structured, theoretically based context enhances the use of high level design guidelines to generate decisions and solutions to specific design problems instead of seeking simplistic remedies and playing lip service to user interface design.

- Furthermore, more radically, the need for a good professionally designed screen display unambiguously shows the unbridgeable discrepancy between what students ultimately require and what authors can offer in the area of graphic design expertise. Worse still, if screen design guidelines represent the sole source of design support available, they can only, despite their ubiquity, be seen to be tinkering with the issue. Although screen design notions and references are undoubtedly important and useful for acquiring a greater insight and developing a conceptual model of the design, screen design guidelines used in isolation as convenient solutions are likely to undermine the design process by giving authors misleading advice and confidence. For example, students unequivocally required textual representations to be limited as much as possible, adding that multimedia was not about typing in text, whereas, screen design guidelines unwittingly give great emphasis on text display as it is the object of much design attention and is well documented.

15.2 Student-Centred Applicability

Table 15-5 *Student requirements reference numbers*

No	Experienced Students:	No	Inexperienced Students
	Screen Design		Screen Design
1	Produce a good, professionally designed screen display.	1	The screen display must be easy to understand.
2	The screen display must be consistent	2	The screen display must be simple.
3	The screen display must be clear and uncluttered	3	The screen display must be clear and uncluttered.
4	The screen display must be stable and reliable.	4	The screen display must facilitate learning.
5	Colour schemes must be carefully chosen.	5	Display a help facility at all times.
6	The screen must only display relevant and useful features.	6	Instructions must be succinct.
7	Icons, symbols and graphical representations must be compatible and standardized.	7	Design a map to be displayed on request.
8	Multimedia presentations must be adequately displayed.	8	Design recognizable commands.
9	In a multimedia environment, limit textual representations as much as possible	9	Make the design adaptable to the different levels of student needs and expertise.
10	Multimedia extensions are only appreciated if purposeful.		Interactive Potential of Interface
11	Treat students like normal human beings.	10	Provide clear objectives.
12	Ensure that the reference database is fully integrated and responsive.	11	Provide clear functionality.
13	Ensure that errors or bugs do not creep in if you want to retain teaching status, credibility and students' trust.	12	Provide appropriate feedback.
14	The material used must be attractive and identifiable.	13	Provide a versatile Help facility.
15	Display contextualized on-line help.	14	Provide understandable, jargon-free explanations.
16	On-line information must not be systematically provided in a written form.	15	Instructions must clearly indicate what actions are required.
17	Provide relevant and helpful task-based feedback instead of warnings and locking mechanism.	16	Provide clear orientation.
18	Do not attempt to design an interface with a view to making the computer look and respond more like a human.	17	Provide a flexible interaction.
19	Multimedia is not by its very nature attractive. It must be made so by design.	18	Multimedia must provide a new, attractive, interactive, environment.
	Interactive Potential of Interface	19	Increase the visual quality of multimedia presentations.
20	The interactive mode must be consistent.	20	Provide means to enable students to better control their actions.
21	The students must always have access to multimedia functions.		Applicability for Language Learning.
22	The students must be given full control over their interaction.	21	Provide clear learning objectives.
23	The students must be allowed unrestricted movement	22	Provide clear explanations regarding the learning approach.
24	Ensure that the students' motivation is maintained throughout the interaction.	23	Provide recommended pathways.
25	Interactive links must be designed to facilitate access to the relevant information.	24	Provide recommended actions.
26	The feeling of being locked in must never occur	25	Provide clear learning markers.
27	Interactive aims and objectives must be clearly stated.	26	Provide supervision.
28	The interface must provide clear, obvious, interactive support.	27	Provide a greater sense of purpose.
29	Provide visual maps of the structure.		
30	Provide optional introductory information related to the concept of the design and context.		

Table 15-5 *Continued*

31	The functionality must be both adequate and appropriate but not overwhelmingly complex.		
32	The functionality must be reliable and consistent.		
33	The functionality must support a more intuitive interaction.		
34	Ensure that multimedia material is interactive.		
35	Ensure that the support material provided in references, grammars etc. is also interactive.		
36	Multimedia must not be about typing in text.		
37	Well known functions such as cut, copy and paste must not be taken for granted.		
38	Ensure that the students' motivation is maintained throughout the interaction.		
39	Provide an overview of progress on request.		
40	Provide a tracking device.		
41	Provide an adequate and relevant context for the designed environment.		
42	Pair students together whenever possible.		
43	There must be complete compatibility between the design of the expected functionality and its technological delivery		
44	Make exercises relevant and realistic.		
45	The interaction must be self-sufficient.		
	Applicability for Language Learning.		
46	Learning objectives must be clearly delimited and explained.		
47	State clearly the expected learning outcomes.		
48	State clearly the target level of language proficiency.		
49	State clearly the adopted learning strategy.		
50	A hypermedia system must be a completely self-sufficient learning platform.		
51	Provide introductory suggestions of language learning approaches with their recommended access modes.		
52	Provide task-specific guidance.		
53	Feedback for language tasks must be relevant and accurate.		
54	Ensure that the multimedia content is adaptable to students' needs.		
55	Specify the type and range of linguistic material used.		
56	Increase the language learning potential.		
57	Highlight the difference between a hypermedia and a conventional presentation.		

Experienced Students:

Table 15-6 *Framework applicability with experienced students*

S.R.	Applied	S.R.	Applied	S.R.	Applied	S.R.	Applied	S.R.	Applied
1	4	13	2	25	4	37	2	49	3
2	3	14	4	26	4	38	1	50	5
3	2	15	3	27	5	39	3	51	3
4	5	16	3	28	3	40	2	52	1
5	2	17	3	29	4	41	3	53	3
6	3	18	2	30	3	42	2	54	2
7	4	19	4	31	2	43	1	55	2
8	3	20	3	32	4	44	6	56	2
9	3	21	4	33	4	45	4	57	1
10	4	22	6	34	3	46	1		
11	2	23	7	35	2	47	2		
12	5	24	3	36	1	48	3		

- The framework incorporated all the student requirements.
- All the design considerations within the framework were relevant to a greater or lesser extent to identified student requirements.
- Looking at table 15.6 a general correlation can be established between student requirements and design guidelines, although it must be noted that there were no relevant student requirements for research-related considerations and direct mention of classroom access, both covered by appropriate guidelines.
- Relevance and importance ranged from (23) "The students must be allowed unrestricted movement" with 7 entries to (22) "the student must be given full control over their interaction" and (44) "make exercises relevant and realistic" with 6. Self-sufficiency of the learning platform, interactive aims and objectives and a fully integrated and responsive reference database follow with 5. Then display, appeal, purposefulness, access, support, consistency and reliability of the functionality with 4.
- Interestingly, the framework approach by fragmenting all design considerations from

a high level conceptual classification to a finer design-oriented crystallization of discrete conceptual aspects and features has further emphasized the degree of priority and importance to be found in student requirements. By going over these sets of results or, indeed, the framework as a whole, it becomes possible to identify and relate to the varying degree of different concerns expressed by students, be they interactive potential in terms of control and access, goals, functionality and applicability, reliability, consistency and accuracy to be expected of a well produced design.

Inexperienced Students

Table 15-7 *Framework applicability with inexperienced students*

S.R.	Applied	S.R.	Applied	S.R.	Applied	S.R.	Applied	S.R.	Applied
1	4	7	4	13	2	19	3	25	5
2	2	8	3	14	2	20	8	26	3
3	2	9	5	15	5	21	5	27	4
4	4	10	5	16	3	22	5		
5	2	11	2	17	7	23	5		
6	1	12	1	18	4	24	3		

- The framework incorporated all the student requirements.
- Therefore, all the design considerations within the framework were relevant to a greater or lesser extent to identified student requirements.
- Looking at table 15.7 a general correlation can be established between student requirements and design guidelines, although it must be noted that there were no relevant student requirements for research-related considerations and direct mention of classroom access, both covered by appropriate guidelines.
- In the case of inexperienced students, the results are not as predictable as with experienced students. This is due to the well-explained fact (Refer to Chapters 8/9/10) that inexperienced students found it very difficult to go beyond the immediate physical man-machine interaction, as a result of high cognitive overheads. By the

same token, they could not muster enough confidence and distance to perceive and critically confront design problems, too busy were they to blame themselves instead. Finally, their general apprehension made them to accept more readily what was expected of them in terms of tasks or type of imposed interaction and, similarly, dampened their critical stance when it came to articulate their views regarding the user interface design.

15.2.1 Mental Models

- Mental models represent, perhaps, the most valuable piece of qualitative data obtained within the confines of this research because, surprisingly, they had never been elicited before in basic CALL research and because, possibly as a result, very little is known about students.
- Moreover, in addition to providing indispensable knowledge on student needs, the gradual approach adopted to enable students to develop such models became almost as important as the outcome of the process itself. Not only did it allow and encourage students to interact with existing hypermedia CALL software, it also gave them the tools to assess and critically evaluate the targeted interfaces.
- As such, the adopted progression, which painstakingly groomed the students from mere apprehensive or suspicious users to collaborators and evaluators, was considered a crucial determinant to secure relevant findings but also a high quality and accurate output.
- However, as previously mentioned, qualitative data is subjective and open to interpretations. This notion of subjectivity is all the more relevant in this particular case, since the process itself was being built on participation and willingness and organized as an extra curricular activity not as a coercive and assessed activity within known learning parameters. As a result, fewer students took part in the experiment than would have otherwise been the case and this, unavoidably, affected the representativeness and general applicability of the results obtained.

- In addition to being instrumental in establishing student requirements, mental models can be seen as being illustrative and complementary to requirements. Therefore, their identification and selection within the framework has given a richer, rounder, more visual impression of the way the students relate directly to such an environment as well as indirectly by projecting their mental visions of its interface. However, even if models provide invaluable qualitative data, their descriptive and impressionistic nature make them difficult to exploit fully.

15.3 Theory to Practice Applicability

- The transition from theory to practice rests on a user interface design methodology, which not only circumscribes the authoring input within the design process but, equally, suggests a practical step-by-step iterative design approach. Particular attention is paid, here, to the elusive and problematic translation of high level conceptual design considerations into appropriate and realistic design decisions and feature-based solutions.
- Transition is facilitated at two different levels within the design process. Firstly, it stems from a high level theoretical base focusing on a conceptual model, with a task analysis, and mental models elicited by students from an initial evaluation process. Ultimately, these models should match to form a successful system image to be implemented and further tested. Secondly, at a more practical level, student requirements are captured and used as goals, which, in turn, become instrumental in formulating design decisions and solutions supported by design guidelines, themselves informed by potential design trade-offs. Subsequently, these design solutions can be evaluated against usability goals for finer tuning as part of the iterative process.
- Therefore, the proposed framework highlights two critical areas considered lacking or inadequate in hypermedia CALL. The first one consists of a User Interface Requirements database comprising the conceptual framework of identified design

elements and features, as well as student requirements and mental models, which feed into it by a process of identification and match. For easier manipulation and generalization the framework has been presented in the form of streams and links, which can be referred to according to specific authoring needs and relevance. Similarly, each identified design element is presented with its own specific user requirement statement including design comments, relevant mental models if appropriate, selected student requirements, links and their selected design guidelines as well as their potential trade-off if applied. The second area considered in this research more specifically concerns the transitional dimension of the process and integrate design decisions and design solutions within the framework itself, at the level of its fragmentation.

- One advantage of this approach rests on its practicability as a design support tool providing easy access to a comprehensive range of potential design features associated with hypermedia CALL and presented with contextualized student requirements as well as design decisions and solutions. Another is its applicability inasmuch as additional requirements and guidelines can be incorporated into the framework as and when necessary and processed accordingly.
- Conversely, the main disadvantage of this method is intricately linked to the nature of its generic base preventing it from providing more task-based and feature-based answers to identified problems within a more finite and delimited hypermedia CALL environment.
- Finally, another drawback can be seen in this dauntingly bulky and rather unmanageable paper-based presentation. This is currently being remedied by the development of an electronic interactive version to be used to support the present thesis.

16 Conclusion

The initial aim of this thesis was to demonstrate that, once developed, design guidelines would realize their full potential when applied within a defined context and a structured design process. However, by creating a coherent and exhaustive theoretical framework providing a comprehensive contextual and conceptual design support for hypermedia CALL authoring, this research reached a number of additional key objectives. Not only has it yielded crucial findings related to the complex, multifaceted, usability field of hypermedia CALL, but similarly, it presents an original and valuable methodology for eliciting student feedback and requirements as well as an interactive design tool conceived to focus on and facilitate the authoring process.

16.1 Key Findings

This research has led to key findings in two important areas related to the identification of a usability field for hypermedia CALL, both at the conceptual level of authors as well as the level of student models and requirements, and the elaboration and implementation of the theoretical framework.

16.1.1 The Hypermedia CALL Authoring Process

At the conceptual level, the research carried out clearly delineates the authoring input within the design process by identifying the remit of the authoring task. In so doing, it establishes and strengthens the notion of academic authoring as an important source of expert advice highlighting its essential role at the conceptual stage, hence, introducing new credibility into a much criticized and devalued design activity. Against old and largely current practices, which enthusiastically but also amateurishly still undertake to oversee the whole of the authoring process, it is argued that CALL authoring is in serious need to be critically redefined. Indeed, authoring is still very much understood as a pursuit imbued with literary, academic and artistic connotations, themselves linked to the referential written work, the textbook, the curriculum to be taught or the stylistic approach of a *metteur en scène*. By implication, or default, given its low level of recognition in academic research, the authoring process has evolved within the confines of its own preoccupations often associated with short term goals and expedient solutions to recognized language learning problems, thus further undermining its position and *raison d' être*. Critically, by redefining its remit, this vicious, self-perpetuating, authoring circle can be broken to instil new, better practices and generate professionally designed interfaces in the domain of hypermedia CALL.

Of particular relevance in this context, the conceptual underpinning of authoring and necessary theoretical cross-fertilization has been seen to be wanting or, equally, limited to language teaching and learning positions adopting varying levels of theoretical abstraction. However, the point is made, here, that, beyond its theoretical entrenchment, CALL and by extension hypermedia CALL, must be perceived as a separate entity with its own identity and delivery based on a multi-disciplinary approach focusing on its specificity. It is this specific distinctiveness combining learning strategies with user interface design considerations such as applicability and usability, which is at the crux of the matter and which can and must be harnessed by authors. In this respect, the originality of these findings stems from the successful transfer and subsequent application of a human factors expertise derived from the field of human-computer interaction to the hypermedia CALL authoring process. By extension, this research forcefully shows that within the constellation of relevant disciplines CALL and HCI are, by their complementarity, natural authoring bedfellows.

Thus, within the wider design process, the academic author input becomes naturally delimited by a redefined usability field based on a language teaching and learning expertise as well as by an invaluable, albeit largely untapped, access to information and knowledge related to the targeted student population. In other words, authoring encompasses conception, user interaction and evaluation. It must fulfil a strategic role by formulating decisions regarding interactive learning approaches and context of use at the macro level of conceptual design, elaborate their optimal application at the micro interface level, establishing the closest match possible between functionality and requirements, and finally evaluate the prototype outcome of the process.

16.1.2 Mental Models and Student Requirements: a methodological approach

Ironically, if academic authors benefit from such an unassailable vantage point providing both theoretical and environmental perspectives, remarkably, little is known about the targeted user group. Beyond studies concerned with its composition and often relying on its unquestioned participation in a variety of task-based experiments, assumptions are still generally made on students' attitudes, expectations and needs. However, this data, to be generated by a reassessed authoring brief, is fundamental to an understanding of such a necessary student-centred interface if it is to be satisfactorily conceived and properly evaluated. Therefore, key findings have been made at the student level, yielding some crucial quantitative and qualitative data on relevant student characteristics, models and requirements, whilst providing a consistent methodological approach for future developments.

Indeed, a sustained and protracted part of this research is initially dedicated to exploring mental models generated by students when interacting with the hypermedia CALL interface as well as identifying projected requirements clearly elucidated on the strength of the students' own interactive experience. Such an emphasis was felt to be particularly relevant and necessary in the current context of both poor evaluation practice and low level of HCI expertise in CALL. Firstly, the evaluation process in CALL, whilst generally recognized as a necessity, is still too often underrated and, as a result, considered a mere formality at best or a misleading authoring vindication at worst. Secondly, there is not, as yet, a strong enough evaluation expertise and tradition in CALL to readily provide the necessary support, guidance and evidence of good practice, due to the prevalence of the instructional stance over design but also the lack of a recognized user interface design approach. Therefore, the need to propose and implement a methodology, tailor-made to such a CALL context, is seen as primordial and ground-breaking insofar as the approach is realistic, applicable and highly effective as it capitalizes on existing CALL design and student involvement. Its rationale for breaking the existing flawed authoring mould stemmed from two important observations. Firstly, the design of the CALL interface was not sufficiently challenged, although CALL authoring could easily turn its empirical design tradition into a developmental asset by learning from past weaknesses and mistakes. Secondly, ill-equipped, unprepared, but also unmotivated students could hardly be expected to provide valuable feedback from clinically and expediently administered evaluation processes, although sound evaluation was not only necessary but also feasible and realistic. As a result, this innovative approach essentially revolved round the need for a gradual, systematic, hands-on student induction providing evaluation experience and support, and the setting up of summative evaluations of existing hypermedia CALL applications to generate data on students with a view to using these key findings in formative evaluations of future projects.

The originality element and novelty factor behind the method rest on its methodical and progressive approach. Indeed, it supports a protracted exposure to the environment to be evaluated with customized summative evaluation sessions in the form of user walkthroughs. It facilitates the creation of interactive situations by accommodating a built-in progression from exploratory to task-based student interaction. It produces genuine and valuable feedback by encouraging the students to adopt a critical stance when commenting on actions and reactions. It promotes verbal exchanges and, above all, collaboration between authors and students, thus triggering a greater sense of involvement and motivation. Finally, it provides students with the necessary support and experience to allow them to be in a better position to satisfactorily evaluate the interface design.

Thus, in addition to presenting a methodology and techniques based on questionnaires, user walkthroughs, verbal protocols, audits, focus groups and discussions, much needed and genuine information has been gathered on the targeted student population, in terms of experience, expertise, attitudes, responses and requirements.

Interestingly, in so doing, it exposed how disenfranchized students were from the interface and how little impact it generated on them. It confirmed the view that misleading assumptions were being made on their behalf, such as the commonly held conviction that students are naturally attracted to a multimedia-based environment for instance. Strikingly, mental models suggested that students sought to establish far greater interactive coherence at the level of learning strategies and self-sufficiency and tried to test the credibility of the instructing interface whilst attempting to clarify and apportion clearer roles between the computer and themselves as users. However, beyond these macro level considerations, their interaction, reactions and reflections showed to what extent the micro functions and screen design elements of the user interface were relevant to forming the necessary working relationship required for sustaining motivation and concentration. Above all, it indicated how vulnerable and volatile the interaction was between a distrusted computer interface and an uncomfortable student group without clear orientational or environmental reference points and prior consultative involvement.

16.1.3 Theoretical Framework

Last but not least, the theoretical framework for authoring hypermedia CALL was conceived and presented as a design support created to fulfil the dual task of providing an overall authoring cohesiveness within the design process as well as offering a specific focus on design considerations. Therefore, its purpose is to enable authors to appreciate both the conceptual dimension of the design process and identify interface design issues related to hypermedia CALL. However, its strength and originality essentially centre on its approach, which promotes the establishment of links between design considerations but also, critically, between conceptual models formed by authors and mental models as well as requirements developed by students as end-users. As a result, the theoretical framework is based on a comprehensive range of design considerations stemming from high level design principles and weighed against relevant mental models and student requirements whilst being supported by appropriate design guidelines. These links between conception and application are further strengthened by the inclusion of potential design decisions and design solutions developed on the basis of the identified usability field, which are, themselves, instrumental in reducing the gap between theory and practice.

Therefore, key findings specifically related to the theoretical framework are, very much, linked to the relationship between conception and contextualization, the implementation of design guidelines and the integration of design decisions and solutions. They corroborate the view that the authoring brief must rely on making design decisions and providing design solutions related to a conceptual system image of the hypermedia CALL environment on the strength of student requirements and a task analysis combining both specificity and applicability. It is only on the basis of this redefinition that hypermedia CALL authoring can regain credibility and validity and that design guidelines can become instrumental in helping authors translate theory into practice. Indeed, as the proposed framework shows, guidelines can and must be applied systematically within the design process as a valuable design support providing suggestions, directions and references towards the formulation of appropriate solutions. In turn, it confirms the position that design guidelines can only inform a conceptual transfer of design information at this stage in the process and not provide simple answers and misleading shortcuts confusing authoring with graphic designing.

16.2 Strengths and Limitations of the Approach

This last point illustrates an inherent strength as well as an identified weakness of the chosen approach. Indeed, the HCI approach is seen as complementary to CALL insofar as it considers the interface as an intrinsic end product in its own right and not as a peripheral adjunct to a language learning curriculum or a given language project. As a result, the CALL/HCI tandem provides the ideal combination of disciplines setting language theories and learning objectives on the one hand and presenting interface design considerations on the other. More specifically, the strength of HCI rests on its user-centred design approach introducing a structured design process, a much-needed conceptual approach to design with its relevant techniques for generating the appropriate data such as task analyses, models, requirements and evaluations as well as practical design supports such as design guidelines. It is on this basis that HCI was initially seen as a valuable discipline capable of confronting the many perceived design problems and shortcomings CALL is currently experiencing. Nevertheless, the qualitative and subjective nature of such a human-related domain inevitably points to a number of intrinsic weaknesses particularly linked to the representativeness of any sampling, the appropriateness and applicability of techniques used, the interpretability of data and the sheer logistical problems involved in the design process. Indeed, HCI is not and could not claim to be an exact science. As such, it does not propose ready-made solutions or convenient short cuts to diagnosed design problems, neither does its expertise easily and necessarily lend itself to all types of interactive interfaces. For instance, the greater the interactive imponderables, the more difficult it becomes to predict the user interactions and, ultimately, to design the appropriate interface, as a student-controlled hypermedia environment perfectly illustrates. However, in spite of these inherent difficulties related to the intangibility of the subject matter, the HCI approach manages to introduce a much-needed theoretical dimension to design allowing an easier transition from theory to design. This orientation must be pursued and further contextualized to CALL with a view to providing clearer design pointers, more relevant referential points and a greater, thus more representative, database of design information and considerations. In this respect, one of the aims of this research was to initiate such a theoretical context to radically change attitudes to design on the part of authors and yield crucial data on students, experience and examples of good practice in hypermedia CALL interface design.

16.3 Suggestions for Further Research

Given the current state of hypermedia CALL design, the above-mentioned strength and limitations of the adopted approach and the objectives set for this research the following suggestions for further research could be made:

- Expanding existing knowledge on students. Students, as end-users, need to be far more implicated into the design process if authors are to build an accurate profile based on relevant characteristics, attitudes and needs. The proposed methodology can help generate such valuable, qualitative data, although its sampling have raised questions concerning the overall representativeness of the findings. If an in-depth study of CALL users can only be carried out on a necessarily finite group, the greater the number of such studies the more accurate and representative the overall picture will be.

- Undertaking summative evaluations. Authors need to capitalize on CALL's empirical development through a proper and systematic summative evaluation of existing systems with a view to identifying what works and what does not.
- Testing and developing design theories. More research needs to be carried out to further develop a conceptually based authoring culture and improve the transition between theory and practice. Possible outcomes could include new, revised guidelines; the development of taxonomies of design decisions and design solutions relating user requirements to evidence of good design practice; further CALL contextualization within a theoretical framework; heuristics for formative evaluations; the development of design features in relation to identified language learning theories.

Finally, corroborating what Levy (1997: 229) advocates, there is a definite need for a "metalanguage" in hypermedia CALL, which generates discussions, conception and evaluation. It is to be hoped that the present approach and framework, by providing authors with a practical yet comprehensive student-centred design support delimiting the authoring input within the design process and promoting a student-oriented applicability will contribute to this necessary development towards greater academic recognition and design credibility.

17 Appendices

17.1 Student Profile

LEVEL 1 FRENCH BC (POST-GCSE LEVEL):		
TOTAL NUMBER OF STUDENTS AT LEVEL 1 IN FRENCH BC:		41
RESPONSE (returned filled and unfilled questionnaires):		10

FILLED QUESTIONNAIRES:							
COMPUTER SKILLS		none	little	some	experienced		no entry
		0	2	4	2		2
IT CONFIDENCE		none	little	reasonable	v. confident		no entry
		0	2	4	1		3
MM INTEREST		poor	some	keen	v. keen		no entry
		2	1	4	0		3
MM EXPERIENCE		none	little	some	a great deal		no entry
		3	2	2	0		3
UNFILLED QUESTIONNAIRES:							
COMMENTS		not avail.	no interest				
		0	0				

COMPUTER SKILLS AT LEVEL 1 (BC) IN PERCENTAGES	TOTAL	%
none	0	0%
little	2	20%
some	4	40%
experienced	2	20%
no entry	2	20%

IT CONFIDENCE AT LEVEL 1 (BC) IN PERCENTAGES	TOTAL	%
none	0	0%
little	2	20%
reasonable	4	40%
v.confident	1	10%
no entry	3	30%

MM INTEREST AT LEVEL 1 (BC) IN PERCENTAGES	TOTAL	%
poor	2	20%
some	1	10%
keen	4	40%
v.keen	0	0%
no entry	3	30%

MM EXPERIENCE AT LEVEL 1 (BC) IN PERCENTAGES	TOTAL	%
none	3	30%

little	2	20%
some	2	20%
a great deal	0	0%
no entry	3	30%

LEVEL 1 FRENCH D (POST-GCSE LEVEL):				
TOTAL NUMBER OF STUDENTS AT LEVEL 1 IN FRENCH D:				39
RESPONSE (returned filled and unfilled questionnaires):				9

FILLED QUESTIONNAIRES:							
COMPUTER SKILLS		none	little	some	experienced		no entry
		0	2	5	2		0
IT CONFIDENCE		none	little	reasonable	v. confident		no entry
		0	2	6	0		1
MM INTEREST		poor	some	keen	v. keen		no entry
		0	1	5	3		0
MM EXPERIENCE		none	little	some	a great deal		no entry
		4	3	2	0		0
UNFILLED QUESTIONNAIRES:							
COMMENTS		not avail.	no interest				
		0	0				

COMPUTER SKILLS AT LEVEL 1 (D) IN PERCENTAGES	TOTAL	%
none	0	0%
little	2	22%
some	5	56%
experienced	2	22%
no entry	0	0%

IT CONFIDENCE AT LEVEL 1 (D)) IN PERCENTAGES	TOTAL	%
none	0	0%
little	2	22%
reasonable	6	67%
v.confident	0	0%
no entry	1	11%

MM INTEREST AT LEVEL 1 (D) IN PERCENTAGES	TOTAL	%
poor	0	0%
some	1	11%
keen	5	56%
v.keen	3	33%
no entry	0	0%

MM EXPERIENCE AT LEVEL 1 (D) IN PERCENTAGES	TOTAL	%
none	4	45%
little	3	33%
some	2	22%

a great deal	0	0%
no entry	0	0%

LEVEL2:							
TOTAL NUMBER OF STUDENTS AT LEVEL 2 IN FRENCH:							73
RESPONSE (returned filled and unfilled questionnaires):							28

FILLED QUESTIONNAIRES:							
COMPUTER SKILLS		none	little	some	experienced		no entry
		2	5	10	5		
IT CONFIDENCE		none	little	reasonable	v. confident		no entry
		5	6	9	2		
MM INTEREST		poor	some	keen	v. keen		no entry
		3	8	10			1
MM EXPERIENCE		none	little	some	a great deal		no entry
		10	8	3			1
UNFILLED QUESTIONNAIRES:							
COMMENTS		not avail.	no interest	none			
			4	2			

COMPUTER SKILLS AT LEVEL 2 IN PERCENTAGES	TOTAL	%
none	2	7%
little	5	18%
some	10	36%
experienced	5	18%
no entry	6	21%

IT CONFIDENCE AT LEVEL 2 IN PERCENTAGES	TOTAL	%
none	5	18%
little	6	22%
reasonable	9	32%
v.confident	2	7%
no entry	6	21%

MM INTEREST AT LEVEL 2 IN PERCENTAGES	TOTAL	%
poor	3	11%
some	8	29%
keen	10	36%
v.keen	0	0%
no entry	7	24%

MM EXPERIENCE AT LEVEL 2 IN PERCENTAGES	TOTAL	%
none	10	36%
little	8	29%
some	3	11%

a great deal	0	0%
no entry	7	24%

LEVEL3 (THIRD YEAR STUDENTS):				
TOTAL NUMBER OF THIRD YEAR STUDENTS AT LEVEL 3 IN FRENCH:				24
RESPONSE (returned filled and unfilled questionnaires):				9

FILLED QUESTIONNAIRES:							
COMPUTER SKILLS		none	little	some	experienced		no entry
			2	4	3		
IT CONFIDENCE		none	little	reasonable	v. confident		no entry
		1	1	4	3		
MM INTEREST		poor	some	keen	v. keen		no entry
			3	4	2		
MM EXPERIENCE		none	little	some	a great deal		no entry
		4	1	3	1		
UNFILLED QUESTIONNAIRES:							
COMMENTS		not avail.	no interest	none			

COMPUTER SKILLS AT LEVEL 3 (3) IN PERCENTAGES	TOTAL	%
none	0	0%
little	2	22%
some	4	45%
experienced	3	33%
no entry	0	0%

IT CONFIDENCE AT LEVEL 3 (3) IN PERCENTAGES	TOTAL	%
none	1	11%
little	1	11%
reasonable	4	45%
v.confident	3	33%
no entry	0	0%

MM INTEREST AT LEVEL 3 (3) IN PERCENTAGES	TOTAL	%
poor	0	0%
some	3	33%
keen	4	45%
v.keen	2	22%
no entry	0	0%

MM EXPERIENCE AT LEVEL 3 (3) IN PERCENTAGES	TOTAL	%
none	4	45%
little	1	11%
some	3	33%
a great deal	1	11%

no entry	0	0%

LEVEL3 (FOURTH YEAR STUDENTS):				
TOTAL NUMBER OF FOURTH YEAR STUDENTS AT LEVEL 3 IN FRENCH:				34
RESPONSE (returned filled and unfilled questionnaires):				14

FILLED QUESTIONNAIRES:							
COMPUTER SKILLS		none	little	some	experienced		no entry
		1	4	5	4		
IT CONFIDENCE		none	little	reasonable	v. confident		no entry
		3	3	5	2		1
MM INTEREST		poor	some	keen	v. keen		no entry
			5	7	2		
MM EXPERIENCE		none	little	some	a great deal		no entry
		6	6	2			
UNFILLED QUESTIONNAIRES:							
COMMENTS		not avail.	no interest	none			

COMPUTER SKILLS AT LEVEL 3 (4) IN PERCENTAGES	TOTAL	%
none	1	7%
little	4	29%
some	5	35%
experienced	4	29%
no entry	0	0%

IT CONFIDENCE AT LEVEL 3 (4) IN PERCENTAGES	TOTAL	%
none	3	22%
little	3	22%
reasonable	5	35%
v.confident	2	14%
no entry	1	7%

MM INTEREST AT LEVEL 3 (4) IN PERCENTAGES	TOTAL	%
poor	0	0%
Some	5	36%
Keen	7	50%
v.keen	2	14%
no entry	0	0%

MM EXPERIENCE AT LEVEL 3 (4) IN PERCENTAGES	TOTAL	%
None	6	43%
Little	6	43%
Some	2	14%
a great deal	0	0%

no entry	0	0%

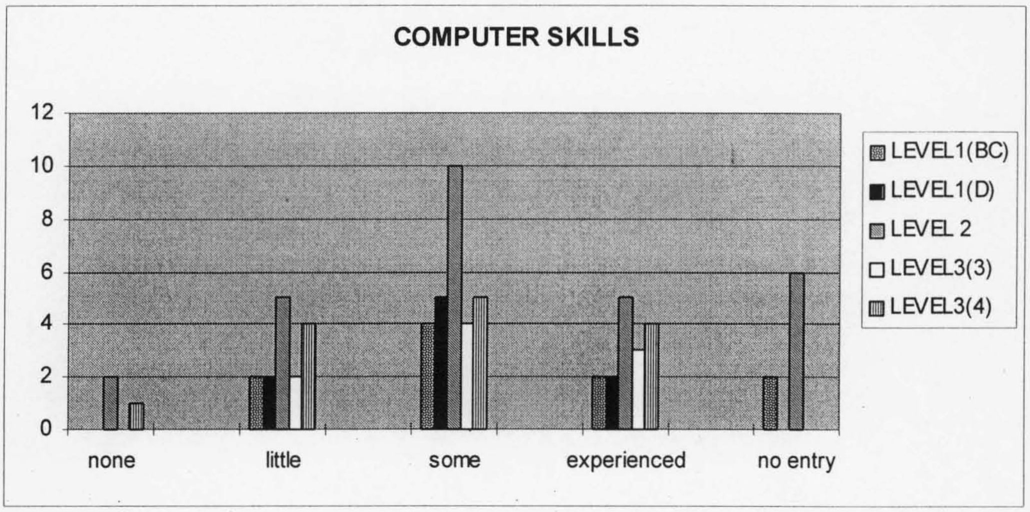
STUDENT PROFILE BASED ON ALL 70 QUESTIONNAIRES							
COMPUTER SKILLS:							
	LEVEL1(BC)	LEVEL1(D)	LEVEL 2	LEVEL3(3)	LEVEL3(4)	TOTAL	TOTAL (70)
None	0	0	2	0	1	3	4%
Little	2	2	5	2	4	15	21%
Some	4	5	10	4	5	28	40%
Experienced	2	2	5	3	4	16	23%
no entry	2	0	6	0	0	8	12%

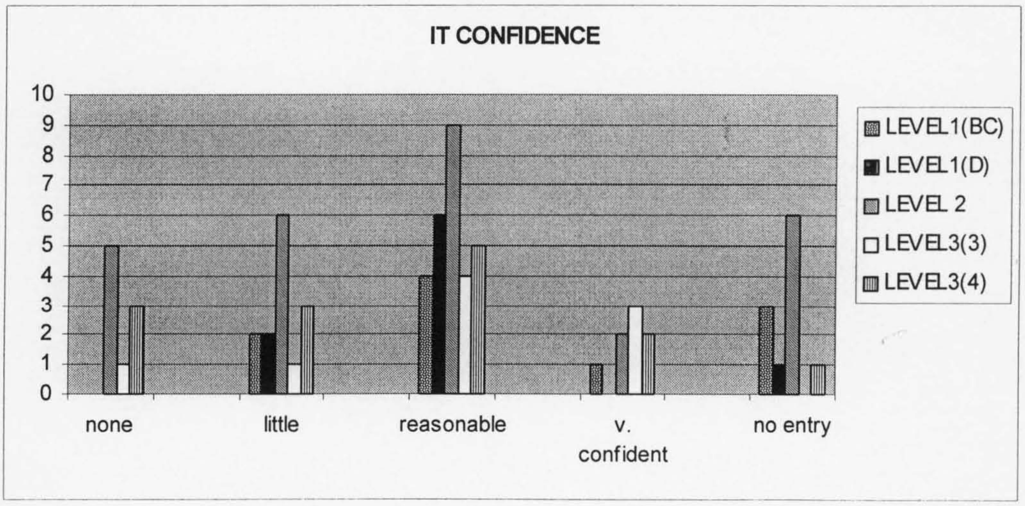
IT CONFIDENCE:							
	LEVEL1(BC)	LEVEL1(D)	LEVEL 2	LEVEL3(3)	LEVEL3(4)	TOTAL	TOTAL (70)
None	0	0	5	1	3	9	13%
Little	2	2	6	1	3	14	20%
Reasonable	4	6	9	4	5	28	40%
v. confident	1	0	2	3	2	8	12%
no entry	3	1	6	0	1	10	14%

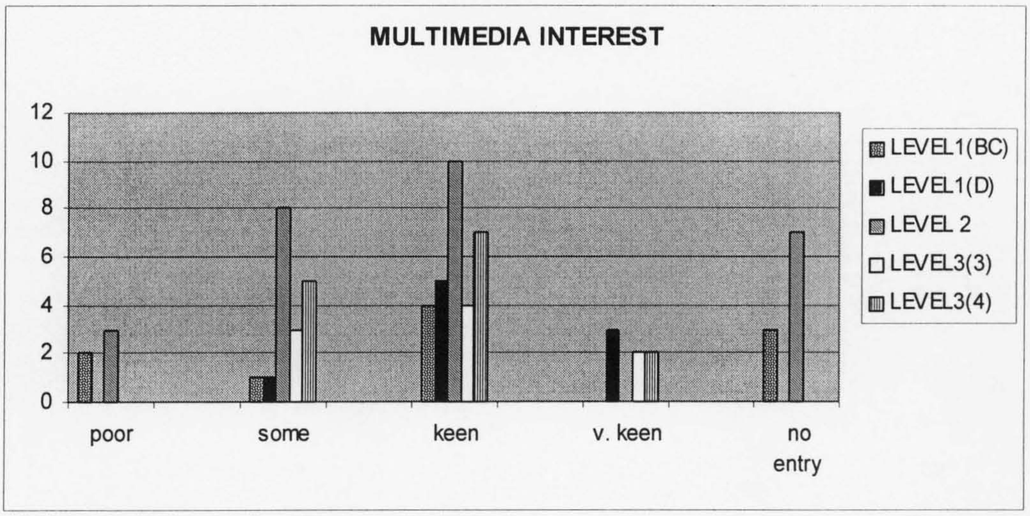
MM INTEREST:							
	LEVEL1(BC)	LEVEL1(D)	LEVEL 2	LEVEL3(3)	LEVEL3(4)	TOTAL	TOTAL (70)
Poor	2	0	3	0	0	5	7%
Some	1	1	8	3	5	18	26%
Keen	4	5	10	4	7	30	43%
v. keen	0	3	0	2	2	7	10%
no entry	3	0	7	0	0	10	14%

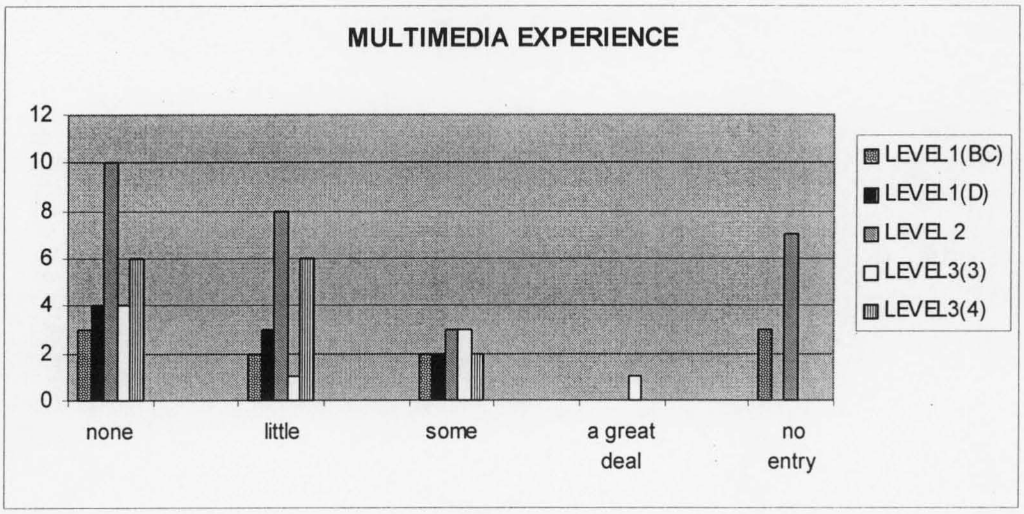
MM EXPERIENCE:							
	LEVEL1(BC)	LEVEL1(D)	LEVEL 2	LEVEL3(3)	LEVEL3(4)	TOTAL	TOTAL (70)
None	3	4	10	4	6	27	39%
Little	2	3	8	1	6	20	29%
Some	2	2	3	3	2	12	17%

a great deal	0	0	0	1	0	1	1%
no entry	3	0	7	0	0	10	14%









RETURNED QUESTIONNAIRES				
		TOTAL NUMBER	RETURNED QUEST	%
LEVEL 1	BC	41	10	24%
	D	39	9	23%
LEVEL 2		73	28	38%
LEVEL 3	3	24	9	37%
	4	34	14	41%

RETURNED QUESTIONNAIRES				
		TOTAL NUMBER	RETURNED QUEST	%
LEVEL 1		80	19	24%
LEVEL 2		73	28	38%
LEVEL 3		58	23	40%

17.1.1 Student Questionnaire

Multimedia Applications For Learning French

Are you interesting in multimedia? Do you want to know what kind of MM software is available in languages and in French in particular? Would you like to try out some of these programmes and give me your views on them? If the answer to these three questions is yes, read on, fill in the questionnaire and return it to Dominique Hémard (CS212 or pigeon hole in Departmental Office)

Foreword

Multimedia applications, from data bases to interactive software, are increasingly introduced into higher education and made available on CD-ROMs. This recent trend is beginning to be felt in language studies and this department is currently holding a small collection of multimedia titles in French, German and Spanish such as *Télé-Texte*, *TV und Texte* and *Learn to Speak Spanish.* However, whilst this technological/commercial drive is gathering its own momentum, too little research into Human-Computer Interaction is carried out to provide valuable, domain-specific, support for designers or academic authors. As a result, the emphasis is often placed on the functionality and entertainment value of MM applications so as to increase their market potential, disregarding in the process the necessity to cater for clearly identified users, in this case you as students, your needs and aims and objectives to meet such needs. It is my view that if designers/authors knew more about users/students' perceptions, apprehensions and interpretations prior to and whilst interacting with the design model, the resulting interface would dramatically improve.

Therefore, it is my intention to organize a number of sessions, during the timetabled open access slots in Language Laboratory 1 (CM213), to allow you to practise with our MM software held in French and give me your impressions, reactions and thoughts on the usefulness and validity of those applications you'll have interacted with.

Please circle as appropriate:

Name:				
Level:	1	2	3 (year 3)	3 (year 4)
French unit:	BC	D	F	H
Computer skills:	None	Little experience	Some experience	Experienced

IT confidence:	None	Little	Reasonable	Very confident
MM interest:	Poor	Some	Keen	Very keen
MM hands-on exp.:	None	Little	Some	A great deal
Availability:	Tuesday 12-2pm	Wednesday 12-2pm	Thursday 12-2pm	Fri 2-4pm
Possible starting date:				
Suggestions Information requests (if any):				

17.2 Appendix 2: User Walkthroughs

17.2.1 Télé-Textes

Recording sheet for User Walk-Throughs

Software:	**Télé-Textes**				
User(s): Group (a)	**no: 2**	**level: 3**	**IT exp: good**	**MM exp: some**	**confidence: high**
Type of Session:	**Exploratory**				
Length of Session:	**1 hour**				
Date:	**7th November 1996**				

Action Taken	Outcome of Action	Observations
Students are given a short introductory presentation about Télé-Textes including the intended level of linguistic competence, target users and the underlying content and purpose of the exploratory session. In particular, students are told that they should focus their attention around the video interactive parts of Télé-Textes which is multimedia as opposed to hypermedia For this user walkthrough student A agreed to be the mouse-holder and B therefore the non-mouse-holder. Role changes will be indicated. The Windows interface is on Program Manager showing Group Icons.		
Click on group icon Télé-Textes in Program Manager.	Group window opened.	A (rehearsing what is required of them in this user walkthrough) Do we simply open the program and do what we like? Are you checking up on us? Do we get a mark for it (laughters). (Experimenter explains the purpose and rules of the user walkthrough again to reassure the students who are somewhat circumspect. B wants to know what her rôle will be since she does not have control over the mouse. The experimenter stresses that her rôle is vital insofar as the verbal exchange between both students is as important as the interaction with the computer itself since it is essentially this type of data which is being captured).
Click on Télé-Textes icon.	Introductory window of system is displayed with visual animation and sound track.	A: This looks good B: Yeah! almost professional! Makes a change from what we're used to!
Click randomly on collection of miniature pictures displayed on the left hand side over a third of the screen.	Nothing happens.	A: OK may be it's not as good as it looks! B: Can't you adjust the contrasts? It's all a bit bland. (Attempts are made to adjust colours and contrasts) A: It hasn't made much difference!
Click on main picture frame repeatedly.	Nothing happens.	A: Looks like a dead duck! B: you mean a dodo!
Random screen scanning with mouse pointer.	Windows-standardized explanations appear at bottom of the screen corresponding to areas scanned.	A: (pointing at explanations) That's a nice touch. It's consistent with the Windows environment. B: I suppose you need to click on "Ouvrir Introduction".
Click on "Ouvrir Introduction".	Introductory video played in main video frame.	A: Is she a real news presenter? Looks quite authentic. B: Don't know. She looks like a speakerine to me! (video watched until the end). A: What do we do now? B: Click on a Dossier? They could say what they are!

		A: They all disabled! You're sure?
Click on "Dossier 1".	New introductory window of Dossier 1 appears.	A: It looks as though we have a choice between two lessons. B: What don't you click on "Inondations en Corse".
Click on "Inondations en Corse".	Nothing happens.	A: Obviously they don't know about hypertext links. That's bad. B: It's because it's at the bottom (pointing).
Click on "Ouvrir Dossier 1".	New Dossier 1 window appears with introductory paragraph and strategy of dossier.	A: OK but that's bad design (A + B quicky read /scan written explanations) A: Let's see some pictures now B: Hang on, don't they tell you what to do here. (Strategy read but simply dismissed at this stage for merely giving advice).
Click on "Inondations" icon.	Nothing happens.	A: It's not hypermedia and it's not much multimedia either! Why bother with pictures if they don't do anything! B: It's this funny filing system that they use. Pretty odd. In fact, it looks very old fashioned.
Click on title at top of display.	New window displays 4 separate areas on screen: Titles of films, video frame,	A: Gosh it's busy. B: What are we supposed to do now?
Click repeatedly on video frame.	Nothing happens.	A: I should have known. Are you recording all this? It's gonna look as though I don't know what I'm doing. B: Do you know what you're doing? A: How do get to see the video? By clicking on "les images"?. That's not very straightforward. B: What's this "Préparez-vous" stuff. (Both students quickly scan text in text box) A: They're just questions related to the topic. Look! they ask you to look up a map of Corsica!! Amazing! I thought that's what multimedia was all about!
Click on "les images".	New video control + customized buttons appear within same display.	A: This looks like it! You were right. How simple! B: OK, let's watch it. That's what we're here for!
Click on "Play" icon underneath picture.	Video switches into play mode.	(A+B watch video) A: Can't you get a better picture quality? It doesn't look as though it's well synchronized! B: May be we should have clicked on "Video oui/non"? (B takes control of mouse)
Click on "Video oui/non".	Moving picture disappears.	B: OK, this is no good (mouse back to A)
Click on "Video oui/non" again.	Picture restored.	A: What I don't understand is why we started half way through it, look at the cursor? B: Don't know. May be you can drag it back? or you must click on "Clip 1" or "Clip 2"?
Click on "Clip 1"	Video cursor moves back to clip 1 anchor point and starts the video where previously started.	A: Doesn't make any difference! I think it's wrong B: Try 2.
Click on "Clip 2"	Video cursor moves forward to second anchor point.	A: No, I told you, the first one is wrong. B (grabs mouse) May be you just move it manually.
Drag and drop video cursor to beginning.	Video film rewound whilst cursor moved back.	A: OK, but you shouldn't have to do it like that! There should be better controls. B: Yes, certainly more accurate.
Click on "Play" icon	Video switches to play	(A+B watch video)

again.	mode.	A: Let's try "Plein écran".
Click on "Plein écran".	Full screen version appears.	B: If you thought the quality was bad before, this is unwatchable! A: This is old bitmap technology. You can do a lot better now.
Click on screen.	Screen reverts back to previous interface.	B: Can we get subtitles? or some support or other ? A: It looks like a straightforward video with some related comprehension exercises. That's not what I would call multimedia!
Random clicking on headings of exercise files.	Video stops, different exercises appear in dedicated text box on right hand side of screen.	(Each time a new heading is selected A + B make an attempt to understand the gist of the exercise, scanning instructions or part of the text, but at this stage, no attempt is made to undertake any of the tasks). A: It's very much comprehension and vocabulary building... B: There is too much text to read and the presentation is pretty boring. A: Let's look at another video. B: How do we get out of here? A: There is nothing too obvious, we probably have to look at the menus. (A notices "Transcription" in menu bar) A: Look we didn't see this (pointing). May be that's where your subtitles are.
Click on "Transcription".	Transcription appears next to video frame.	B: OK but is it synchronized with the video or just sitting there?
Click on "Play".	Video plays.	A: Doesn't look like it B (with mouse): I suppose you're expected to scroll down the text as required! It's not very good, though it's better than nothing. A: Let's try something else.
Click on "Fichier" then on "Sortir Dossier".	Introductory display appears.	A: Let's watch another one quickly. I'm gonna have to go soon. B: Me too.
Click on "Dossier 4" then 5, then 6 to settle for 7.	New Introductory dossier interface appears.	A: Forget about the strategy B: Choose the goldfish!
Click on "L'histoire d'un poisson rouge".	New interface appears with video frame.	A: Look it's different from the other one. Talk of consistency! B: At least it's clearer. Click on "Visionner clip".
Click on "Visionner clip".	Video plays.	B: See. It's better. I wonder why they have changed! (A + B watch video til the end commenting on the strange nature of the content) A: Must go now ...will do some more if you insist!
The experimenter tries to retain the students for a few more minutes to get an overall impression of how they perceived the application. They simply reiterate that it is not multimedia as they imagined it to be with greater interlinking and an enhanced visual support combining both audio + visual extensions. Overall, the students seemed to appreciate the authenticity of the video clips they saw, the idea behind the application but not the design of its interface and expected interaction.		

Recording sheet for User Walk-Throughs

Software:	**Télé-Textes**				
User(s): Group (b)	**no: 2**	**level: 3**	**IT exp: some**	**MM exp: none**	**confidence: low**
Type of Session:	**Exploratory**				
Length of Session:	**1 hour**				
Date:	**8th November 1996**				

Action Taken	Outcome of Action	Observations
Students are given a short introductory presentation about Télé-Textes including the intended level of linguistic competence, target users and the underlying content and purpose of the exploratory session. In particular, students are told that they should focus their attention around the video interactive parts of Télé-Textes which is multimedia as opposed to hypermedia (difference explained). For this user walkthrough student A agreed to be the mouse-holder and B therefore the non-mouse-		

holder. Role changes will be indicated. The Windows interface is in Program Manager showing Group Icons.		
Click (several times) on Télé-Textes Group icon til double clicking successful.	Introductory window appears with short clip and sound track.	(A + B take time to watch the screen) B (reading instructions on screen): "Ouvrir Introduction" or "Ouvrir Guide". I think we should look at the explanations first. A: I wonder if you can just click on things…
Click on main video frame.	Nothing happens.	
Click (repeatedly) on icons.	Nothing happens.	B: Why don't you try "Ouvrir guide". We won't waste our time that way.
Click on "Ouvrir guide".	Text appears in scrolling box where icons were.	A: You're right. (A + B read beginning of explanations). B: This looks helpful. (A scrolls for more text) B: Surely, we're not expected to remember all this, are we? A: Don't know, may be we can go back to it later on. We'll see. I suppose we should just click on "Ouvrir Introduction" as instructed.
Click on "Ouvrir Introduction".	Introductory video clip comes on.	(A + B watch silently) B: Looks good. A: could be interesting! (When video ends, the students don't know what to do and decide to read the explanations, still displayed, again. They then realize that they need to click on a numbered Dossier tab at the top of the screen).
Click on "Dossier 1".	Dossier 1 window shows topics. Guide is still on and displayed on screen.	A: That's quite good that you can have permanent explanations like that. B: Yeah. They don't say if we've got to look at the topics in any kind of order? A: We might as well try this one! I've got to click on "Ouvrir Dossier", haven't I?
Click on "Ouvrir Dossier".	Introductory Dossier 1 window displays information on topic + strategy of dossier.	(A + B read introductory material, ensuring it's understood) A: It looks simple enough! We're told to watch the video...I'm sure we can do that! B: I don't understand why it's recommended to watch it without the sound. A: Where do we go from here? B: I don't know. Try the tabs again. How about "Inondations en Corse"
Click on "Inondations en Corse" tab.	New window displays four separate areas on screen: titles of films, video frame, student pad and exercises.	(A + B carefully look at screen and automatically read the default "Préparez-vous!" text in exercise section. No attempt is made to answer the questions which are put to them). B: It's funny, we've lost the explanations...I'm not sure when. A: Anyway, we need to watch the video. May be we can manage that!
Click repeatedly on picture in video frame.	Nothing happens.	B: Try "Restaurer" maybe?
Click on "Restaurer".	Nothing happens.	B: obviously not...may be it's "Les images"?
Click on "Les images".	New controls + text appear.	A (reading text): How do you watch the video without the sound? B: It's got to be these buttons under the picture.
Click on "Audio oui/non".	Button highlighted.	A: It probably only works when the video in on.
Click on "Video oui/non".	Picture in video frame disappears.	A: My God! What have I done! B: It's designed so that you can watch the video without sound or listen to the sound without the pictures... Don't ask me why!
Click on "Video oui/non".	Picture restored.	A: OK. How do you get the thing to work? B: Try this button (icon displaying play sign underneath the frame).
Click on play button.	Video switches into play mode.	(A + B, relieved, watch the whole video without interruption, not holding mouse. B takes mouse when video is finished).
Click on play button again.	Cursor goes back to beginning and video is played again.	B tries different options by alternatively and repeatedly clicking on "Video oui/non", "Audio oui/non" and "Plein écran". A: With this quality, I don't think you need the whole screen.

		B: Yeah, it's pretty awful like this. (B goes back to original screen and gives mouse back). A (looking at text): What are we supposed to do with this? (Both A and B attempt to remember what they've seen).
Click in space between brackets in text.	Nothing happens.	A: Is this assessed? B: Doesn't look like it? Try another one.
Click on "Vrai ou faux?".	New text appears in exercise section.	B: It's all the same...Click on 1st sentence and vrai to see what it does.
Click on space for 1st sentence and "vrai".	Vrai is displayed between brackets.	A: What if it's wrong? Do we get corrections?
Click on "faux".	Faux appears straight after vrai.	A: Look at this...It can be both (A enters a succession of vrais and faux into the text, despondently). B: I think I've got the gist of it now. A: Have we got time for another video? B (looking at watch): I suppose so ....quickly. A: The problem is...I don't know how to.... (A + B watch screen, to no avail, A clicks on 1B "Chutes de neige inattendues" which is part of the same dossier.
Click on "Les images".	Video controls appear.	B: Look! Why don't you try "Visionner clip".
Click on "Visionner clip" button.	Video plays.	(A + B watch video, commenting this time on the content, snow, weaather etc) B: OK we're getting the picture... A to experimenter: How can you choose a video from another dossier? I don't know how you can get out of this. (Experimenter explains)
Click on "Fichier" in menu bar then on "Sortir Dossier".	Introductory display appears.	A: It's so simple when you've done it.... (A + B indicate that they have to go)
The experimenter manages to retain both students for additional information on their initial impression(s). A thought the video was good but not the questions since you could not work out what to do with them and they seemed to be boring. B also liked the video but thought the quality of the pictures should have been better. "What's the point of having a video if you can't even lip read!". Both agreed it was OK generally, and preferred to remain uncritical of the interface at this stage. However, they were not sure if the whole thing could not have been done just as adequately with a simple video tape and a few questions in class.		

Recording sheet for User Walk-Throughs

Software:	**Télé-Textes**				
User(s): Group (a)	**no: 2**	**level: 3**	**IT exp: good**	**MM exp: some**	**confidence: high**
Type of Session:	**Task 1**				
Length of Session:	**1 hour**				
Date:	**14th November 1996**				

Action Taken	Outcome of Action	Observations
Task 1: Select a Dossier, select small video excerpt in Studio Mode and record your own version of events.		
Both students could easily recall what their previous interaction with the application had been, albeit somewhat negatively. In this respect, they expressed their disappointment when reminded that this second user walkthrough was also based on Télé-Textes. This time the application is already loaded and its introductory interface displayed. B becomes mouse holder, A support member.		
Click on "Dossier 2".	Introductory window is displayed.	B: Do you fancy anything in particular? A: Nothing I can remember. Why don't you try all the dossiers and then

		we'll choose sth. (B systematically clicks on each Dossier to find out what the topics are from Dossier 1 to Dossier 7, remembering Corsica in 1 and the sick fish in 7, finally goes back to 3) B: why don't we go for "Le Karaoké", it could be fun. A: It depends on what we're supposed to do. If we need to record sth I won't do the singing!
Click on "Le Karaoké".	Nothing happens.	B: Hell, I forgot about that! A: I'm sure I would have done the same!
Click on "Ouvrir Dossier 3" at bottom of screen.	New introductory window with strategy of Dossier appears	(A + B cast an eye but do not seem to be convinced or overtly enthusiastic). A: Anyway, we've got sth specific to do (A + B look and ponder at the task script, looking puzzled) A: I don't understand what Studio Mode means for a start. B: I don't think we've come across this thing. We should be able to find it! A: Le rap might be more interesting! (pointing at file heading)
Click on "3C Le rap au festival de la danse de Montpellier".	New window appears with video frame + exercises.	(A + B look at screen in an attempt to jog their memory) B: OK, this looks familiar (scanning screen with mouse pointer). A: Let's watch the video... B: What is it again? A: I think you click on "Les images" (pointing).
Click on "Les images".	New video controls + customized buttons appear within same display.	B: I remember now...though not "Visionner clip..Did we have that? A: Can't remember...
Click on "Visionner clip".	Video switches into play mode.	(A + B watch the whole of the video) B: I like it! A: Yeah..but what's the point when the pictures like the lip movements aren't fast enough to be synchronized with the sound track...I'm sure you can do better now..(to the experimenter) How old is this software? (Date: 1995 on CD-ROM sleeve given to students). A: I'm sure the technology has moved on...
Click on "Visionner clip" again.	Video switches into play mode.	(A + B watch the video again but in a more fragmented fashion, dragging the video cursor several times to watch the dancers and concentrate on what they had to say) B: OK shall we get on with our task... A: Where is it?...With this design it could be anywhere.... A: That's probably it! (pointing at Ouvrir Studio 3C next to transcription in menu bar). B: I don't really understand the difference between functions there and on screen? A: I'm sure they didn't either!
Click on "Ouvrir Studio".	New dedicated Studio window appears with video frame + specific controls.	B: Nothing too obvious here! A: They don't have a clue. Why can't they use existing protocols for video recordings!
Click on "Ouvrir".	File location Dialog box appears.	B: Wrong! I thought Ouvrir meant opening the video! A: I think you click on play icon for this. You're right we haven't seen the video yet.
Click on "Cancel" then on Play icon underneath video frame.	Video is played.	A + B watch the whole clip (with comments) obviously interested in the subject matter and report. A takes mouse to click on counter, to no avail.
Click on "Début" repeatedly.	Counter reels numbers related to video frames	B: OK you can only select your extract by entering numbers. A: It's not that logical! It would have been easier to click on the selected

	when mouse button pressed. Sound stops when in process.	video clip and get beginning and end automatically. (A tries both Début and Fin repeatedly to get a feel for it. A: starts the video again to find out which clip they want to select. Début set at 660 and Fin at 760.
Click on recording button.	Pop-up box "Ready to Record insert" appears.	B: OK, since I navigate you do the recording! A: Smart! I don't know what to say. Should I pretend I'm some kind of journalist? (experimenter reassures student that the recording itself is not relevant to the interaction, therefore it could be anything he wanted) A: Can we play our insert once more, so that I can visualize the context better!
Click on "Cancel" in pop-up box then play button.	Pop-up box disappears + video plays at beginning of selection.	B: There must a way of watching the pictures without sound A: Wait til the end of this. It gives me some idea.
Click on Stop.	Video stopped.	B: This is bad. The video is completely ignoring the ending of our insert. What's the point then. A: Try clicking on Audio/video, though it looks disabled. B: Anything is possible with this system!
Click on "Audio/Video"	Video level disappears.	B: Is it what we want? A: I don't know. Play the video now.
Click on play.	Sound come on but not the pictures.	B: Brilliant! That's exactly the opposite! A: What's the point of having sound with no pictures! Amazing. If anything it should be the other way round.
Click on "Audio/Video" several times.	Video comes on and off until they reset the display to original position with sound + screen.	A: Forget it. Let's record sth and that's it!
Click on recording button.	Pop-up box appears.	B: OK, yes
Click on Yes.	Recording functions appear alongside the audio level.	B: It's so complicated A: I know. These controls are now standard. There is a protocol for recording. Obviously unaware of it!
Click on recording button again.	Button turns red, audio/video cursor moves down bar.	A (with microphone records sth, inconsequential, over the pictures as they unreel, both students have a laugh). A: And I don't want to listen to it again! B: This should be better integrated. Look the video should not go on like this!
Click on video cursor and drag back.	Video is rewound to desired point.	A: there must be a simpler and more accurate way. B: May be you have to click selection?
Click on play.	Video is played with sound.	(A + B listen, amused at recording but not impressed at all) B: This is a nice idea but it will never work! A: Anyway, this is it, we've done it....
In the discussion which ensues students reiterate their negative feelings towards the application and express the desire to look at another one if their participation and possibly motivation is still to be required. The message does not go unnoticed although a third session had been planned.		

Recording sheet for User Walk-Throughs

Software:	**Télé-Textes**				
User(s): Group (b)	**no: 2**	**level: 3**	**IT exp: some**	**MM exp: none**	**confidence: low**
Type of Session:	**Task 1**				
Length of Session:	**1 hour**				
Date:	**15th November 1996**				

Action Taken	Outcome of Action	Observations
Task 1: Select a Dossier, select small video excerpt in Studio Mode and record your own version of events.		
Both students could recall watching the video clip on the flooding in Corsica. They remembered the stunning visual impact these images had made on them. Students are reminded that this user walkthrough is equally based on the same application. This time it is already loaded and its introductory interface displayed. B becomes mouse holder, A support member. A + B discuss which dossier they should look at.		
Click on "Dossier 2".	New Dossier 2 window appears with list of topics covered.	A: Corsica again....why don't we look at them all. We might find something interesting!
Click on "Dossier 3" then 4, 5, 6, 7.	Lists of topics appear.	(B goes back to Dossier 4 on "Une nouvelle formation pour les femmes") A: OK, this looks interesting! B: Anything you want.
Click on "Ouvrir Dossier 4 C / D".	New introductory window with information and strategy appears.	(A + B spend a couple of minutes reading the two text boxes). A: Is it about the way the media process information? B: Possibly, but we're supposed to do something else.
Click on tab "Une nouvelle formation pour les femmes".	New window with video frame, word processor and exercise section appears.	A: Let's watch the video. I don't care what the task is. (A looking at screen) How did we do it last week? B: I remember we ended up clicking on image or something like that. A: That's great...because it's not there...
Click on picture.	Nothing happens.	A: We tried that last time.
Click on "Restaurer".	Nothing happens.	A: That too.
Click on all the tab in the exercise section.	New controls and functions appear when first tab "L'essentiel" activated.	A: It's not obvious...if they did it to discourage students from looking at the video... B: I think it's too confusing.
Click on play underneath video frame.	Video gets into play mode.	(A + B watch the whole of the video, hardly any time is spent looking at the text, information and verifications in the exercise section). A: The material is good B: Yeah, what do we do now! (A + B look at task but admit they don't understand it, experimenter explains that the application enables them to be more pro-active and edit the soundtrack of a small section of the video in the recording studio mode).
A + B look at screen in an attempt to find recording functions. B clicks successively but unsuccessfully on video frame, "ouvrir" button in student word processing notepad (then cancelling subsequent dialog box), Video oui / non (on /off), Audio oui / non and Restaurer before giving up. A tries clicking on number counter, on Couper, Copier et Coller. Experimenter points at menu in menu bar to students amazement since they did think it was part of the application.		
Click on "Ouvrir Studio 4D".	New dedicated Studio window appears with video frame + specific controls.	B: Interesting! A: What happens if you've never done any video editing? B: Presumably you set the beginning and the end of your extract and record something over it.
Click on "Début" (forward arrows). (action repeated	Counter reels numbers linked to video frames. Sound stops when in	B: I was right.

several times).	process. Pop-up box with message: "End must be greater than start" appears.	
Click on OK in pop-up box, then on "End" (forward arrows). Action repeated several times.	Numbers change as well as video frames.	A: It's quite good (A tries moving forward one frame at a time with mouse) B: I like the precision!
Same as above but this time trying to select a specific video extract.	Same as above. Selected numbers are 54 and 154.	(A + B discuss the pros and cons of different parts of the video, A notices "Afficher transcription" and suggests displaying the transcription on right hand side of screen).
Click on "Afficher transcription".	Nothing happens.	B: Isn't it what it's meant to happen? I don't understand! A: May be it's not available.
Same as above, several times.	Nothing happens.	(Experimenter gives clue)
Click on "Afficher user".	Text prompt appears in field.	A: What does this mean "Afficher user"? B: No idea. If it works it's the main thing!
Click on "Afficher transcription".	Transcription appears in text box.	A: OK lets try it out.
Click on play symbol.	Video clip starts at beginning corresponding to transcription but not chosen number.	A: It could be better synchronized! B: At least we've got the text. We can just read it out, can't we! (students show signs that they now want to complete the task as quickly as possible)
Click on recording button.	Message "Ready to Record insert" appears.	A: OK
Click on "OK".	Pop-up box disappears.	
Click on recording button.	Recording mode starts from beginning.	(A + B look at screen + attempt to use the microphone left on the table. Together, they mutter a couple of lines). A (whilst recording still on): Look the video goes on, we've already reached 185...it goes too fast. B: We probably selected only one sentence...but it's not sufficiently precise. Let's go back... A: I must stop now. B: Play it back for fun.
Drag and drop cursor and click on play button.	Original video is played.	A: The recording hasn't worked... (the experimenter gives another clue).
Click three times on recording selection to get to "ensemble".	New, brief recording can be faintly heard with video.	A: The original is better....Why do we bother.. B: Can we go now, pleased!
Experimenter tries to get an overall impression from the students. They liked it, thought the material was useful because seemed authentic and well done but did not quite understand how it was meant to be seriously exploited. They also said that they would simplify it and would use it in a classroom situation with a tutor to direct them and assess their work. The only thing they remembered was playing with the video without even checking up the information or the vocabulary.		

17.2.2 Up to Standard in French

Recording sheet for User Walk-Throughs

Software:	**Up to Standard in French**				
User(s): Group (a)	**no: 2**	**level: 3**	**IT exp: good**	**MM exp: some**	**confidence: high**
Type of Session:	**Exploratory**				
Length of Session:	**1 hour**				
Date:	**20th November 1996**				

Action Taken	Outcome of Action	Observations
The students are given a short introductory presentation of Up to Standard including level of lilnguistic competence, target users, underlying content and purpose of the exploratory session. For this user walkthrough, student A is the mouse-holder and B therefore the non-mouse-holder. Role changes are indicated.		
Double-click on icon in Group Window	Application entered. The screen displays the title page.	A: Nice deep blue! Good colours. Let's move on.
Click on "Move On" button.	Message appears: "Have you used the programme before and set up a password?"	A: No. I suppose you need to create your own file. B: Will you get this message each time you open the application? A: We'll soon see.
Click on No, enter password, click on Accept.	Original Introductory window displayed followed by the main Course Menu window.	A: Good. It pretty clear! Mind you the topics look rather basic. B: I suppose if it's for beginners it's to be expected! Didn't we use something like that before? with a similar menu? A: Possibly, I don't remember. How about "Relaxing at a café"? I feel in the mood!
Click on Unit 2	New Unit Menu displayed.	A: That's simple enough! B: It looks as though a unit is composed of 2 dialogues with support material.
Click on "Dialogue A".	Dialogue window appears.	A: The colours are excellent B: It's funny there isn't any sound? Is it on? (Experimenter confirms it is on).
Click on omnipresent picture at random.	Nothing happens.	A: So much for interactivity! Why do they display such a large picture if it's only cosmetic! B: How about clicking on characters at the bottom. (student tries unsuccessfully to click at random on the buttons showing characters' names). A: It's all pretty dead!
Click on "Listen" in activity.	Radio button linked to "Listen" which was already on stays on.	A: We're not making much progress! B: May be the Activity is simply where you select what you want. (student clicks on different settings such as Practise, Full Text etc. They both realize that it is only a selection process). OK, I give up. Where is it? Surely, it cannot be Exit or Move On? or can it? A: We could try Help.
Click on "Help F1"	Help text box appears with standard functions and features.	(The displayed text only gives information on the selection in Activity). A: (Reading and scrolling text) I can't see anything about navigation! B: Bizarre!
At this stage the experimenter explains that in order to enter the dialogue you must click on "Move On" as it is the device which takes you to the next window. The students seem rather put off.		
Click on "Move On".	New dialogue frame appears and displays the	A: (giggles) God! They could have found an authentic French speaker! B: Let's hear it again.

	first sentence of the dialogue with attached sound track.	
Click on "Hear Model".	Sentence read out again.	B: Amazing, may be it's easier to understand?
Click on "Next" (highlighted).	Next sentence appears with sound.	A: I suppose that in the listening mode that's about all you can do (student clicks at random on picture but also on sentences in dialogues, highlighting them in turn). B: You now have "Hear Model" and "Playback". It must be the same thing (student clicks on both options in succession and gets the same result each time) Confusing, isn't it? A: How do we go back to change the setting? B: Not a clue. There are no arrows, nothing!
Click on "Help"	Help box appears.	A: (reading and scrolling down text) It only gives you information on the displayed functions. Pretty much hopeless. B: Go to the end of it, you don't know. It's getting embarrassing ! (text scrolled from beginning to end and explanations about Exit found at the very end) A: I don't believe it! What! Exit means going back! I've never seen this. B: It's very misleading!
Click on "Exit".	Back to introductory Dialogue window.	A: OK, so you've only got Move on and Exit. B: Let's try practise.
Click on "Practise" and "Move On".	Dialogue frame appears with 1st sentence + sound track.	A: What's the difference! B: Can't see it. Click on Next to see.
Click on "Next".	New functions appear: standby, recording, finished, record	A: this is a bit weird, you know. There are conventions for sound recordings now! (student clicks on recording displayed in red but nothing happens, same with standby) B: It's got to be Record then.
Click on "Record".	Recording displays arrows intermittently lit showing recording is on.	(Experimenter prompts student to say something in the microphone) A: Do I really have to...1,2,1,2....(student reads out cue). B: It's still on! Stop it. It's going to be a funny recording!
Click on "Stop".	Recording mode stops.	A: Let's hear it then.
Click on "Playback".	Nothing happens then a faint voice + background noise.	A: I'm not impressed. You can hardly hear it! B: May be you need to shout in the mic. A: OK, I think we've got the picture. Let's move on as they say or exit to be more precise!!
Click on "Exit" twice.	Back to Unit Menu.	A: Are both dialogues the same? B: Probably, try it though.
Click on "Dialogue B".	New Dialogue window appears.	A: No, you're right! There is no difference. B: Let's try something else.
Click on "Exit" twice.	Back to Unit Menu.	A: We could look at the information at the top?
Click on "Cultural Information".	New text box appears (same functions as for Help).	A: That's quite good! It looks context sensitive. B: Yeah but it's all text based. I don't think much of the multimedia display!
Click on "Close" then Click on "Vocabulary"	New text box appears with choice between the 2 dialogues.	A: I think that's OK. (student clicks on dialogue A and a list of words appears with their translation). that's just what you need if you get stuck. B: I wonder what "Tips" is. (student takes mouse)
Click on "Tips".	New text box appears giving advice related to the interaction.	A: So there is a difference between the 2 dialogue after all and there is a suggested progression. B: Let's look at "Check your Progress".
Click on "check Your Progress".	New window appears displaying activities.	A: Let's give a go B: I've got to go.
Click on "Listening".	Listening frame appears.	A: Why is there always so much reading to do?! If it's clear it should be

		simple to explain. B: or even self-explanatory! (students read quickly what is required of them and click on "Move On".
Click on "Move On".	Listening exercise appears.	A: More reading! B: I think you just need to listen to the phrase and click on answers.
Click on "Play Phrase".	Phrase is read out.	A: That's a good comprehension exercise, I like it. B: It's quite clever.
Exercise is nonetheless interrupted because the students have to go. The experimenter still manages to extract a few off the cuff comments out of them on how they related and reacted to the software. The overall impression was rather positive. They thought the screen display was well designed and generally attractive apart from some crashing mistakes like move on and exit. They both thought it could have been more interactive with more functions and more user friendly commands.		

Recording sheet for User Walk-Throughs

Software:	**Up to Standard in French**				
User(s): Group (b)	**no: 2**	**level: 1**	**IT exp: some**	**MM exp: none**	**confidence: low**
Type of Session:	**Exploratory**				
Length of Session:	**1 hour**				
Date:	**20th November 1996**				

Action Taken	Outcome of Action	Observations
The students are given a short introductory presentation of Up to Standard including level of linguistic competence, target users, underlying content and purpose of the exploratory session. For this user walkthrough, student A is the mouse-holder and B therefore the non-mouse-holder. Role changes are indicated. Students are told that in order to start the application they need to double click on its icon.		
Double-click on icon in Group Window	Application entered. The screen displays the title page.	A: Double clicking is a real pain. I can never do it fast enough. B: You've just done it! A: Presumably, we move on.
Click on "Move On".	Message appears: "Have you used the programme before and set up a password?"	A: No, so let's do just that!
Click on "No".	Password box appears.	A: Can we type in anything we want? B: We must think of something we can remember, don't we?
Enter short name and click on "Accept".	Main Course Menu window displayed.	A: These are all the lessons, I suppose. B: Can we choose any of them, or should they be done in the order they are displayed? A: I don't know but it's quite likely. We could try help and see.
Click on "Help".	Help standard text box appears.	A: It doesn't really say, though it talks about language aspects situations, vocabulary and grammar. B: Why don't we try a few and see what they look like.
Click on Unit 4 "Finding Your Way".	New Unit Menu appears.	A: It's all explained in English. That's not too difficult! B: Why don't we try Dialogue B, just to be different.
Click on "Dialogue B".	Dialogue B introductory window appears.	A: The drawings are quite well done. It's a nice screen. B: What do we do now? A: Not much! I don't know. I suppose it's got to be somewhere in Activity. How about Practise?
Click on "Practise".	The "Practise" radio button comes on.	A: I don't mind, but it's not doing much. It's got to be something else. (student starts clicking at random) B: It could be "Move On" couldn't it, but we might get terribly lost if it isn't. (following much hesitation and stalling, experimenter confirms that B was right about "Move On").

Click on "Move On".	New dialogue frame appears and displays the first sentence of the dialogue with attached sound track.	A: OK, what are we supposed to do? B: May be you have to hear the model and repeat it?
Click on "Hear Model".	The previous phrase is read out again.	A: Obviously that's not it. It's probably Next.
Click on "Next".	The following sentence is displayed and read out.	A: It's a comprehension exercise isn't it? B: Give it another go.
Click on "Next".	The new sentence is displayed and recording functions appear.	A: You were right. We're asked to record this sentence. B: Exciting, come on do it!
Click on "Record".	Recording in process is displayed on screen.	(time elapses, student taps on microphone, then says something) A: I'm not sure about this. B: Do you think we can listen back? A: I don't know but it looks as though it's still on!
Click on "Finished" then "Standby".	Nothing happens.	A: OK that's not it, it must be "stop".
Click on "Stop".	Recording stops.	A: It's too complex really. B: Imagine doing this for the whole of the exercise! A: Let's try playback.
Click on "Playback".	Nothing can be heard then a muffled voice appears.	A: That's not my voice! It's terrible. OK let's try something else.
Click on "Exit".	Back one frame to the first dialogue frame.	A: I thought we would have gone back to the main menu. Strange! B: May be you need to do it again?
Click on "Exit".	Back one frame to the introductory dialogue window.	A: It's very slow. B: There must be a quicker way!
Click on "Exit".	Back to Main Menu.	A: Let's look at another one B: How about "Shops and Restaurants".
Click on Unit 5, Dialogue A, Listening mode.	Dialogue window, first and second frames of dialogue.	Students become passive listeners simply clicking on "Next" to hear the following sentences. B: (taking the mouse) I'm sure I saw that you get the whole dialogue continuously.
Click on "Exit".	Back to introductory dialogue frame.	B: See, let's try that (pointing at continuous mode).
Click on "Move On".	Dialogue frame appears and runs dialogue.	A: That's good. (After a few sentences the students try to exit the dialogue but they are locked in) B: What! We can't get out. We're forced to listen to the whole of the dialogue. How boring!
Click on "Exit" 3 times when dialogue finished.	Back to Main Menu.	A: That's enough for today B: Agreed.
The short discussion which ensued seemed to indicate that the students enjoyed "playing around" with the application. They thought it was colourful, well made and potentially useful for beginners. Asked why they left many areas unexplored, they said that what they had done was very time consuming and generally too fiddly for their own liking. Also, they had not felt the need (at this stage) to look at the references and the support material in general. When it was mentioned that the application contained exercises related to listening, reading, writing and speaking they looked baffled and said they simply did not know where they were "hiding", but it had to be an obscure place because they had no idea where such exercises were.		

Recording sheet for User Walk-Throughs

Software:	**Up to Standard in French**				
User(s): Group (a)	**no: 2**	**level: 3**	**IT exp: good**	**MM exp: some**	**confidence: high**
Type of Session:	**Task 1**				
Length of Session:	**1 hour**				
Date:	**27th November 1996**				

Task 1: Practise part B in Dialogue B of Unit 8 in continuous mode

Action Taken	Outcome of Action	Observations
Concise explanations related to the above task (steps and outcome) are provided to the student.		
Double-click on icon in Group Window	Application entered. The screen displays the title page with the message: "Have you used the programme before and set up a password?".	I suppose so! It's a bit tedious I must say!
Click on "Yes".	Password text box appears.	I can't remember what it was (exchange of words with fellow student).
Type password and click on "Accept".	Main menu window appears.	So what do I have to do? Select Unit 8.
Click on button labelled "8. Banking".	Unit 8 introductory window displayed	Good! I'm going to select Dialogue B
Click on button labelled "Dialogue B".	Dialogue window displayed	Fine, no problem. I quite like this design. I now need to select Continuous in Run Mode
Click on Continuous	Adjacent radio button highlighted	OK. I also need to select Practise and the character...Character B seems to be already selected...
Click on Practise.	Radio button highlighted	I probably need to click on Move On. I know I have already said it but who could have designed something like that!
Click on Move On	Dialogue window appears with sound track of first cue. Standby is highlighted.	What do I do now? I need to record the next line don't I?
Click on "Record".	Display unchanged.	That's a silly display. Why isn't it displayed underneath the dialogue? Anyway, I'm not getting anywhere! Ah! I know where to click! Silly me!
Click on button adjacent to "Record".	Display shows recording in progress.	(Student takes microphone, tries it, realizes that it is connected).
Reading out cue using microphone	Recording in progress.	Is this it? I'm being recorded? What am I supposed to do? (fellow student mentions that everything that is said might be recorded).
Click on "Finished"	Recording still flashing.	What's going on?! Ah I get it! It's got to be "Stop". What a dreadful design!
Click on "Stop".	Dialogue window gets back into listening mode, displays new cue with its sound track and toggles back into recording mode (standby highlighted).	I'm beginning to get the hang of it. But God what a bizarre setup. What do I need to do? Play it back? But I can't. (student clicks onto phrase to highlight it but to no avail). I don't believe this. I can't do anything. I can only go forward. (student clicks on "Record" to repeat the operation, then clicks on "Stop" and arrives at the same conclusion as previously). This is crazy. I can't even get out. "Exit" doesn't work neither does the control menu....(student then records following three cues in an automated way and frustrated by the operations and length of exercise decides to click on control menu box of window)
Click on "Close" in Control Menu box.	Back to Program Manager.	There is definitely something wrong with it. Anyway, there you are. Task completed...not terribly sure it was that useful...

In the very brief discussion which followed, the student expressed a degree of frustration essentially stemming from what was regarded as an unnecessarily complicated functionality when it would have been much simpler to have adopted the well known, recognizable conventional protocol for recording. As a result, it was felt that the technology had not enhanced the presentation of the data nor the expected interaction.

Questions:	Answers: (circle as appropriate)			
Do you find the task:	easy	difficult		neither √
Why?	simple	usability of application √		complex
Is this kind of interaction:	useful	interesting		boring √
Does the task fit in within the learning strategy of the application?	very clearly √	possibly	not clearly	not at all
What could be its most obvious learning outcome?	vocabulary √	pronunc. √	contextual knowledge	writing skills
Any other relevant views on given task?	Frustrating due to limitations but also unnecessary complexity of presentation.			

Recording sheet for User Walk-Throughs

Software:	**Up to Standard in French**				
User(s): Group (a)	**no: 2**	**level: 3**	**IT exp: good**	**MM exp: some**	**confidence: high**
Type of Session:	**Task 2**				
Length of Session:	**1 hour**				
Date:	**4th December 1996**				

Task 2: Practise the Writing Exercise Level 2 of Unit 8 and check your results.		
Action Taken	**Outcome of Action**	**Observations**
Concise explanations related to the above task (steps and outcome) are provided to the student.		
Double-click on icon in Group Window	Application entered. The screen displays the title page with the message: "Have you used the programme before and set up a password?".	OK...
Click on "Yes".	Password text box appears.	If anything I'll probably end up remembering it!
Type password and click on "Accept".	Main menu window appears.	You want the same unit? OK So much for change! The red slider next to it must indicate that I have already gone into it. That's good. It keeps track of what you've done. Mind you, it shows I have done half of it, which is not quite accurate.
Click on "Unit 8. Banking".	Unit 8 Introductory window displayed.	I don't want the dialogue...It must be in "Check Your Progress" if I remember well.
Click on 'Check Your Progress'.	New window appears displaying the four types of exercises.	There we are...and it's the writing exercise I want..Level 2.
Click on 'Writing'.	New Writing window appears displaying a text with gaps and instructions in English in	This looks straight forward enough (student peruses over instructions). It's very much the kind of gap-filling exercise we used to do in the good old days...You can click and drag! That's pretty good.

	text boxes.	
Click on "Move On".	Instructions are replaced by a list of words in a new text box.	Let's try clicking on a word and dragging it to a gap. (student reads text and hesitates over choice of word in the first sentence, then opts for second one which is easier.
Click on, drag and drop "pas".	Word is highlighted and pointer changes to a missive suggesting the post. When word placed over gap, a frame appears focusing on the gap. Word is lodged in gap.	I quite like that. I like the way the pointer changes. I'm not sure, though, if I like the font they have chosen. You get the impression it's typed on a real page. It's odd. I think you must decide if it's multimedia or not. (student sufficiently motivated to complete the whole exercise which comprises 10 gaps). That's also good (pointing at remaining words). They have given you more words than you need.
Click on 'Finished'.	A Model Answer text box appears on screen next to original text with a score in the top right hand corner (10/10)	(Congratulated by fellow student) What would have happened if I had got it wrong? (student by then feeling very confident clicks on Start Again but it is disabled, Exit, Writing and Move On. Two wrong words are entered then student clicks on "Finished". The model answer box appears and give all the answer with a score of 0). I don't think it should give you all the answers straight away. It shows its limitations...I think it would be nice if answers and explanations were given as you progressed.
Click on "Exit" (three times).	Back to Main menu.	Amazing that you can't get back to the main menu more quickly!
In the discussion which took place after the user walkthrough, the student expressed a reserved liking for the application. On the one hand, efforts had clearly been made to clearly and concisely present the data on screen using and making the most of the windows-based techniques, on the other, it was felt that the multimedia presentation was never anything more than a camouflage hiding a traditional, uninspired and, at times, deficient approach to language learning.		

Questions:	Answers: (circle as appropriate)			
Do you find the task:	easy √	difficult		neither
Why?	simple √	usability of application √		complex
Is this kind of interaction:	useful √	interesting √		boring
Does the task fit in within the learning strategy of the application?	very clearly √	possibly	not clearly	not at all
What could be its most obvious learning outcome?	vocabulary √	pronunc.	contextual knowledge	writing skills √
Any other relevant views on given task?	Quite an enjoyable task although what it is supposed to do to writing skills is not known.			

Recording sheet for User Walk-Throughs

Software:	**Up to Standard in French**				
User(s): Group (b)	**no: 2**	**level: 1**	**IT exp: some**	**MM exp: none**	**confidence: low**
Type of Session:	**Task 1**				
Length of Session:	**1 hour**				
Date:	**27th November 1996**				

Task 1: Practise part B in Dialogue B of Unit 8 in continuous mode		
Action Taken	**Outcome of Action**	**Observations**

Concise explanations related to the above task (steps and outcome) are provided to the student.		
Double-click on icon in Group Window	Application entered. The screen displays the title page with the message: "Have you used the programme before and set up a password?".	Of course! (showing confidence)
Click on "Yes".	Password text box appears.	OK. I need to type my password again? I wonder why really? Is it top security?
Type password and click on "Accept".	Main menu window appears.	I remember this. I'd quite like to try something else. Do I really have to choose Banking? Boring!
Click on button labelled "8. Banking".	Unit 8 Introductory window displayed.	So now I need to do Dialogue B.
Click on button labelled "Dialogue B".	Dialogue window displayed.	These pictures, funny aren't they! What do I do now? Practise part B. Where the hell is that? (fellow student helps).
Click on "Character B" repeatedly.	Nothing happens for radio button disabled.	I keep telling you. It never works with me! (consultation between students follows) Let's try Practise then and see.
Click on "Practise".	Radio button highlighted enabling all the selections.	See this! (student clicks several times on both Listen and Practise to see how it changes the display of the commands). I get it! You can only choose what you want if you're going to practise with it.
Click on "Character B".	Radio button highlighted.	There you are! Dead simple. Let's get on with it.
Click on "Move On".	Dialogue window appears with first cue read out.	OK. This must be the tricky bit. I click on Next don't I. (At this stage, the student is reminded that the exercise has to be done in Continuous mode....student unhappy goes back to previous set up.
Click on "Exit".	Back to previous set up window.	Right! Where is it then? Silly me.
Click on "Continuous".	Radio button highlighted.	Enough time wasted!
Click on "Move On".	Dialogue window appears with first cue read out followed by second cue in standby mode.	This is where the fiddly bits are! I can't remember exactly what's got to be done at this stage....I suppose practise means recording...doesn't it?!
Click on "Record".	Recording in progress displayed by flashing arrows.	Student hesitant, picks microphone, reads out cue of character B recording following comments). Beautifully said... don't you think...what do I do now....click on stop.
Click on "Stop".	Recording stops, next cue comes on screen read out followed by B's and the standby mode.	Hold on! Why is it going so fast...can't I listen to the recording to know what it sounds like? What's the point then...I don't understand. (reluctantly the student carries on)
Click on "Record".	Recording in progress is displayed.	Student records cue speedily.
Click on "Stop".	Recording stops as above.	Very funny...OK. I think I have completed the task? Yes...That's good enough for me (student tries clicking on Exit but a warning sound indicates that this function is not available. I remember it happened last time too..OK. How about skipping then? Hope you don't mind.
Click on "Skip" several times.	Recording skipped jumping to the following cue etc. til the end of the dialogue.	I know it's cheating but I honestly can't see the point...(when exercise is finished student clicks on Exit).
Click on "Exit" three times.	Back to the Main menu window.	How could you use something like this in class. If you used it by yourself you wouldn't have these types of tasks? I'm not sure what value it has!
In the discussion which followed the student (supported by fellow student) indicated that the point of the exercise (and		

therefore the task) had been missed. It was easier to understand and use the commands and felt less fiddly than previously but set as it was, it had little obvious purpose. Finally, it was felt the presentation was as artificial as that of a language laboratory exercise and as such was not particularly stimulating.

Questions:	Answers: (circle as appropriate)			
Do you find the task:	easy	difficult		neither √
Why?	simple	usability of application √		complex
Is this kind of interaction:	useful	interesting		boring √
Does the task fit in within the learning strategy of the application?	very clearly	possibly	not clearly √	not at all
What could be its most obvious learning outcome?	vocabulary	pronunc.	contextual knowledge	writing skills
Any other relevant views on given task?	I didn't quite see what the outcomes were.			

Recording sheet for User Walk-Throughs

Software:	**Up to Standard in French**				
User(s): Group (b)	**no: 2**	**level: 1**	**IT exp: some**	**MM exp: none**	**confidence: low**
Type of Session:	**Task 2**				
Length of Session:	**1 hour**				
Date:	**4th December 1996**				

Task 2: Practise the Writing Exercise Level 2 of Unit 8 and check your results.		
Action Taken	**Outcome of Action**	**Observations**
Concise explanations related to the above task (steps and outcome) are provided to the student.		
Double-click on icon in Group Window	Application entered. The screen displays the title page with the message: "Have you used the programme before and set up a password?".	Yes I have. OK
Click on "Yes".	Password text box appears.	OK.
Type password and click on "Accept".	Main menu window appears.	OK. I need to go to Unit 8. Not the same one! Please...Couldn't we do something else!
Click on "Unit8. Banking".	Unit 8 Introductory window displayed.	(student looks at task) Practice the Writing Exercise Level 2...I haven't the faintest idea where that can be. Was there something I missed in the dialogue?
Click on "Dialogue B".	Dialogue Introductory window displayed.	(student scans the screen display with mouse pointer) I can't find anything here! (fellow student: It couldn't be in "Notes" by any chance!
Click on "Notes".	Pop-up Notes box appears.	It doesn't look like it does it? (student scrolls down text). This is quite interesting, I hadn't realized.. but it's not what I am looking for. I don't know it might be further on. I could try the practise mode again.
Click on "Close" and "Move On".	Activity window appears.	No, it's exactly the same. I would have surprised. I think I have tried everything haven't I (student getting annoyed - experimenter suggests a closer look at the unit menu: in particular "Check Your Progress")
Click on "Exit" twice.	Back to Unit menu.	Is it really? I would never have thought that it could be this...It's a

		strange way of showing exercises.
Click on "Check Your Progress".	New window appears displaying the four types of exercises.	At long last! What is it I want? the writing exercise, Level 2, OK.
Click on "Writing".	New Writing activity window appears displaying text with gaps and instructions in English in text boxes.	(student reads instructions carefully) We do this type of exercise in the lab! How boring! Mind you, at least it doesn't seem to be too difficult!
Click on "Move On".	Instructions are replaced by a list of words in a new text box.	(student reads the text with gaps and tries clicking in a space to select it). OK, this isn't the way to do it..What did they say...I can pick the word and place it over the space?
Click on "a" in list of words.	Word is highlighted and pointer changes to a missive held by a hand. Word dropped when hand over space prior to showing selecting frame. Word does not stay in place.	That's not it either. Obviously it doesn't want to stay there. It is correct though! (fellow student suggests trying again).
Click on "a" in list of words.	Word is highlighted and pointer changes to a missive held by a hand. When word placed over gap, a frame appears focusing on the gap. Word is dropped onto space and stays in place.	You were right! It works (both students get involved in completing the exercise mastering in the process the click, drag and drop method both ways: to fill all ten gaps the students carry out 15 drag and drop actions from the list to the text, both ways, and 4 within the text itself.
Click on "Finished".	A model answer appears on screen next to the original text with a score in the top right hand corner of 8/10.	Hang on! What's that! Were did we go wrong? (students compare both text carefully, grudgingly agree and click on Exit.
Click on "Exit" twice.	Back to Main menu.	That was quite good I thought.though it takes some getting used to!
In the discussion which followed the student indicated that it had been a useful exercise which, despite the initial difficulty of finding it, was well designed.		

Questions:	Answers: (circle as appropriate)			
Do you find the task:	easy	difficult		neither √
Why?	simple	usability of application √		complex
Is this kind of interaction:	useful √	interesting √		boring
Does the task fit in within the learning strategy of the application?	very clearly √	possibly	not clearly	not at all
What could be its most obvious learning outcome?	vocabulary √	pronunc.	contextual knowledge	writing skills √
Any other relevant views on given task?	There is nothing you can't do in a lab but I suppose the mouse makes it easier. I like the fact that you don't have to write anything and that it gives you all the answers.			

17.2.3 A la Recherche d'un Emploi

Recording sheet for User Walk-Throughs

Software:	**A la Recherche d'un Emploi**				
User(s): Group (a)	**no: 2**	**level: 3**	**IT exp: good**	**MM exp: some**	**confidence: high**
Type of Session:	**Exploratory**				
Length of Session:	**1 hour**				
Date:	**27th January 1997**				

Action Taken	Outcome of Action	Observations
Students are given a short introductory presentation about A la Recherche d'un Emploi including intended level of linguistic competence, target users, underlying content and purpose of the exploratory session. For this user walkthrough student A will be the mouse-holder and B therefore the non-mouse-holder. Role changes will be indicated.		
Click on icon.	Software loaded (takes what appears to be a long time). Text box appears on background.	A: God, it's taking ages! B: Are you sure it's working? The screen looks frozen! A: No, look the timer is on...it's coming now!
Enter name for personalized directory.	Name typed and entered. New Text box "Password" displayed.	A: I imagine you can save your work afterwards. B: Do you have to do this each time? A bit of a bind!
Enter password.	Password entered. New introductory window appears.	A: Gosh! That's a terrible colour scheme! B: Yeah, pretty awful!
Click on button "Commencer".	Main menu displayed	A: That's clear enough! B: That's not bad. You get some kind of a picture of what's in it.
Mouse pointer scanned over window.	Displays additional information in box when pointer meets "unit" box.	A: That's good though it's not telling us much. Will it show us how to get a job? OK let's look at CVs, it could be useful. B: I like it, that's quite neat.
Click on "Unit 2: Lettres et CV".	New Unit Menu displayed presenting 6 activities.	A: OK, I don't really know... Let's choose "Choisir les éléments d'un CV" if that's OK? B: Yeah, I don't mind. It's pretty straightforward so far.
Click on "Activité 4: Choisir les éléments d'un CV".	New window displaying interactive exercise based on selection of items in CV.	A: What's that! Are these official guidelines for CVs? Is all this standardized? I think it's a bit Mickey mouse really! B: I'm not sure what you're supposed to do.
Click mouse pointer over one item.	Item highlighted.	A: I'd imagine it's a drag and drop job.
Drag and drop item	Item positioned in right window.	A: That's fine! but I don't know how valid this is or if this would help me write my own CV. B: You should be able to do your own really.
Click on enabled arrow at bottom.	Taken back to Unit Menu.	A: OK, let's try the main menu again.
Click on button displaying diagram.	Taken back to Main Menu.	B: Let's try something else! How about l'itinéraire...?
Click on "Unit 1: L'itinéraire de deux chercheurs d'emploi".	New Unit Menu displayed showing 3 sequenced activities.	A: Let's look at the video then. Do we have a choice?
Click on "Activité 1: Vidéo: interview de deux chômeurs".	New window displayed designed to choose a character	A: God! These cartoon characters are appalling! B: I don't know. They're cheerful enough! A: OK how about Gérard?

Click on Gérard	New Video window displayed showing small screen with controls.	A: It's a very small screen! It almost defeats the object of the exercise! B: I don't think much of the controls either, look you can't even see if it's on or not.
Click on Play	Film comes on small screen.	A: Play should be highlighted when it's on. I think it's too small to be useful. B: Sound and images are not terribly well synchronized either!
Drags cursor to beginning.	Lack of response from software.	A: There is no way I can go back to the front directly? These controls are not sensitive enough! B: May be it's a bit slow. (B tries with mouse button but to no avail, then gives mouse back to A) A: The quality isn't too bad but I'm not that impressed. Should we try something else?
Click on Main Menu button.	Taken back to Main Menu.	A: Let's look at the database.
Click on "Culture".	New "menu général" displayed.	A: Ah! That's very good!
Click on "Les études"	Menu box appears	A: Excellent! B: Let's see "Enseignement supérieur" we could learn something!.
Click on item: "Enseignement supérieur"	New box displayed showing detailed diagram.	A: Shame about the colours. You can't even read some of the boxes! But that's really useful! B: Mind you it feels tacked on to it. Would I really want to go into this application if I wanted this type of information? Probably not! A: Let's try something else.
Click on arrow.	Taken back to Main Menu.	A: Let's try "Grammaire".
Click on "Grammaire".	Grammar box displayed showing contents page.	A: Let's click on "L'adverbe". I must admit I find it difficult to understand why it's there at all! Why would I want to know something about adverbs now or during the interaction is beyond me! B: You never know! It might be all linked up!
Click on "L'adverbe".	Small box shows 3 items.	B: Let's go for "Accord".
Click on "Accord"	New box gives definitions.	A: Not only I cannot see the logic of having this here, I think the design is pretty awful. It's just like a book and they don't even provide exercises! B: I think it could have been made more interactive with exercises for instance. A: I think I've seen enough of this!
Click on arrow	Back to Main Menu	A: What shall we do? B: We could try "Lexique".
Click on "Lexique"	New box showing content of database.	A: The design is consistent with "Culture". Good. I think that is excellent. B: Mind you I don't quite understand "Réseaux". Try it to see what it's like!
Click on "Embaucher" in "Réseaux"	New box displayed showing diagram with ramifications.	A: I reserve judgement on the design but this is quite good for synonyms. These symbols are not entirely clear. B: Gosh, it's a bit too fanciful for me!
Mouse pointer dragged over the box	Symbols highlighted and explained.	A: I'm not sure these links help. B: May be not in this form?
Click on "Explications"	New box appears with explanations	A: My god! the colour shading scheme was wasted on me! I wouldn't have noticed it. B: I still think these symbols are a little bit feeble!
Click on arrow	Back to diagram.	A: It would take some getting used to! May be it's not a bad idea after all!
Click on arrow	Back to Main Menu.	A: From what I've seen of it, I must admit I don't know yet what it's

		trying to achieve. Is it supposed to teach you French or help you find a job? B: It's too soon to say. I can't make up my mind yet if I like it or not. It's a bit depressing as a topic!
A: I didn't know what to expect but I'm not much further advanced. I can relate to the context within which the interaction is taking place but I can't quite see what I could gain from it or how I could get too excited about it if I had to use it on my own. B: At the same time, you must admit there are some good ideas like the database on Culture or the vocabulary and they give you menus and explanations. A: It's meant to be a multimedia or hypermedia system but, from what we've seen, the multimedia add-ons like the video feel inadequate and even unnecessary.		

Recording sheet for User Walk-Throughs

Software:	**A la Recherche d'un Emploi**				
User(s): Group (b)	**no: 2**	**level: 3**	**IT exp: some**	**MM exp: none**	**confidence: low**
Type of Session:	**Exploratory**				
Length of Session:	**1 hour**				
Date:	**27th January 1997**				

Action Taken	Outcome of Action	Observations
Students are given a short introductory presentation about A la Recherche d'un Emploi including intended level of linguistic competence, target users, underlying content and purpose of the exploratory session. For this user walkthrough student A will be the mouse-holder and B therefore the non-mouse-holder. Role changes will be indicated.		
Click on icon.	Software loaded (takes a long time). Text box appears over background.	A: Have I done something wrong? Nothing is happening. B: don't worry, with me computers crash all the time! (Experimenter explains that it is taking a little while for the software to be loaded and that nothing is wrong, then the next frame appears) A: Do we just type anything in? B: I suppose so. How about Ken?
Enter name for personalized directory.	Name typed and entered. New Text box "Password" displayed.	A: What next! I don't have a password!! B: Should we have been given one? (intervention by experimenter) A: This is highly personalized!
Enter password.	Password entered. New introductory window appears.	A: It's all happening!
Click on button "Commencer"	Main Menu displayed	A: That's quite good. Presumably you just click on one of them to go into a unit. May be I should look at "Instructions" first. B: Is it "Instructions" or "Aide"?
Click on "Instructions"	Box displayed containing brief instructions.	A: You see! That's exactly what I said! B:Let's click on Unit1, it might make sense and it might tell us something about them. A: Do you reckon units have to be done in any kind of orders? B: Well, it doesn't say, does it?
Click on "Unit 1: L'itinéraire de deux chercheurs d'emploi"	New Unit Menu displayed showing 3 sequenced activities	A: I reckon we should start with the video! B: That's the one I would have gone for as well!
Click on "Activité 1: Vidéo: interview de deux chômeurs".	New window displayed designed to choose a character.	A: What's that! We're not into role-play are we? This worries me. B: I don't know why we've got to do this, but we cannot do anything else

		A: Let's try Catherine shall we?
Video window appears with video screen. After several unsuccessful clicking on video screen, student A doesn't understand why it's not working. Student B suggests clicking on "instructions" where steps to take are revealed.		
Click on Play.	Film comes on small screen.	A: That's very nice. A bit small possibly. B: Yes it's good. Mind you it doesn't look all that exciting...
Click on right arrow when video finished.	New screen displaying a comprehension exercise based on video.	A: I can't possibly remember all this from the video. B: What is it supposed to test?
Click on "Corrections" after 2 attempts.	Message appears to indicate the whole exercise has to be done first.	A: OK! Forget it! B: It should be able to give us corrections for our answers. So if you want to see if you're doing the exercise properly, you've got to do it all first. This is very silly!
Click on right arrow.	New screen displayed providing interactivity based on video.	A: That's quite helpful especially the words highlighted in the text.
Click on right arrow.	New screen displaying a 2nd comprehension ex.	A: Well I think I'm going to leave this one for later. Do we have to type in the information ourselves? B: Too much...
Click on left arrow.	Taken back one stage.	B: Let's get out of this.
Click on left arrow.	Taken back one stage.	A: It's a bit slow. May be I'm not doing the right thing. What's that sign supposed to mean? (pointing at the bent arrow pointing to the left) B: It might be the arrow you use to exit out of the programme?
Click on bent arrow.	Taken back to Main Menu.	A: I think that's enough for today. (experimenter asks students what they thought of application prior to them going, since information isn't forthcoming) A: I don't really know what to think of it. I liked the video, though it was a bit boring... we haven't done much with it I suppose. I wonder if all these units are linked up? What we've looked at was mainly about comprehension wasn't it? B: I can't really say how useful this is or what I'd do with it if I was told I could use it. The problem is that with multimedia you expect some sort of entertainment, some fun. I don't think that's what you get here! I suppose this could be linked to the topic they have chosen. the other thing is I don't think I would seriously do the exercises if I didn't have to. It feels all this is a little bit wasted on me!

Recording sheet for User Walk-Throughs

Software:	**A la Recherche d'un Emploi**				
User(s): Group (a)	**no: 2**	**level: 3**	**IT exp: good**	**MM exp: some**	**confidence: high**
Type of Session:	**Tasks 1/2/3**				
Length of Session:	**1 hour**				
Date:	**3rd February 1997**				

Task 1:	**Vous rencontrez au cours de votre interaction le terme "stage". Trouvez le plus rapidement possible son sens.**	
Action Taken	**Outcome of Action**	**Observations**
Introductory window: "Activité 2: Repérer les marques de l'oral", text of 2nd part of dialogue showing in text box, sentence shows "stage".		
Click on "stage"	Message appears displaying "Ce n'est pas	Obviously, it has a link but it's the wrong one. I suppose this is part of the exercise. Repérez les marques de l'oral, it makes sense. It would be

	une marque de l'oral"	interesting to see what it would do if I clicked on Euh for instance...
Click on "Euh"	All "Euh" expressions highlighted	That's more like it! OK, so it hasn't got an hypertext link to it. We'll have to try the lexique then.
Click on Lexique	Lexique's Menu Général appears	We should have better luck here! I might as well try inputting the word directly!
Type "stage" in text box in Dictionnaire	Entry selected in Dictionary.	I'm getting there!
Click on "Lancer la recherche".	Lexique: dictionnaire box appears displaying definition of word.	There you are! Hang on, they could have provided a translation into English. Could have been useful! That was easy. I suppose I could have tried a theme from the Réseaux!
Click on thème: Le travail	Diagram of synonyms displayed.	Funny I would have thought stage was filed under work! Let's try entreprise.
Click on thème: L'entreprise.	Diagram of synonyms displayed.	My God! This is a complex one!, but I can't see stage or stagiaire. OK, never mind...
Click on "Retour à l'activité".	Taken back to original frame.	Overall it's OK though a better use of hypertext links could have been made.

Questions:	Answers: (circle as appropriate)			
Do you find the task:	easy √	difficult		neither
Why?	simple √	usability of application		complex
Is this kind of interaction:	useful √	interesting		boring
Does the task fit in within the learning strategy of the application?	very clearly	possibly √	not clearly	not at all
What could be its most obvious learning outcome?	vocabulary √	pronunc.	contextual √ knowledge	writing skills
Any other relevant views on given task?	OK but definition disappointing - translation not provided - reference not built into material used - feeling of two separate environments.			

Task 2:	**Vous êtes à l'écran de départ affichant le menu principal. Imaginez que vous deviez rechercher le plus rapidement possible dans le logiciel les formules liées à une situation téléphonique. Que faites-vous?**	
Action Taken	**Outcome of Action**	**Observations**
Introductory window: starting frame displaying Main Menu		
Click on "Unit 3: Prendre rendez-vous par téléphone".	New window displayed showing unit menu.	It says "savoir téléphoner" in the objectives, so I can't really go wrong! Mind you, I don't know which one to choose now. Better still, I don't even understand this "appariement"
Click on "Activité 1: Vidéo: un appel téléphonique".	New window displaying small screen with video controls.	I'm not sure what to do. I suppose I could watch and listen to it. But it's unlikely to give me what I want.
Click on Play	Film comes on.	OK. Fine.... but I need to move on...Hang on, is that the secretary? Good God...She looks pretty off-putting!!
Click on right arrow.	New window displaying screen plus text of conversation.	I suppose I could scroll down the text but I don't really know what telephone formulas are! I think I should just go on. That's not terribly clear, I must say.
Click on right arrow.	New window displaying comprehension exercise.	That's not it I hope! I can't stand these memory tests! I wouldn't even know what to do with this one (student clicks at random in boxes provided) Let's move on.
Click on right arrow.	New window displaying text of conversation under heading: Les	Could this be it? Just as well, I 've reached the end of the line. It's a bit of a maze when you get into a unit. You don't know what to expect and where it's taking you to. I imagine I have to find these formulas myself

	formules liées à une situation téléphonique.	in the text.
Click on "bonjour"	Box "Ce n'est pas une formule téléphonique" appears.	Oh! That's clear enough. OK, let's go down the text. (student clicks on several expressions, some right, some wrong.
Click on red button "Cliquez ici lorsque vous avez repéré toutes les formules".	Message appears: Vous avez trouvé 4 formules, il vous en reste 7 à trouver.	That's good enough. Let's look at the correction.
click on "Correction complète".	Correction Box appears.	OK. A bit of a convoluted way to find this information. Obviously, this must be used in a more structured learning context, say a controlled exercise in class or something like that.
Click on Main Menu button.	Taken back to main menu.	I don't know really, I still go back to what I said before: is it supposed to teach us French or show us how to telephone or learn expressions to get by. I'm not sure how helpful it all is.

Questions:	Answers: (circle as appropriate)			
Do you find the task:	easy	difficult		neither √
Why?	simple	usability of application √		complex
Is this kind of interaction:	useful	interesting		boring √
Does the task fit in within the learning strategy of the application?	very clearly	possibly	not clearly √	not at all
What could be its most obvious learning outcome?	vocabulary	pronunc. √	contextual knowledge	writing skills
Any other relevant views on given task?	In a way we're still exploring it - but it does yet fall into place			

Task 3:	**Réaliser une simulation au téléphone**	
Action Taken	**Outcome of Action**	**Observations**
Click on icon.	Software loaded. Text box appears on background.	The usual I suppose.
Enter name for personalized directory.	Name typed and entered. New Text box "Password" displayed.	Idem.
Enter password.	Password entered. New introductory window appears.	OK. I imagine I need to click on "Unit 3: Prendre rendez-vous par téléphone".
Click on button "Commencer".	Main menu displayed	Activité 4 indicates "Simulation au téléphone" so let's choose that!
Click on "Activité 4"	New window entitled "Préparation de l'appel téléphonique" appears.	What's that? Is this what they call simulation? (random clicking on radio buttons highligthing selected sentences for simulation) I'm not sure what I'm doing! Better get more info in "Instructions".
Click on "Instructions".	Box appears giving context-specific instructions.	OK! Let's imagine what I'd choose in this context.
Click on "1A and 1C"	Highlighting is mutually exclusive, only 1C remains lit.	That's a bit silly! Why should they be exclusive? It really shows the limitations of computer programs and these so-called virtual worlds. OK, so it's one answer per section. Let's try again. (selection: 1C, 2A, 3A, 4A).

Click on "Correction".	Correction box appears showing 3 good answers + one error.	I don't understand why they should give you a correction. May be they could provide a model version, or what they think should be a model version!
Click on "OK".	Correct answers appear.	So it's 4C and not 4A. I think this kind of information should be supported by references and the like. If they're trying to teach you something, may be they should be more serious about it.
Click on right arrow.	Introductory window of simulation appears.	OK. That's good, they don't rush you into it!
Click on "Commencer".	Simulation window appears showing video + "Dialogue Interaction Video" box.	I remember the video..OK. So presumably they want me to choose an answer. Should I record it?, should it be live? That's not terribly clear!. I'll just click on 1 and see.
Click on radio button 1 and click on "Continuer" (twice).	First: next frame of video is played; second: interactive box with choice of new cues.	Gosh! She (the secretary) looks freaky! Nothing here is made to look attractive! I wonder if it's done on purpose?!
Click on 1 and "Continuer" (twice).	First: next frame of video is played; second: interactive box with choice of new cues.	I don't think much of him (Directeur du Personnel) either! I go for 2, 1 is too long.
Click on 2 and "continuer".	Next frame played + interactive box showing only one cue.	This is it? That's rather curt! Have I said something wrong? I wonder how interactive this simulation is? It would be quite good if there was a scenario for each one of the possible combinations of answers.
Click on "Nouvelle simulation" button.	New simulation window displayed.	This time, I'll try something different. (interaction: same as above but chosen answers are: 1;1;1;1. God, it's even worse than the previous one. I must try again. (interaction: same as in first attempt but opts for 1 instead of 2 in the exchange with the head of personnel.
Click on 1 and "Continuer" (twice).	Next frame played + interactive box displays final cue showing successful outcome of call.	I'm getting there! It's not bad, after all, it's what CD-ROM are good at! I haven't tried all the alternatives but it's quite well done. The only thing is that the simulation could have been flowing better. All these clicks on selections and then on "continuer" doesn't make it terribly natural!
Click on "Main Menu" arrow.	Taken back to Main Menu.	I know I'm repeating myself but is this trying to teach you something? I mean, I don't know if what you're getting is advisable, or if it's a model to learn and copy. The problem of course is that life isn't quite like that! I wish there was a scientific way to getting a job! It would be easier!

Questions:	Answers: (circle as appropriate)			
Do you find the task:	easy	difficult		neither √
Why?	simple	usability of application √		complex
Is this kind of interaction:	useful	interesting √		boring
Does the task fit in within the learning strategy of the application?	very clearly	possibly √	not clearly	not at all
What could be its most obvious learning outcome?	vocabulary	pronunc.	contextual√ knowledge	writing skills
Any other relevant views on given task?	Are we supposed to be wiser now? models provided feel limited by technology not by natural restrictions.			

Recording sheet for User Walk-Throughs

Software:	**A la Recherche d'un Emploi**				
User(s): Group (b)	**no: 2**	**level: 3**	**IT exp: some**	**MM exp: none**	**confidence: low**
Type of Session:	**Tasks 1/2/3**				
Length of Session:	**1 hour**				
Date:	**3rd February 1997**				

Task 1:	**Vous rencontrez au cours de votre interaction le terme "stage". Trouvez le plus rapidement possible son sens.**	
Action Taken	**Outcome of Action**	**Observations**
Introductory window: "Activité 2 of Unité 1: Repérer les marques de l'oral", text of 2nd part of dialogue showing in text box, sentence shows "stage".		
Thinking aloud, no action taken. Mouse pointer scanned over window.		There must be an easy way of course. I suppose I could start by clicking on the word itself.
Click on "stage"	Message appears displaying "Ce n'est pas une marque de l'oral"	I don't understand the message. Let's try something else. I suppose that Lexique is the place to go to, even if it can be done more quickly.
Click on Lexique	Lexique's Menu Général appears	That looks interesting! I suppose I need to type it in don't I?
Type "stage" in text box in Dictionnaire	Entry selected in Dictionary.	This is it! See, that's pretty good!
Click on "Lancer la recherche".	Lexique: dictionnaire box appears displaying definition of word.	Mind you! Having done all this, the definition that's given is a bit of a disappointment. It's pretty basic!
Click on "Main Menu" arrow.	Taken back to Main Menu.	That was easy though I don't know if I would have done it if I hadn't had to!

Questions:	Answers: (circle as appropriate)			
Do you find the task:	easy √	difficult		neither
Why?	simple √	usability of application		complex
Is this kind of interaction:	useful √	interesting		boring
Does the task fit in within the learning strategy of the application?	very clearly	possibly √	not clearly	not at all
What could be its most obvious learning outcome?	vocabulary √	pronunc.	contextual knowledge	writing skills
Any other relevant views on given task?	That's a good back up altogether. It's so simple it could encourage you to look up words more often.			

Task 2:	**Vous êtes à l'écran de départ affichant le menu principal. Imaginez que vous deviez rechercher le plus rapidement possible dans le logiciel les formules liées à une situation téléphonique. Que faites-vous?**	
Action Taken	**Outcome of Action**	**Observations**
Introductory window: starting frame displaying Main Menu		
Click on "Unit 3: Prendre rendez-vous par téléphone".	New window displayed showing unit menu.	I'm not sure I understand the question let alone do the task! I might as well try "Exercice d'appariement" since I don't even know what it means...
Click on "Exercice	New window appears	That was a good guess! I never thought I would find them so quickly.

d'appariement".	showing "formules téléphoniques".	Hang on, do I need to do anything with them? Have they got to be matched? OK, I'll give it a go.
Click on A, in box below and on 3.	Cursor positioned in Box A but nothing is highlighted.	I would have thought that they could have made it easier to use! Does it mean I have to type it! Forget this.
Experimenter indicates at this stage that the formulas found are not those asked for in the task. Student hesitates a great deal then decides to further explore the activity.		
Click on right arrow.	New window displaying screen plus text of conversation.	I don't know if I'm on the right track, or even where I am but nevermind. Anyway, this isn't it is it?
Click on right arrow.	New window displaying comprehension exercise.	Neither is this! though it could be anywhere.
Click on right arrow.	New window displaying text of conversation under heading: Les formules liées à une situation téléphonique.	I think they should really tell you what there is and where to find it. This could go endlessly and I would end up being very confused and lost. Hang on could this be it?
Click on "Merci et au revoir"	Box "Ce n'est pas une formule téléphonique" appears.	Nice one. At least, you can see it! What do they mean by "formules liées à une conversation téléphonique"?
Click on red button "Cliquez ici lorsque vous avez repéré toutes les formules".	Message appears: Vous avez trouvé 0 formules, il vous en reste 11 à trouver.	Let's see if they're going to give them to me!
click on "Correction complète".	Correction Box appears containing the list of expressions.	There you are! even if it's not terribly academic in approach. If you ask me, I'm not sure it's likely to help me with my telephone conversation skills overall! I must also say that the way you have to find out where things are is a little bit frustrating.
Click on Main Menu button.	Taken back to main menu.	

Questions:	Answers: (circle as appropriate)			
Do you find the task:	easy	difficult		neither √
Why?	simple	usability of application √		complex
Is this kind of interaction:	useful	interesting		boring √
Does the task fit in within the learning strategy of the application?	very clearly	possibly	not clearly √	not at all
What could be its most obvious learning outcome?	vocabulary √	pronunc.	contextual√knowledge	writing skills
Any other relevant views on given task?	Didn't get into it at all. better direction much be provided.			

Task 3:	**Réaliser une simulation au téléphone**	
Action Taken	**Outcome of Action**	**Observations**
Click on icon.	Software loaded. Text box appears on background.	I must remember what I did last time round.
Enter name for personalized directory.	Name typed and entered. New Text box "Password" displayed.	Yes, I remember these...Do you have to this each time? How tedious. (the student struggles to remember the password - colleague helps in the matter)

Enter password.	Password entered. New introductory window appears.	OK. This looks simple enough. I'll click on "Unit 3: Prendre rendez-vous par téléphone".
Click on button "Commencer".	Main menu displayed	This is too straight forward. There must be a trick somewhere! Let's click on Activité 4 "Simulation au téléphone".
Click on "Activité 4"	New window entitled "Préparation de l'appel téléphonique" appears.	I told you this was too easy! Now I don't know what to do! Do I need to read all this! I don't have that much time left so I'll see if I can skip this.
Click on right arrow.	Introductory window of simulation appears.	If I'm allowed to do this it couldn't have been that crucial!. This is more like it.
Click on "Commencer".	Simulation window appears showing video + "Dialogue Interaction Video" box.	Oh yes. That's the same video. Now they've lost me again! It certainly isn't clear what needs to be done.
Click on "Play" button.	Error message appears: "Aucun son n'a été enregistré".	That's that. May be I'll just try the simulation again.
Click on "Rejouer".	The first frame of the video is played again.	OK. I'm not making much progress am I? May be they just want me to choose between given questions and answers. I'm probably going to get it wrong!
Click everywhere in yellow cue boxes to select one of them but nothing happens. Hopeless!...		
Click on radio button 1 and click on "Continuer" (twice).	First: next frame of video is played; second: interactive box with choice of new cues.	OK! so that's the way it works. I prefer their cartoon characters, mind you! It's quite good - So if I understand correctly I select an answer and this determines how the conversation progresses.
Click on 1 and "Continuer" (twice).	First: next frame of video is played; second: interactive box with choice of new cues.	I think I'm getting the gist now! So what next! I don't really know if one is correct and the other wrong!
Click on 2 and "continuer".	Next frame played + interactive box showing only one cue.	I didn't get very far, did I. I would need more time to really appreciate it. I think I'll just leave it for the time being.

Questions:	Answers: (circle as appropriate)			
Do you find the task:	easy	difficult √		neither
Why?	simple	usability of application		complex √
Is this kind of interaction:	useful	interesting		boring
Does the task fit in within the learning strategy of the application?	very clearly	possibly √	not clearly	not at all
What could be its most obvious learning outcome?	vocabulary	pronunc.	contextual√ knowledge	writing skills
Any other relevant views on given task?	I imagine you can do a lot more with it -What I would like to know is why they don't give you more feedback.			

Recording sheet for User Walk-Throughs

Software:	**A la Recherche d'un Emploi**				
User(s): Group (a)	**no: 2**	**level: 3**	**IT exp: good**	**MM exp: some**	**confidence: high**
Type of Session:	**Task 4**				
Length of Session:	**1 hour**				
Date:	**11th February 1997**				

Task 4:	**Procédez à la simulation de l'entretien.**	
Action Taken	**Outcome of Action**	**Observations**
Introductory window: Main Menu.		
Click on "Unit 4: L'entretien"	New window displayed showing Unit menu and pictures of characters involved.	OK. There is "Activité 4: Simulation d'un entretien". It's funny, this presentation is different! It's as though they want you to do the activities in sequence. I suppose I could try "Instructions" first.
Click on "Instructions"	Instructions box appears with message: Choose an activity by clicking on it.	Ah well I was wrong. Still the arrows must mean something! I just feel like trying "Activité 2: Le comportement du candidat" to see what it's like!
Click on "Le comportement du candidat".	New window displayed showing activity-based menu.	Am I going to learn something about how to behave? OK, let's try "La présentation de soi".
Click on "La présentation de soi".	New window displayed showing three cartoons depicting different behaviours and a related exercise.	What is this? Gosh, it's a bit crude, isn't it? We have the stark choice between "renfrognée", whatever this means but I can guess looking at the face of the character, shaking with fear and happily smiling!? Not very subtle. Should I use the Lexique to find out what "renfrognée" means?
Click on Lexique.	Lexique window appears.	I'll do a word search.
Type "renfrognée" and call search.	Error message indicates that word is not in dictionary.	That's bad! I think all the words they use in the programme should be in the dictionary. It shows how limited and cheap it is. Never mind. Lets go back to the activity. I still don't understand what they want me to do.
Translation offered by experimenter.		
Click on "OK" and "Retour à l'activité".	Back to "La présentation de soi".	But this is a grammar exercise! OK, I don't mind but why isn't it systematic? Why do we get this out of the blue? I better click on "Exemple".
Click on "Exemple".	"Exemple" text box appears showing required approach.	This is just grammar! OK, I'm not against it, especially when it's contextualized like this but not as a one off. It's like they haven't quite made up their mind as to what they want to do with it : teach us French or help us to learn how to find a job! OK, I don't think I can really be bothered with this one. In any case, you shouldn't have to type when using multimedia because it defeats the object of the whole exercise!
Click on "Corrections".	Error message indicates that all questions must be answered first.	I half expected this! Lets see something else.
Click "OK" and arrow to return to sub-menu.	Back to sub-menu of "Le comportment du candidat".	Lets try "Le comportement".
Click on "Le comportement".	New window appears adopting same approach and design as previous "La présentation de soi".	I'm getting the picture! They're all based on the same approach. This is as crude as the other one! Lets quickly click on the others. (student goes back to sub-menu and click successively on all the other activities, often laughing at the cartoons then goes back to main menu of the unit).
Click on "Simulation d'un entretien".	New window displayed showing discription of	OK! but there should be more people as models to increase the choice. I can't really identify with either of them. Lets be Gérard then.

	the two central characters.	
Click on 2 then "Continuer".	New window displayed showing "assessment criteria".	Student scroll down "Explications" text box. Fine, but this doesn't tell me how they arrived at these assessment points? I must admit that I don't understand these criteria! Lets move on!
Click on right arrow.	New window displayed showing video + choice of dialogue répartis.	That looks very much like the previous simulation. That's good.
Click on 1 and "Continuer".	First: next frame of video played; second: new set of cues appears.	I find the choice restricted. I don't think I'd say either of these.
Click on 2 and "Continuer".	First: next frame of video played; second: new set of cues appears.	The difference between the questions and the choice of answers is too great. The idea is good, but the exercise isn't very sophisticated.
Click on 2 and "Continuer".	First: next frame of video played; second: new set of cues appears.	This situation for me is quite unrealistic!
Click on 2 and "Continuer".	First: next frame of video played; second: new set of cues appears.	Neither are satisfactory. They are too long for a start and there should be a lot more!
Click on 2 and "Continuer".	First: next frame of video played; second: new set of cues appears.	Idem.
Click on 2 and "Continuer".	First: next frame of video played; second: new set of cues appears.	I really don't like the tone and insinuations.
Click on 1 and "Continuer".	First: next frame of video played; second: new set of cues appears.	I think there is a problem with the interface. There should be greater correspondance between the image and the text. As it stands, all these clicking make the dialogue rather fragmented and even more unreal!
Click on 3 and "Continuer".	First: next frame of video played; second: new set of cues appears.	It would probably be interesting to try all the possible scenarios!
Click on 2 and "Continuer".	First: next frame of video played; second: new set of cues appears.	Lets be clean!
Click on 3 and "Continuer".	First: next frame of video played; second: new set of cues appears.	What a choice of answers! None are appropriate I would have thought!
Click on 2 and "Continuer" (twice).	First: next frame of video played; second: new set of cues appears.	I can see what they're trying to do but it can be perfected.
Click on "Continuer" and "Vos résultats".	New window appears with results compared with original criteria.	I can see they have improved but for me all this is meaningless! It would be interesting to see if they changed drastically in a worst case scenario! (student decides to try out new simulation, this time clicking on what is thought to be the worst possible answer. Sequence chosen: 1/1/1/1/2/3/1/2/2/3). Look at this! In my worst case scenario I'm still not doing too badly!
Click on "Quitter" and arrow to menu of unit.	Back to introductory window of unit.	I suppose simulations can be fun, but a proper simulation should give you far more permutations. They should also explain these criteria better. I don't know how they related to my choice of answers or better still how they are affected by choice of answers. If anything they indicate that there isn't a wide enough discrepancy between the best and worst scenarios. The other thing is, now that I've done it, I can't see how helpful the previous activities would have been like when simulating the interview?

Questions:	Answers: (circle as appropriate)			
Do you find the task:	easy	difficult		neither √
Why?	simple	usability of application √		complex
Is this kind of interaction:	useful	interesting √		boring
Does the task fit in within the learning strategy of the application?	very clearly	possibly	not clearly √	not at all
What could be its most obvious learning outcome?	vocabulary	pronunc.	contextual√knowledge	writing skills
Any other relevant views on given task?	Not sufficiently well exploited - frustrating			

Recording sheet for User Walk-Throughs

Software:	**A la Recherche d'un Emploi**				
User(s): Group (b)	**no: 2**	**level: 3**	**IT exp: some**	**MM exp: none**	**confidence: low**
Type of Session:	**Task 4**				
Length of Session:	**1 hour**				
Date:	**11th February 1997**				

Task 4:	**Procédez à la simulation de l'entretien.**	
Action Taken	**Outcome of Action**	**Observations**
Introductory window: Main Menu.		
Click on "Unit 4: L'entretien"	New window displayed showing Unit menu and, pictures of characters involved.	You won't believe it but I'm almost getting the hang of it! See! Incidentally, I quite like the box which appears when the mouse goes over the selection.
Click on "Simulation d'un entretien".	New window displayed showing a description of the two central characters.	I shouldn't boast, I know it's going to get complicated. I'd rather be Catherine, looking at her profile, though it's not quite me!!
Click on "Continuer".	Error message appears indicating the choice has not been made.	What's that now. I thought I had! OK, never mind, I suppose I must click on this funny thing. It's not obvious! (student clicks on OK of error message).
Click on 1 then "Continuer".	New window displayed showing "assessment criteria".	That's better! though I don't understand any of it now! Am I supposed to do anything or this is for information only. (student starts scrolling text fast, too fast to read) All this to read? I'm going to skip if it's not necessary. Hope you don't mind!
Click on right arrow.	New window displayed showing video + choice of dialogue repartees.	God! He is depressing. I really can't stand this kind of guy. That would put me right off going through with it. I reckon they do it on purpose. If it's off-putting enough then you're more likely to see it as a threat and take it seriously! But I don't agree. For me it's like a deterrent, I just don't want to know anymore about it...OK, don't worry, I will....
Click on 1 and "Lecture".	Error message displayed indicating that no sound has been recorded.	I just can't get used to these funny buttons! OK, where have I gone wrong? Should I just continue?
Click on 1 and "Continuer".	First: next frame of video played; second:	I really don't understand the choice given to us? It looks as though she is late for her interview? I don't really know. That's a good start! I don't

	new set of cues appears.	know if I'm late or not, as if it wasn't bad enough being late!
Click on 2 and "Continuer".	First: next frame of video played; second: new set of cues appears.	She is obviously fudging. They all sound about the same though!
Click on 3 and "Continuer".	First: next frame of video played; second: new set of cues appears.	What a choice! Who is going to choose 2? I suppose you could just for fun!
Click on 1 and "Continuer".	First: next frame of video played; second: new set of cues appears.	I like the third one. It's not going to get me anywhere but he's too nasty anyway and I wouldn't want to work for him anyway!
Click on 3 and "Continuer".	First: next frame of video played; second: new set of cues appears.	He hasn't thrown me out yet! The choice is clearer here! Lets go as far away as possible!
Click on 1 and "Continuer".	First: next frame of video played; second: new set of cues appears.	Fine so far.
Click on 2 and "Continuer".	First: next frame of video played; second: new set of cues appears.	It's not a bad exercise on the whole even if I'm hopeless at it but the answers provided are pretty basic!
Click on 1 and "Continuer".	First: next frame of video played; second: new set of cues appears.	That's even better, I don't even get a choice! What does he want now ? To tell him about myself? No such luck! Mind you, this will really blow my chances...
Click on 2 and "Continuer".	First: next frame of video played; second: new set of cues appears.	I think he hasn't quite understood the message! Well, I quite like that it's been taken into account. I feel I can defend myself in a limited sort of way.
Click on 1 and "Continuer".	First: next frame of video played; second: new set of cues appears.	OK! Lets be curt!
Click on 2 and "Continuer" (twice).	First: next frame of video played; second: new set of cues appears.	It's all coming to an unexpectedly quick ending! Is it something I've done? (laughs). Do I want to see my results? Might as well..
Click on "Vos résultats".	New window appears with results compared with original criteria.	Fine! I don't score well in presentation and contact/expression verbale but also in aisance and assurance. I don't see why not? I don't know much about multimedia but this is a bit far-fetched and too limited to be treated seriously. As a language exercise, it could be fun but you would need more possibilities otherwise you'd get easily bored wouldn't you?
Click on "Quitter" and arrow to menu of unit.	Back to introductory window of unit.	No further comments.

Questions:	Answers: (circle as appropriate)			
Do you find the task:	easy	difficult √		neither
Why?	simple	usability of application √		complex
Is this kind of interaction:	useful √	interesting √		boring
Does the task fit in within the learning strategy of the application?	very clearly	possibly √	not clearly	not at all
What could be its most obvious learning outcome?	vocabulary	pronunc.	contextual√ knowledge	writing skills
Any other relevant views on given task?	Once you get there it's quite good. When you've got used to their buttons and the like it could be fun but they should have done something with the characters.			

17.2.4 France InterActive

Recording sheet for User Walk-Throughs

Software:	**France InterActive (Demonstration CD-ROM)**				
User(s): Group (a)	**no: 2**	**level: 3**	**IT exp: good**	**MM exp: some**	**confidence: high**
Type of Session:	**Exploratory**				
Length of Session:	**1 hour**				
Date:	**3rd March 1997**				

Action Taken	Outcome of Action	Observations
Click on FIA icon.	Introductory window displayed with message in text box: "Please select the unit you wish to study".	None so far. (Students given short introductory presentation about France InterActive including level, target users, scope and limitation of the demonstration CD and purpose of the exploratory session. For this user walkthrough student A will be the mouse-holder and B therefore the non-mouse-holder. Role changes will be indicated)
Click on OK in message box.	Introductory window fully displays Table of Contents.	A: That's quite clear. (Student scrolls down list and up again). B: Funny that you should have a mixture of French and English (ref: Debut and First Steps). A: How about unit 1 for a start.
Click on "Module 1 - Debut".	Text box appears with message: Click on a unit rather than a module.	OK.
Click on OK of message box and click on Introduction.	New unit content is displayed, item by item, automatically scrolled and read out. New window appears with structure of unit.	A: That's good, I like it. At least they tell you what's in it! B: It sounds as though it's somebody speaking English with a French accent! If it's to put us in the mood it's a bit silly! A: (Student scans window with mouse pointer, translation + explanations in pop-up box offered when pointer over title and blue-coloured buttons). That's excellent. If you're a beginner that's just what you need. B: Why couldn't they do it more systematically? I think everything should have been in French and translated.
Click on "Commencez ici".	Error message displayed: Cannot find page "intro".	(limitations of demonstration CD explained).
Click on OK in error message then "Exercise Guide".	New window displays "The Lesson Plan" with visual structure of the unit.	It's very well thought out. (Student scans with mouse pointer, displaying further explanations when going over coloured buttons in the plan).
Click on coloured buttons with right mouse button as indicated.	Text in coloured button read out.	So, you have words with their translation and pronunciation! Very good.
Click on Stop (no effect) double click on Stop.	New "Stop" window appears with short video clip saying "C'est fini pour aujourd'hui?"	A + B (laughing) B: How patronizing! Are you sure this software is for students? A: I don't understand why we're asked if we want to exit the programme! This "Stop" is not very clear!
Click on "Non".	Taken back to Plan of M1U1.	A: OK! Let's try another unit. B: You can only click on "Stop". I bet you'll get that funny woman again!
Students get locked in a loop: "Stop" takes them back to exit, when in "Stop" mode, clicking on "Non" or "Plan" takes them back to the introductory window of M1U1. On the advice of experimenter, students close application and frustratingly start again.		

Click on "OK" and "Unité 1 - Première leçon".	Contents reeled out both visually + orally (see above). New Plan of M2U1 displayed.	A: Apart from the previous navigation problem, you really know where you are and what you can do. (scanning provides further explanations). B: Let's click on "Commencez ici" it says that's the way to start the lesson. Mind you I don't think they should say again since we haven't seen the video yet!
Click on "Commencez ici".	New "Video" window appears + sound track introducing mode.	A: May be they should provide a written explanation in a pop-up box for the students who don't know what to do? B: Surely, everybody knows how to use a video recorder!
Click on play symbol.	Video film is played in video screen.	A: God! the quality is very poor! Pictures are very impressionistic! B: It's good animation you know. It's very authentic, it's real, though you're right about the quality!. It's quite a long video!
Click on "Avec texte" then on Rewind function.	Text appears underneath video screen.	A: You can watch it with or without text. The rewinding facility isn't very friendly (student persists but rewinding very slow).
Click on "Instructions".	"Instructions" box appears.	A: OK, that's fairly standard. B: Yes but presumably you can have it in English too (B uses mouse to click on "Anglais"). Excellent stuff. (Mouse back to A)
Click on blue arrow.	New "Video Texte" window appears (combining both text and video).	A: What's the difference? We've just got the whole of the text this time. B: Try clicking on the text as suggested to see what it does!
Click on text randomly.	Part of text highlighted. Video linked to highlighted text played	A: It's a bit slow possibly but it's well done! B: Yes it's very well synchronized.
Several attempts at clicking and highlighting text are successively and successfully made. Students then decide to explore other parts of the application.		
Click on "Culture".	Culture box appears, superimposed, with scrolling text and functions.	A: (scrolling text) This looks pretty general! It could have been contextualized though. It would have been nice to have information on cafes etc... B: As long as it is translated! yes! Try clicking on one of these buttons. I don't understand the difference between these and the others.
Click on "Grammaire" then "Lexique" then "Fonctions" unsuccessfully, then clicks on "Plan".	A Contents page appears displaying themes.	A: There you are! It is context specific. I imagine these are the topics dealt with in the programme. B: OK, I imagine it was easier this way, but still, I don't understand why they should display buttons which are not live! The other thing is that they could have given a translation of the text!
Click on both blue arrows.	Topic displayed changed to next or previous ones.	A: I'd say it's easier to select it from the Contents page if you know what you want. I think it's very static! I'm sure it could be better integrated with proper links to the lexique and to the text of the video! B: Do you reckon "Stop" takes us back to the funny exit.
Click on "Stop".	Taken back to Video Texte window.	A: Thank god for that! Mind you their use of Stop is not all that coherent. B: May be but we've been spared the silly speech.
Click on "Grammaire".	"Gram" box appears displaying list of contents + arrows.	A: (Student goes down list of topics clicking on them randomly) This looks like a pretty straightforward database. I think links should be in blue to follow conventions. B: What's the meaning of the arrows? (B tries pointer on vertical arrows reducing or enlarging the text box). I'm not sure what this is supposed to do! (A tries horizontal arrows) A: There seems to be different ways of getting where you want to go, it's confusing! (students getting increasingly lost, clicking on topics, sub-topics and arrows. At one point, the system cannot cope with it and displays both French and English version superimposed!). B: Anyway, this book form is boring, it's too rigid and unimaginative.
Click on "Fonctions".	"Fonctions" box appears	A: (Student trying clicking on functions) This is the same as before. OK,

	(using same format as "Culture").	but it's not that useful here. B: Try clicking on "Plan".
Click on "Plan".	Error message indicates that it cannot find page "toc".	A: this must be the disc. B: I must go (end of session)
General impressions at the end of first session: students very positively impressed by efforts made to show them how the platform is structured and what it is trying to achieve in terms of linguistic objectives. Secondly, they were similarly impressed by the authenticity of the video material they had seen. On the negative side, they criticized the quality of the video which they thought was a deterrent and the poor navigational facilities they seemed to be provided with (possibly because this was a demonstration disc).		

Recording sheet for User Walk-Throughs

Software:	**France InterActive (Demonstration CD-ROM)**				
User(s): Group (a)	**no: 2**	**level: 3**	**IT exp: good**	**MM exp: some**	**confidence: high**
Type of Session:	**Task 1**				
Length of Session:	**1 hour**				
Date:	**10th March 1997**				

Task 1: Rechercher et exploiter tous les exercices de l'unité 4 Module 6		
Action Taken	**Outcome of Action**	**Observations**
The students' recall of the previous session is sufficient to enable them to access and start the application. In the process of doing so, the students clearly remember and mimic the video clip "C'est fini pour aujourd'hui". The experimenter stresses that the software was intended to be used on the basis of a single unit per session, therefore encouraging users to explore and exploit all the exercises within the confines of the unit before attempting to move to the next one. Thus, it was a design decision, not a design fault.		
Click on M6U4	New unit content displayed, itemized on screen and read out followed by "Plan" window of unit.	(For the purpose of this user walkthrough, B agrees to be the official mouse-holder whilst A is merely adviser. Role changes will be indicated as appropriate). OK! That's fairly straightforward...What do we want to start off with? (Student scrolls screen with mouse pointer, triggering pop-up boxes with translations of titles. They decide to opt for the video).
Double click on "Commencer ici".	New Video window appears with video screen and controls.	It's quite slow....I suppose it's loading the files...
Click on play symbol .	Video film on transport is played on video screen.	The picture hasn't improved, has it!...It's a pity because the sound is quite good. It was probably done a while ago or may be the camera they used was not sufficiently sophisticated.
Click on right-hand arrow.	New "Video-Texte" window appears.	We've done this before! It's a good design. (Student reads displayed text).
Click on text to highlight chunks (action repeated 5 times)	Chunks of text highlighted triggering corresponding video clip.	(Student tries out clicking on several chunks of text and watching the video clips). This really helps when you don't understand what is being said!
Click on right-hand arrow.	New "Video Quiz" window appears.	I remember this too! what's nice about this one is that it's not a memory test! They also provide you with the selected information.
Click on 1st question.	Selected video clip is played on screen.	It's almost too easy!
Click on "Vrai".	Oral compliments provided.	Very nice, lets do some more. (student undertakes to click on the following 4 questions).

Click on "Vos progrès".	"Excellent...but it might not be a very good gauge..." is the progress report given by the text box.	It's good that they have found a safe enough way to give results... but it does shows the limitations of the machine!
Click on OK and DC on "Plan".	Taken back to "Plan" window with voice over: "Qu'est-ce que vous voulez faire maintenant?".	I'm not sure (after consultation with student A, B decides to go for "Fonction : A l'agence de voyage").
DClick on "A l'agence de voyage".	New window displaying interactive exercise appears with oral explanations.	This looks interesting!
Click on "Commencez".	Oral interaction triggered.	(Students decide whether B should record his own voice and A + B agree that an attempt should be made). I'm not sure I like this...
Click on "Record", record voice and click on "Stop".	"Record Now" appears with pop-up window indicating the Stop function.	It's funny, I don't get a chance to play it back! I don't know, there must be a way! It's a shame the video doesn't come on! It would have made it even better!
Click on "Elle".	Sentence displayed and read out.	I see how this works. It must be "Vous" now...
Click on "Vous".	New cue displayed and read out.	That's not it, is it?
Click on "Continuez" and then "Vous".	Question and answer given orally.	OK! You can either take an active part in the dialogue or simply listen to it and follow the gist of it in English. (Student sufficiently engrossed to complete all the exercise, only recording roughly 50% of answers, when prompted to do so by his fellow student. New display at the end of the exercise shows that it is possible to listen to the whole dialogue or the recorded one). It's good but always a little bit too fiddly for my own taste. You've got to click on "Continuez" then "record" then "Stop" then "Continuez" then "avion" or something else...
Click on "Votre version".	Student's version presented but error message appears because student had not recorded his own version systematically.	That's obvious...I know.
DClick on "Plan".	Taken back to "Plan" of unit.	Let's try something completely different!
Click on "Ordres et contre-ordres".	New window appears with exercise.	This looks more interactive!
Click on "Commencez".	Video clip is played and text given.	(Student clicks on "Répétez l'ordre" which gives video extract again, then "Contre-ordre" which is given both visually and orally. No attempt is made to record own voice). It's interesting, but you need to be at that level and possibly told to do this in class otherwise you might just skip it! (Exercise is not completed)
DClick on "Plan".	Taken back to "Plan".	I think I'll try the last column...
Click on "Mots-clefs".	New window appears with "Mots-clefs".	Ok, so you have a list of words and their translation...
Click on "Mélangez".	Lists of words appear scrambled.	I suppose the idea is to find their correct translation. (Student clicks on a word then looks for its translation in the right-hand column, then clicks on it. Orally approved both word and translation are crossed out). I find these types of activities a little bit tedious, I must say. You feel multimedia is under-utilized...(Student indicates other pressing

		engagements and must leave..)
Dclick on "Plan".	Back to "Plan".	I know I could have done more but there you are...It's good though. I'm sure that there is plenty for a beginner to get his teeth into!
The brief discussion which ensues supports the last point. The unit is clearly structured and presented with its consistent display and use of video material. The exercises are categorized and introduced logically and pedagogically. If the quality of the image had been better and if the video had been more widely used, as in the interaction function, then it would have been perfect...almost since the students remembered that a lot of the interaction required them to concentrate on fiddly buttons and intricate sequences. The whole session lasted 55 minutes including a 10 minute discussion.		

Recording sheet for User Walk-Throughs

Software:	**France InterActive (Demonstration CD-ROM)**				
User(s): Group (b)	**no: 2**	**level: 1**	**IT exp: some**	**MM exp: some**	**confidence: average**
Type of Session:	**Exploratory**				
Length of Session:	**1 hour**				
Date:	**3rd March 1997**				

Action Taken	Outcome of Action	Observations
Students given short introductory presentation about France InterActive including level, target users, scope and limitation of the demonstration CD and purpose of the exploratory session. For this user walkthrough student A will be the mouse-holder and B therefore the non-mouse-holder. Role changes will be indicated.		
Click on FIA icon.	Introductory window displayed with message in text box: "Please select the unit you wish to study".	None so far.
Click on OK in message box.	Introductory window fully displays Table of Contents.	A: What shall we do? B: Can we get the whole list of topics? A: Let's try.
Click on scrolling device.	Table of Contents scrolled	A: Funny, it jumps from 2 to 6 B: It's just a sample. It's meant to give you a flavour of the topics. How about the last unit "La cuisine en France"?
Click on Module 7, Unit 4 "La cuisine en France".	New window appears introducing the itemized contents of the Unit both orally and visually. This introductory window is automatically followed by the "plan" window of the unit.	A: That's very clear, it's good! B: It's good they give you a brief rundown of what's in the lesson. A: Mind you, what have we here? (student scans window with mouse), Look it gives you a translation of the headings! B: The three sections are clear enough! but where should we start? A: I suppose we can start anywhere! May be they should give people some explanations! (at this stage, the random scanning shows what COMMENCEZ ICI means) B: I thought this start here, nothing more!
Click on "Commencez ici".	New video window appears with video screen and controls (with oral explanations).	A: Videos are very good! I wouldn't do it without them. B: It's a bit like the Berlitz guide!
Click on "Play" control.	Video film is played on screen.	A + B make a number of personal remarks related to the content of the film, agreeing or disagreeing with opinions expressed or slant given to coverage of subject A: It's quite long altogether don't you think? B: Yes, it's good, not too hot on the quality of the picture!

		A: Where do we go from here! B: Let's try another video. A: How do you reckon you do that! B: Let's try "Stop" or "Plan". It's strange that there aren't any arrows to go back!
Click on "Plan".	"Plan" window reappears.	A: OK! that's what it means! B: We seem to be locked in this unit. Maybe we could try some of the functions since we're here.
Click on "Le PDG et la secretaire" ref. button.	New interactive window appears (Faire une reservation).	A: This has nothing to do with food! B: I don't know. Do they want us to play a part? A: You do it.. come on (students not terribly forthcoming to do exercise)
Click on PDG, followed by "Continuez".	English cue in interface appears to enable users to interact with system.	A: I don't know what we must do. B: I imagine we record what this guy is saying! (B has microphone)
Click on recording.	Recording in progress.	A: Very good (chuckles) B: Very funny....Do you think this guy looks like a boss! A: We must click on Stop don't we!
Click on "Stop".	Nothing happens.	A: What do we do! B: Click on "Continuez" I imagine!
Click on "Continuez".	The next exchange takes place and new cue appears.	A: That's a bit much! Your answer doesn't even show! Don't you get any feedback? B: Obviously, we forgot to do something. How about "Recommencez"
Click on "Recommencez".	The whole interaction goes back to beginning with oral presentation.	A: Ah no! Not again! I'm getting fed up with this one....It's so slow as well! B: Let's do something else.
Click on "Stop".	New "Stop" window appears with short video clip saying "C'est fini pour aujourd'hui?"	A: Where the hell are we? No we don't want to quit, not just yet! B: (giggles) Isn't she funny? She has got to be a teacher! don't you think?
Click on "Non".	"Plan" window of M7U4 reappears.	A: I give up B: We just can't get out of this!
Students get locked in a loop: "Stop" takes them back to exit, when in "Stop" mode, clicking on "Non" or "Plan" takes them back to the introductory window of M7U4. On the advice of experimenter, students close application and, frustrated, start again.		
Click on Module 6 Unit 1.	New "contents" window appears followed by "Plan".	A: Let's see the film!
Click on "Commencez ici".	New "video" window appears.	A: Let's see what it's like shall we?
Click on "Play".	Film appears.	A: God! the quality hasn't improved! B: It's a shame because it's quite authentic! Students decide to move on when film finished)
Click on blue arrow.	"Video Texte" window appears with oral instructions.	A: Hang on! What do we have to do? B: Something to do with clicking on the text to hear it in film.
Click on chunk in text.	Chunk highlighted followed by selected clip of film.	A: This is very good! I'm impressed! B: Try another one to see if it works as well. (text selected further down, same process takes place).
Click on chunk in text.	Chunk highlighted followed by selected clip of film.	A: That's very helpful B: See! we can still go on!
Click on right arrow.	"Video Quiz" window appears with oral	A: I suppose we just click, I'm not sure B: It's one of those test again, I really dislike them!

	explanations.	
Click on 1st question.	Question highlighted and relevant clip of video shown.	A: Look, they even show you where it is in the film. B: Ah that's alright then. Well that's dead easy now. A: very good stuff.
Click on "Faux"	Questions shown crossed out.	A: Pretty amazing! B: Try our progress to see the score!
Click on "Vos progres".	Message box appears with percentage score.	A: Brilliant we have a 100% score! B: Wait. It says that it might not be right! (students have to leave, application is left in the exercise mode, students are asked a few questions related to the application)
General impressions at the end of the first session: the students thought it had been fun. it was a good application. Although they had not seen much of it, what they had seen was impressive. They liked the videos, minus the quality of pictures. They did not think they were free to do what they wanted and choose at random. They would have liked to have seen more of it, but did not have the time. A thought it was difficult to do both interact with mouse and listen to explanations at the same time, whilst B did not have this problem because he had some distance for listening and thinking. Would be back to try some more.		

Recording sheet for User Walk-Throughs

Software:	**France InterActive (Demonstration CD-ROM)**				
User(s): Group (b)	**no: 2**	**level: 1**	**IT exp: some**	**MM exp: some**	**confidence: average**
Type of Session:	**Task 1**				
Length of Session:	**1 hour**				
Date:	**10th March 1997**				

Task 1: Rechercher et exploiter tous les exercices de l'unité 4 Module 6		
Action Taken	**Outcome of Action**	**Observations**
The students' recall of the previous session is sufficient to enable them to access and start the application. The experimenter stresses that the software was intended to be used on the basis of a single unit per session, therefore encouraging users to explore and exploit all the exercises within the confines of the unit before attempting to move to the next one. The students are told that the problems they previously experienced with the "Stop" function will not materialize again.		
Click on M6U4	New unit content displayed, itemized on screen and read out followed by "Plan" window of unit.	(For the purpose of this user walkthrough, B agrees to be the official mouse-holder whilst A is merely an adviser. Role changes will be indicated as appropriate). What shall we do? (student scrolls screen with mouse pointer, triggering pop-up boxes with translations of titles. The decision is made to begin at the beginning and choose the video).
Click and double click on "Commencer ici".	New video window appears with video screen and control as well as oral instructions.	(The student looks at the screen as if to better remember what the functions are).
Click on play symbol.	Video film on transport is played on video screen.	(On A's suggestion, the student decides to click on "Avec texte")
Click on "Avec texte".	Caption box with text appears. "Avec texte" is replaced by "Sans texte".	That's really good. It helps to follow what she says (A suggests they might want to rewind the video as they have missed the beginning).
Click on rewind symbol.	Video tape is rewound and allowed to play till the end.	(The students watch the video conscientiously and attentively). It's a little bit more formal, you know academic, than the two we saw last week. Isn't it? (A has no opinion). OK! let's move on.
Click on right arrow	New "Video-Texte"	We did do this, didn't we? It's excellent stuff.

	window appears with oral instructions.	
Click on first chunk of text.	Text highlighted followed by selected clip of film.	(Student decides to click on the following chunks of text, in the same order, noticing that at times there are some small anomalies due to inaccurate anchorage). It must be very difficult to design this so that the text matches the picture. (Systematic clicking ensues until the student reaches the end of the text). I think I'm getting the hang of it now. It is a very good support, you know.
Click on right arrow.	New "Video-Quiz" appears with oral instructions.	(The student spends a couple of minutes studying the display). If I remember properly I have to click on the question?
Click on 1st sentence.	Video plays the relevant clip.	Do you realize that they even give you the information on a plate. It's brilliant that you don't have to memorize it! In this case it must be "Yes".
Click on "Yes".	Voice congratulates the student and question is crossed out.	Look at this, they even cross out the sentence so that you don't do it again. (Student clicks on following question, watches the video and then answers by "Vrai"ou "Faux" until all nine questions are done.
Click on "Vos progrès".	Text box appears with score.	Look at this! I get full mark for this! Not bad! So what do I do now? No I don't want to "recommencer" ....(hesitations) I might as well try "Plan". I'm not getting out I hope!
Click on "OK" then click and double click on "Plan".	"Plan" window appears with oral instructions.	(Student scans display, not knowing which exercise to choose). I think I'd be tempted by "A l'agence de voyage", it's the one that appeals to me most! Let's see what it looks like!
Click and double click on "A l'agence de voyage".	New window appears displaying interactive exercise with oral instructions.	I'm not sure I understood all of what she said. If I'm not mistaken I'm in Paris and I want to buy a ticket to go to London...May be I should try Instructions first..(Student scans the screen with pointer, triggers display of a pop-up text box when pointer is over the recording controls, reads it). That's good, I'm not sure I understand what it means yet but the idea is nice...Why haven't they done the same thing for the other buttons.
Click on "Instructions".	Text box appears with intructions in French.	Suivez les instructions en anglais....Should I click here (pointing at "Anglais" in the Instructions" text box.
Click on "Anglais".	Instructions in English appear.	It's a lot more explicit in English. Must be because it's a more precise language... (laughter)
Click on "OK" then click on "Commencez".	Oral interaction triggered and cue displayed.	(Student hesitates, not knowing what to do) Should I click on "Vous"?
Click on "Vous".	Cue given orally.	OK. May be I should simply start again.
Click on "Recommencez".	Whole exercise starts again with oral instructions.	Shit...I didn't want that...Mind you it's probably better if I do start again. They could have made it clearer for first-time users.
Click on "Commencez".	Oral interaction triggered and first cue displayed.	I imagine I now need to record my part of the dialogue?
Click on "Record".	"Record NOW" appears in red and pop-up box displayed with information.	(Student records the requested part with much hesitation mainly due to a great deal of attention paid to the visual display creating distraction). My god! It's appalling. I think I can do it again?! (A suggests that they should play it anyway)
Click on "Play".	Recorded cue played.	(Giggles) I told you...Sound could have been better.
Click on "Record".	"Record NOW" appears in red and pop-up box displayed with information.	(Student re-records cue). OK, that will do.
Click on "Play".	Recorded cue played.	That's better!
Click on "Continuez".	Display provides and shows new cue.	(Student decides to record the new cue straight away, following the instructions and clicking on "avion" as requested). I'm getting the hang

		of it now, but it's not that easy the first time round...(Student carries on clicking on the necessary commands: Continuez , Record, Stop, Play, Vous to get model answer and so on until the exercise is completed. On one occasion the student clicks on Vous to get the answer directly and record it afterwards). Not so easy, you know! That's a good exercise when you know how to handle it!
Click on "Dialogue entier".	Screen changes to display the whole dialogue.	It's quite good. You feel you're part of it...
Click on "Votre version".	Screen changes to display the student's version.	That's going to be good for a laugh. (After six cues the display is stopped by an error message indicating that the specified file could not be found due to the student having skipped the recording. At this point the exercise is abandoned). I don't know what this means, but I think I need to move on!
Click and double click on "Plan".	Back to "Plan" window with voice over: "Que voulez-vous faire maintenant?"	I don't know! Let's look at some grammar. How about the first one "Ordres et contrordres".
Click on "Ordres et contrordres".	New "Ordres et contrordres"window appears.	This looks pretty straight forward..but I might be mistaken.
Click on "Ordre".	Video clip played.	It's always better with the video. Come to think of it, I don't why it wasn't used in the previous exercise.
Click on "Contre-ordre".	Contre-ordre provided orally and displayed.	I get it! OK I suppose I need to record it as well.
Click on "Record".	Error message displayed: "There is no object named record now".	Fine. Let's do the next one then!
Click on "OK" then "Continuez".	Ordre appears and video clip played.	Let's get this right now!
Click on "Record"	Same error message appears.	Is this working properly! It does look like it! Do I do something wrong? (Experimenter explains that it is abnormal behaviour and that recording for this exercise should be skipped. From then on, the student goes relatively quickly through exercise clicking on "Continuez" and "Contrordres" until the exercise is completed). I suppose it's a useful exercise but it's a bit tedious after a while.
Click and double click on "Plan".	Back to "Plan" window.	(Student scans display with hesitation) Might as well carry on with the grammar.
Click on "L'interrogation".	New window appears.	The nice thing about the display is that it's quite consistent. It becomes easier to understand what you've got to do.
Click on "Commencez".	Static picture appears with sentence read out and displayed.	(Student clicks on the right button and pursues the activity quickly but systematically. At no stage is the recording facility used. After a while, the student decides to stop). That was easy.
Click and double click on "Plan".	Back to "Plan" window.	I don't have much time left! I think I can look at the last two grammar exercises.
Click on "On..."	New window appears.	OK.
Click on "Commencez".	Sentence is read out and displayed, a picture is displayed.	I've never done this type of exercise before! (Student clicks on wrong answer initially but quickly understand what is required. The exercise is attempted but not seriously pursued. The recording facility is never used). I've got the gist. Let's try the last one now.
Click and double click on "Plan".	Back to "Plan" window.	(no comment)
Double click on "L'ordre des mots".	New window appears + oral instructions.	It's a bit like a text jumbler isn't it!

Click on "Continuez".	Words appears.	(Student without hesitation drag and drop the words in the relevant boxes). I know this well! This is very neat! Much better than what we're using! (Student makes four successful attempts and decides to call it a day)
Click on "Plan".	Back to "Plan" window.	There you are! That was quite good, I enjoyed it you know even if it was a bit basic. Ideally, we'd need something like this at our level! Any chance?
In the brief discussion which ensued both students expressed their enthusiasm towards the application, saying they would be looking at it again but without the experimenter / lecturer being present, and thought that if such application followed a language course it would be considered a very good support. When asked, they did not think that it was ideally suited for free, uncontrolled browsing as students would not understand what it was trying to achieve and would possibly get bored with it. They thought that, may be, a proper list or checklist of linguistic outcomes with their aims would be welcome to identify what was to be learned and why. This very positive and useful user-walkthrough lasted one and a half hour.		

Recording sheet for User Walk-Throughs

Software:	**France InterActive (Demonstration CD-ROM)**				
User(s):	**no: 1**	**level: 1**	**IT exp: some**	**MM exp: none**	**confidence: average**
Type of Session:	**Task 1 (part 1)**				
Length of Session:	**1 hour**				
Date:	**16th May 1997**				

Task: Rechercher et exploiter tous les exercices d'une unité		
Action Taken	**Outcome of Action**	**Observations**
The student is given a brief introduction including start up information concerning the software, the type of CALL environment, the aims and objectives of the courseware, the level of expected linguistic competence, purpose and expected format of the experiment.		
Click on FIA icon.	Introductory window displayed with message in text box: "Please select the unit you wish to study".	Student reiterates that she does not know anything about multimedia. (showing apprehension). Reassured by experimenter.
Click on "OK" in message box.	Introductory window fully displays the Table of Contents.	Can I click on anything? May be I should start with "Début".
Click on "Début".	Error message appears with message: "Please click on a unit rather than a module".	(Whilst the student is deciphering message, experimenter explains that the introductory unit is uniquely designed to present the computer and the structure of units) May be I need to look at it first?
Click on Unit 1.	New window displays the unit plan + oral instructions.	(Student studies it carefully and silently! but does not scan mouse pointer over screen). If it says "Commencez ici", may be that's what I should do!
Click on "Commencez ici".	Translation given + explanations in pop-up window.	It's not doing anything! (student clicks again, to no avail). Experimenter points at the displayed information at the bottom of the screen on mouse clicking.
Double click on "Commencez ici".	Error message appears with message: "Cannot find page "intro".	I'm not very good at double-clicking! Is this working properly? (experimenter explains that it is only a demonstration version suggesting clicking on Exercise Guide for fear that the student would get bored).
Click then double click on "Exercise Guide".	New window displays the Lesson Plan.	(Student conscientiously studies the interface, initially perplexed but as she reads on and starts moving the mouse pointer on the coloured

		buttons, she begins to understand how the units are planned. She goes over the buttons several times and tries out the sound presentation). This is very good. I never realized the right mouse button could be used! Where do I go from here? Can I go back to the first menu? there isn't much of a choice!
Click and DC on "Plan".	Back to window displaying "Plan".	Well! That's not exactly what I wanted. May be I should try "Use of Buttons".
Click and DC on "Use of Buttons".	New window displays "Using the buttons".	(Student, as previously, studies display carefully and clicks on Stop and Plan triggering sound and visual explanations. Random clicking on other types of buttons ensues). I'm wasting your time, ain't I? (Experimenter reassures student). I'm not sure what to do now! If I understood the explanations I should click on "Plan"?
Click and DC on "Plan".	Back to window displaying "Plan".	I'm not doing very well. OK, so it must be "Stop" then.
Click and DC on "Stop".	New "Stop" window appears with short video clip of a woman saying " C'est fini pour aujourd'hui?".	She is asking me if I want to quit? No, of course not! I really don't understand. (Experimenter explains that for technical reasons it is necessary to quit the application in order to access another unit.
Click on "Oui".	Back to "Program Manager".	Back to square 1!! Should I continue with this! (Experimenter encourages student who is feeling somewhat despondent). Student reluctantly clicks on icon and this time chooses "Première leçon".
Click on "Première leçon".	New window displays "Plan" of unit.	I haven't done anything yet but at least I know what a plan looks like! I imagine that "Commencez ici" doesn't work, does it? (Experimenter intervenes again to let student know that all the functions are enabled.
Double click on "Commencez ici".	New "video" window appears + sound track introducing mode.	It's good to have an oral explanation but it's too fast. I've missed half of what she said. (after some hesitations, student clicks on "Instructions". May be this will start the voice again?
Click on "Instructions".	Text box appears with instructions in French.	(Student reads instructions). Look, it's possible to have them in English! It's good for beginners!
Click on "Anglais".	Instructions appear in English in the text box.	Brilliant! OK, should I watch the video?
Click on "OK" in text box then click and DC on the video screen itself.	Text box disappears. Nothing else happens.	That's not it obviously. (Student scrutinizes video controls and comes to the conclusion that it must be the single arrow for Play.
Click on play symbol.	Video film is played in video screen	(Student expresses amazement and satisfaction that the video should come on so easily). That's great! The image is not terribly clear. Is it possible to adjust it? (Experimenter explains it can't). Student watches the whole video with interest and without interruptions. When the video ends, the student, evidently pleased by it, tries out the controls, rewinds it partly and plays it back twice.
Student indicates that she has to go. The whole user walkthrough has lasted 45minutes. She apologizes for the little progress made but is sufficiently interested to pursue this interaction during a second session.		

Recording sheet for User Walk-Throughs

Software:	**France InterActive (Demonstration CD-ROM)**				
User(s):	**no: 1**	**level: 1**	**IT exp: some**	**MM exp: none**	**confidence: average**
Type of Session:	**Task 1 (part 2)**				
Length of Session:	**1 hour**				
Date:	**24th May 1997**				

Task: Rechercher et exploiter tous les exercices de l'unité 1, Module 2		
Action Taken	**Outcome of Action**	**Observations**
This task is the continuation of Task 1 undertaken by the same student. Therefore, no further introductory explanations are volunteered and the user walkthrough starts directly in Module 2 of Unit 1.		
Click on "Première leçon".	New window displays "Plan" of Unit with voice over.	It's better the second time round. I almost understood all of what she said! I think I need to watch the video again. Is that OK? (confirmed by experimenter).
Click on "Commencez ici".	Nothing happens.	Yes. You need to double click on every thing don't you! This is a drag. I'm never fast enough!
DC on "Commencez ici".	New "video" window appears with voice over presenting mode.	Yes I remember now.
Click on play symbol.	Video film is played on video screen.	(The student watches it silently, concentrating on the dialogues. When it ends she looks a little perplex as to what must be done to access the rest of the unit. Student rehearses previous interaction mentally pointing at buttons with mouse pointer remembering the Stop function). I imagine I must go back to the "Plan" don't I? (Experimenter reminds her of the blue arrow function). Sorry my lack of experience shows!
Click on blue arrow.	New "Video Texte" window appears.	(Student strives to understand what the voice says, with difficulty). It's not so much what she says it's just that it's too fast for me. I'm afraid I need to look at instructions.
Click on "Instructions"	Text box appears with instructions in French.	(Student reads instructions and promptly switches to English for confirmation?)
Click on "Anglais".	Text box displays instructions in English.	(Student reads instructions and rehearses it orally to make sure she understands, interestingly, student notices an anomaly between a written instruction and the screen display: instructions invite student to click on arrow on the right of the screen when the only existing arrow is now on the left.
Click on "OK" and random click on displayed text.	Text highlighted and corresponding video clip played.	This is excellent. This is exactly what I need. I have watched this video twice or three times but there are still bits I don't quite understand. Brilliant! (Student taken in by the potential of the interaction carries on clicking and watching throughout the text which is read quite methodically). This is exactly the kind of practice I need. (protracted time). At the end, the student decides to click on "left" arrow!
Click on arrow.	Taken back to the previous "Video" window (with sound track).	OK! That makes sense I suppose! I have to go back to "Plan" if I'm not mistaken!
Click and DC on "Plan".	Taken back to window with "Plan" and voice over.	What do I want to do now? (translating what the voice had said) I don't know really.
Click and DC on "mots clefs".	New window appears displaying "Mots-clefs".	(Student hesitates).
Click on "Play".	Error message appears saying that "The specified device is not open or is not recognized by MCI".	(Experimenter explains its meaning as well as the Play function. Student clicks on "OK" and scrutinizes the list of vocabulary) Do I need to click on "Mélangez"? I suppose I could try!
Click on "Mélangez".	Lists displayed become scrambled.	No comment.
Click on first word (alors)	Word highlighted with oral pronunciation given.	Do I need to find its translation now?
Click on translation	Word is crossed and	OK! understood (Student tries out 9 other words correctly)

(then, so).	voice over compliments student.	
Click on "Vos progrès".	Text box appears with results of exercise.	Not bad..May be I should do this more often...Looks like a good confidence booster!
Click on right arrow.	New window displays more "Mots-clefs".	It's the same thing isn't it?
Click on word (default display unscrambled).	Word highlighted with pronunciation.	No comment.
Click on translation (adjacent to word)	Voice compliments student and word crossed out.	Ah! that's funny! I forgot to scramble the lists but I can still do it automatically and get credit for it! where is the difficulty then?
Click on left arrow and click and DC on "Plan".	Taken back to "Plan" window.	I'm not going very fast! Let's try something different!
Click on "Je...& Vous..".	New window appears showing the new grammar exercise.	(As in previous cases, student is somewhat perplexed) I didn't quite register what I needed to do. This is frustrating....
Click on picture.	A sentence is displayed and a voice indicates that the answer is wrong.	(Student becomes even more perplexed, not understanding what is happening. Experimenter explains what the interaction consists of)
Click on "Continuez" (initially: Commencez).	Sentence read out.	I'm not very clear with this one! Do I need to click on either ? (confirmation by experimenter)
Click on "Je..."	Yes comes the answer whilst sentence is displayed in the central box.	I see what they are getting at! (On the basis of the first model, student tries out a small number of sentences. However, exercise is by now clearly understood and is felt to be rather basic. Experimenter reminds student that the software was designed for beginners).
Click and DC on "Plan". Click on "Je voudrais.., s.v.p.?".	New exercise window displayed.	I'm sure that once you get the hang of it, it must be dead easy to do! anyway, I'll try not to make the same mistake as before!
Click on "Commencez".	Sentence displayed with gap and read out.	(Student correctly clicks on the right box and carries on several times). At least I didn't get it wrong this time. See I'm learning!
Click on "Un/Une..."	New exercise window displayed.	I'm going to click on one of these buttons (pointing at "Ça svp, un/e svp") but I haven't got a clue as to what to expect!
Click on "Ça svp".	Video clips played.	OK. It's always more straight forward than I think! I don't know why I'm so hesitant...It's probably because you're watching me...
Click on right arrow.	New exercise window appears "Vous desirez..?"	I have seen this already..(student indicates that time is up but just for the record goes back to Plan and access the last exercise)
Click on "Chiffres: 0 à 16".	New window appears.	Student looks at screen display rather quickly
Click on "Ecoutez" et "Commencez".	Numbers are highlighted and read out sequentially.	I think I have seen it all now...
When asked (albeit briefly at the end) the student felt it had been an interesting and worthwhile experience and will want to do some more, probably by herself. Above all, the video part of the interaction was considered the most valuable especially in conjunction with the video-texte. Even at the level at which it was pitched, the student felt there was gain to be made as this type of visual and oral help had never been provided in the past and was definitely lacking.		

17.3 Appendix 3: Audits

AUDIT
STUDENT EVALUATION

The following usability audit is based on a checklist adapted from Ravden and Johnson (1989).

Information related to the student interaction:

CALL Application:	Télé-texte
Number of students interacting with interface:	2 (group A).
Length of interaction:	2hrs (2x1) + 1hr audit
Date:	18.11.96

Visual Clarity

Information displayed on the screen should be clear, well-organized, unambiguous and easy to read.

		Always	Most of the time	Some of the time	Never	comments
1	Is each screen clearly identified with an informative title or description?	✓				
2	Is important information highlighted on the screen? (e.g. cursor position, instructions, errors)			✓		
3	When the student enters information on the screen, is it clear where the information should be entered?			✓		prominent it there but not made terribly clear
4	Does information appear to be organized logically on the screen?			✓		
5	Does the use of colour help make the displays clear?			✓		
6	Is the information on the screen easy to see and read?				✓	
7	Do screens appear uncluttered?				✓	
8	Is it easy to find the required information on a screen?				✓	

9	Are there any comments (good or bad) you wish to add regarding the above issues?
	very poor

10	Overall, how would you rate the application in terms of visual clarity? (Please tick appropriate box below.)				
	Very satisfactory	Moderately satisfactory	Neutral	Moderately unsatisfactory	Very unsatisfactory
					✓

Consistency

The way the application looks and works should be consistent at all times.

		Always	Most of the time	Some of the time	Never	comments
1	Are different colours used consistently throughout the application?		✓			probably always, but not sure.
3	Are icons, symbols, graphical representations and other pictorial information used consistently throughout the application ?	✓				Shame some of them are comp. [illegible]!
4	Is the same type of information a) in the same location on the screen b) in the same layout?			✓		filing system changes → disorientation!
5	Is the method of entering information consistent throughout the application?			✓		depends on exercise.
6	Is the method of selecting options (e.g. from a menu) consistent throughout the application?	✓				
7	Is the way the application responds to a particular student consistent at all times			✓		not sure what this means.

8	Are there any comments (good or bad) you wish to add regarding the above issues?
	Generally consistent though filing system confusing but poor design = pictures for display not interaction.

9	Overall, how would you rate the application in terms of consistency ? (Please tick appropriate box below.)				
	Very satisfactory	Moderately satisfactory	Neutral	Moderately unsatisfactory	Very unsatisfactory
		~~✓~~		✓	

Adaptability

The way the application looks and works should be adapted to match student expectations.

		Always	Most of the time	Some of the time	Never	comments
1	Where icons, symbols, graphical representations etc, are displayed, are they easy to recognize and understand?			✓		Some not others
2	Is information presented and analysed in a way which is familiar to the student?				✓	too complicated
3	Are control actions compatible with those used in other applications with which the student may need to interact?			✓		should really follow conventions
4	Is information presented in a way which fits the student's view of the task?				✓	no unfortunately

		Always	Most of the time	Some of the time	Never	comments
5	Does the organization and structure of the application fit the student's perception of the task?				✓	never obvious
6	Does the sequence of activities required to complete a task follow what the student would expect?				✓	
7	Does the application work in the way the student thinks it should work?				✓	not at all clear

8	Are there any comments (good or bad) you wish to add regarding the above issues?
	Should be a lot more specific about what it's trying to do

9	Overall, how would you rate the application in terms of compatibility ? (Please tick appropriate box below.)				
	Very satisfactory	Moderately satisfactory	Neutral	Moderately unsatisfactory	Very unsatisfactory
					✓

Informative Feedback

Students should be given clear, informative feedback on where they are in the application, what actions they have taken, whether these actions have been successful and what actions should be taken next.

		Always	Most of the time	Some of the time	Never	comments
1	Are instructions and messages displayed by the application concise and positive?			✓		Strategies are OK. but not tasks
2	Are messages displayed by the application relevant?			✓		not in aide
3	Do instructions and prompts clearly indicate what to do?			✓		not obvious
4	Is it clear what actions the student can take at any stage?				✓	not without help.
5	Is it clear what the student needs to do in order to take a particular action?			✓		much like pen work.
6	When the student enters information on the screen, is it made clear what the information should be?			✓		depends on task
7	Do error messages explain clearly: what the errors are? Why they have occurred?				?	Don't know

8	Are there any comments (good or bad) you wish to add regarding the above issues?
	interface not obvious and help (if that's "aide") inconsistent.

9	Overall, how would you rate the application in terms of informative feedback ? (Please tick appropriate box below.)

	Very satisfactory	Moderately satisfactory	Neutral	Moderately unsatisfactory	Very unsatisfactory
					✓

Explicitness

The way the application works and is structured should be clear to the student.

		Always	Most of the time	Some of the time	Never	Comments
1	Is it clear what stage the application has reached in a task?			✓		depends on the task.
2	Is it clear what the student needs to do in order to complete a task?				✓	
3	Where the student is presented with a list of options, is it clear what each option means?			✓		after a while not immediately.
4	Is it clear what part of the application the student is in?		✓			
5	Is it clear what the different parts of the application do?			✓		
6	Is it clear why the application is organized and structured as it is?			✓		guesswork more than anything else.
7	Is the structure of the application obvious to the student?			✓		
8	Is the application well-organized from the student's point of view?				✓	too many
9	In general, is it clear what the application is doing?			✓		rough idea only

10	Are there any comments (good or bad) you wish to add regarding the above issues?
	should be a lot clearer - you end up getting the gist but not good enough

11	Overall, how would you rate the application in terms of explicitness ? (Please tick appropriate box below.)				
	Very satisfactory	Moderately satisfactory	Neutral	Moderately unsatisfactory	Very unsatisfactory
					✓

Appropriate Functionality

The application should meet the needs and requirements of students when carrying out tasks.

Always	Most of the time	Some of the time	Never	comments

1	Are the functions available to the student appropriate for the tasks to be carried out?			✓		
2	Is the way in which information is presented appropriate for the tasks?			✓		
3	Does each screen contain all the information which the student feels is relevant to the task?		✓			
4	Can the student access all the information which s/he feels is needed for the appropriate task?			?		don't really know.
5	Does the application allow the student to do what s/he feels is necessary in order to carry out a task?			✓		frustrating
6	Is the application feedback appropriate for the task?				✓	
7	Do the contents of help and tutorial facilities adequate?				✓	

8	Are there any comments (good or bad) you wish to add regarding the above issues?
	inadequate = too much functionality or not enough

9	Overall, how would you rate the application in terms of appropriate functionality ? (Please tick appropriate box below.)				
	Very satisfactory	Moderately satisfactory	Neutral	Moderately unsatisfactory	Very unsatisfactory
				✓	

Flexibility and Control

The interface should be sufficiently flexible in structure, in the way information is presented and in terms of what the student can do, to suit the needs and requirements of all students, and to allow them to feel in control of the application.

		Always	Most of the time	Some of the time	Never	comments
1	Does the student have control over the order in which s/he requests information?	✓				
2	Can the student look through a sequence of screens in either direction?		✓			Can't move across easily (but doing it)
3	Can the student access a particular screen directly?			✓		not always. see above
4	Can the student move to different parts of the application as required?		✓			
5	Can the student choose the rate at which information is provided?	✓				Not sure
6	Can students tailor certain aspects of the interface for their own preferences or needs?				✓	don't really know

7	Are there any comments (good or bad) you wish to add regarding the above issues?

	navigation frustrated – control OK but largely irrelevant.

8	Overall, how would you rate the application in terms of flexibility and control ? (Please tick appropriate box below.)				
	Very satisfactory	Moderately satisfactory	Neutral	Moderately unsatisfactory	Very unsatisfactory
		✓			

Multimedia Extensions

The multimedia facilities provided by the application should be appropriate and convey useful and valuable information data stimulating both the student interaction and the learning process.

		Always	Most of the time	Some of the time	Never	comments
1	Does the multimedia presentation enhance the educational value of the application?		✓			if we mean the video
2	Does the multimedia presentation promote the recreational value of the application?	✓				jump, well little etc
3	Do the multimedia extensions form an integral part of the application (i.e: they are not simply added on)?	✓				control aspects
4	Are the multimedia extensions attractive and naturally engaging?		✓			aside from functionality yes
5	Do the multimedia extensions provide greater meaningful student interaction?		✓			yes though limited
6	Is the balance between each multimedia type satisfying?			✓		

7	Are there any comments (good or bad) you wish to add regarding the above issues?
	the video is central to app. but badly integrated

8	Overall, how would you rate the application in terms of its multimedia presentation ? (Please tick appropriate box below.)				
	Very satisfactory	Moderately satisfactory	Neutral	Moderately unsatisfactory	Very unsatisfactory
		✓			

Applicability for language learning

The application should clearly state what its educational aims and objectives are thus ensuring greater orientation and better learning outcomes.

		Yes	Yes by default	Only indirectly	No	comments
1	Is the purpose of the design (entertainment, educational or edutainment) unambiguous and clearly stated?				✓	Couldn't see it
2	If the application is for learning, are learning objectives delimited and quantified?				✓	
3	Does the application clearly indicate the level of language proficiency necessary for performing the tasks?	✓				Advanced ?
4	Does the application require supplementary support material such as a text book to perform the necessary tasks?	?	✓			? shouldn't require anything
5	Does the application explain if a language learning methodology has been adopted? If so, is it stated?				✓	
6	Does the application recommend pathways or approaches for best learning outcomes?				✓	
7	Does the application suggest or recomment modes of access such as self-access, or teacher-guidance/teacher-led ?				? ✓	Don't know
8	Is the student's input assessed? If so, are assessment criteria clearly stated?			✓	✓	Not clear

9	Are there any comments (good or bad) you wish to add regarding the above issues?
	Presumably you learn as you go along. don't know how this works - not clear - part of problem - what is purpose of it -

10	Overall, how would you rate the application in terms of applicability for language learning ? (Please tick appropriate box below.)			
Very satisfactory	Moderately satisfactory	Neutral	Moderately unsatisfactory	Very unsatisfactory
			✓	

Error Prevention and Correction

The application should be designed to minimize the possibility of student error, with inbuilt facilities for detecting and handling those which do occur; students should be able to check their inputs and to correct errors, or potential error situations before the input is processed.

		Always	Most of the time	Some of the time	Never	comments
1	Does the application validate student inputs before processing?				✓	
2	Does the application clearly and promptly inform the student when it detects an error?				✓	N/A ?

3	Is the student able to check what s/he has entered before it is processed?			?		it doesn't feel as though it's processed.
4	Is it easy for the student to correct errors?	✓				
5	Can the student try out possible actions without the application processing the input?		✓			
6	Is the application protected against common trivial errors?					Don't know
7	Does the application prevent the student from taking actions which s/he is not authorized to take?					Like what?
8	In general, is the application free from errors and malfunctions?					Don't know.

9	Are there any comments (good or bad) you wish to add regarding the above issues?
	Largely irrelevant with what has been done.

10	Overall, how would you rate the application in terms of error prevention and correction ? (Please tick appropriate box below.)				
	Very satisfactory	Moderately satisfactory	Neutral	Moderately unsatisfactory	Very unsatisfactory
			✓		

Student Guidance and Support

Informative, easy-to-use and relevant guidance and support should be provided, both on the computer (via an on-line help facility) and in hard-copy document form, to help the student understand and use the application.

		Always	Most of the time	Some of the time	Never	comments
1	Is there some form of help facility on the computer to help the student when using the application?			✓		Guide at beginning
2	Can the student request this easily from any point in the application?			✓		not flexible.
3	Is the help facility presented clearly?			✓		OK in guide otherwise non-existent.
4	Does the help facility clearly explain the possible actions which can be taken?			✓		hard to find
5	When using the help facility, can the student find relevant information directly, without having to look through unnecessary information?				✓	Couldn't find any.
6	Is there some form of hard-copy guide to the application?	✓				believe so
7	Is the organization of all forms of student guidance and support related to the tasks which the student can carry out?				✓	?
8	Do student guidance and support facilities adequately explain both student and application errors?				✓	?

9	Are there any comments (good or bad) you wish to add regarding the above issues?

	not a crucial issue here – but little help is available. don't understand Aide not activated in some cases. Too general

10	Overall, how would you rate the application in terms of student guidance and support ? (Please tick appropriate box below.)				
	Very satisfactory	Moderately satisfactory	Neutral	Moderately unsatisfactory	Very unsatisfactory
			✓		

Usability Problems

When using the hypermedia CALL application, did you experience problems with any of the following:

		No problems	Minor problems	Major problems	Comments
1	Working out how to use the application		✓		
2	Lack of guidance on how to use the application		✓		
3	Poor application documentation		✓		
4	Understanding how to carry out the tasks			✓	many
5	Knowing what to do next		✓		
6	Understanding how the information on the screen relates to what you are doing		✓		
7	Finding the information you want		✓		
8	Information which is difficult to read clearly	✓			
9	Too many colours on the screen	✓			
10	Colours which are difficult to look at for any length of time	✓			
11	An inflexible, rigid application structure		✓		
12	An inflexible HELP (guidance) facility		✓		
13	Losing track of where you are in the application		✓		
14	A general sense of aimlessness			✓	
15	An easily reached boredom threshold			✓	
16	Lack of clear learning indicators			✓	
17	Unexpected actions by the application	✓			
18	Functions which are difficult or awkward to use		✓		
19	Knowing where or how to input information		✓		
20	Working out how to correct errors		✓		
21	Poor assessment mechanisms		✓		
22	Having to carry out the same type of activity in different ways	✓			

General questions on the usability of the application

Please give your views on the usability of the application by answering the questions below in the spaces provided. There are no right or wrong answers.

1	Does the application correspond to what you expected? Why?
	No – didn't know what to expect – thought video could have been more/better exploited – should have been more interaction
2	What are the best aspects of the application for you as student?
	access to authentic video material with transcription
2	What are the worst aspects of the application ?
	too ambitious – too many different/obscure exercises when you have to type in text – this is not what multimedia should be
3	Are there any parts which you found confusing or difficult to fully understand?
	Many – didn't understand "les témoins" – didn't know what to do with student pad or the cut/copy/paste ?
4	Were there any aspects which you found irritating although they did not cause major problems?
	Many – nothing was strictly major but as a whole this app. was very irritating – compact. cluttered. messy – poor design.
5	What were the most common mistakes you made when using the application?
	not knowing what to do – reluctant to do any of the activities just wanted to sit back & watch the video.
6	Is this CALL application a valuable learning tool? Why?
	No not as it stands – see above – not conducive to a learning situation
7	What changes would you make to the application to make it better from the student's point of view?
	better use of technology – synchronisation – better audio-visual facilities – more flexibility – more interactive links
7	Is there anything else about the application you would like to add?
	good idea – pretty useless design. – sorry to be so damning

AUDIT
STUDENT EVALUATION

The following usability audit is based on a checklist adapted from Ravden and Johnson (1989).

Information related to the student interaction:

CALL Application:	ici texte
Number of students interacting with interface:	2 (groups).
Length of interaction:	2hrs (2x1) + 1hr audit.
Date:	20th, November 1996.

Visual Clarity

Information displayed on the screen should be clear, well-organized, unambiguous and easy to read.

		Always	Most of the time	Some of the time	Never	comments
1	Is each screen clearly identified with an informative title or description?		✓			
2	Is important information highlighted on the screen? (e.g. cursor position, instructions, errors)		✓			
3	When the student enters information on the screen, is it clear where the information should be entered?			✓		
4	Does information appear to be organized logically on the screen?			✓		
5	Does the use of colour help make the displays clear?	✓				
6	Is the information on the screen easy to see and read?				✓	too busy
7	Do screens appear uncluttered?				✓	
8	Is it easy to find the required information on a screen?				✓	

9	Are there any comments (good or bad) you wish to add regarding the above issues?
	too much on screen

10	Overall, how would you rate the application in terms of visual clarity? (Please tick appropriate box below.)				
	Very satisfactory	Moderately satisfactory	Neutral	Moderately unsatisfactory	Very unsatisfactory
				✓	

The way the application looks and works should be consistent at all times.

		Always	Most of the time	Some of the time	Never	comments
1	Are different colours used consistently throughout the application?	✓				but there aren't many colours used
3	Are icons, symbols, graphical representations and other pictorial information used consistently throughout the application ?		✓			
4	Is the same type of information a) in the same location on the screen b) in the same layout?			✓		
5	Is the method of entering information consistent throughout the application?			✓		
6	Is the method of selecting options (e.g. from a menu) consistent throughout the application?	✓				
7	Is the way the application responds to a particular student consistent at all times		✓			don't know

8	Are there any comments (good or bad) you wish to add regarding the above issues?
	felt comfortable. apart from the types of exercises displayed in Dossier.

9	Overall, how would you rate the application in terms of consistency ? (Please tick appropriate box below.)				
	Very satisfactory	Moderately satisfactory	Neutral	Moderately unsatisfactory	Very unsatisfactory
		✓			

Adaptability

The way the application looks and works should be adapted to match student expectations.

		Always	Most of the time	Some of the time	Never	comments
1	Where icons, symbols, graphical representations etc, are displayed, are they easy to recognize and understand?			✓		
2	Is information presented and analysed in a way which is familiar to the student?		✓			too much to read
3	Are control actions compatible with those used in other applications with which the student may need to interact?			✓		weird at times.
4	Is information presented in a way which fits the student's view of the task?			✓		

		Always	Most of the time	Some of the time	Never	comments
5	Does the organization and structure of the application fit the student's perception of the task?			✓		
6	Does the sequence of activities required to complete a task follow what the student would expect?			✓		
7	Does the application work in the way the student thinks it should work?			✓		

8	Are there any comments (good or bad) you wish to add regarding the above issues?
	[illegible] - but it was a bit of a struggle

9	Overall, how would you rate the application in terms of compatibility ? (Please tick appropriate box below.)				
	Very satisfactory	Moderately satisfactory	Neutral	Moderately unsatisfactory	Very unsatisfactory
				✓	

Informative Feedback

Students should be given clear, informative feedback on where they are in the application, what actions they have taken, whether these actions have been successful and what actions should be taken next.

		Always	Most of the time	Some of the time	Never	comments
1	Are instructions and messages displayed by the application concise and positive?		✓			
2	Are messages displayed by the application relevant?		✓			
3	Do instructions and prompts clearly indicate what to do?		✓			
4	Is it clear what actions the student can take at any stage?			✓		
5	Is it clear what the student needs to do in order to take a particular action?			✓		
6	When the student enters information on the screen, is it made clear what the information should be?			✓		
7	Do error messages explain clearly: what the errors are? Why they have occurred?				✓	don't know

8	Are there any comments (good or bad) you wish to add regarding the above issues?
	didn't use much - nothing was sufficiently specific

9	Overall, how would you rate the application in terms of informative feedback ? (Please tick appropriate box below.)

	Very satisfactory	Moderately satisfactory	Neutral	Moderately unsatisfactory	Very unsatisfactory
		✓			

Explicitness

The way the application works and is structured should be clear to the student.

		Always	Most of the time	Some of the time	Never	Comments
1	Is it clear what stage the application has reached in a task?			✓		
2	Is it clear what the student needs to do in order to complete a task?			✓		
3	Where the student is presented with a list of options, is it clear what each option means?			✓		bad presentation
4	Is it clear what part of the application the student is in?	✓				
5	Is it clear what the different parts of the application do?			✓		
6	Is it clear why the application is organized and structured as it is?				✓	no explanation given.
7	Is the structure of the application obvious to the student?				✓	
8	Is the application well-organized from the student's point of view?				✓	
9	In general, is it clear what the application is doing?				✓	

10	Are there any comments (good or bad) you wish to add regarding the above issues?
	might be thick but didn't really know what its application was doing or what we were supposed to be doing

11	Overall, how would you rate the application in terms of explicitness ? (Please tick appropriate box below.)				
	Very satisfactory	Moderately satisfactory	Neutral	Moderately unsatisfactory	Very unsatisfactory
				✓	

Appropriate Functionality

The application should meet the needs and requirements of students when carrying out tasks.

Always Most of the time Some of the time Never comments

1	Are the functions available to the student appropriate for the tasks to be carried out?		✓			
2	Is the way in which information is presented appropriate for the tasks?		✓			
3	Does each screen contain all the information which the student feels is relevant to the task?		? ✓			Don't understand
4	Can the student access all the information which s/he feels is needed for the appropriate task?	✓				think so
5	Does the application allow the student to do what s/he feels is necessary in order to carry out a task?		✓			hopefully
6	Is the application feedback appropriate for the task?			✓		not specific enough
7	Do the contents of help and tutorial facilities adequate?			✓		" "

8	Are there any comments (good or bad) you wish to add regarding the above issues?
	there is just too much to be done - with few functionality understood.

9	Overall, how would you rate the application in terms of appropriate functionality ? (Please tick appropriate box below.)				
	Very satisfactory	Moderately satisfactory	Neutral	Moderately unsatisfactory	Very unsatisfactory
			✓		

Flexibility and Control

The interface should be sufficiently flexible in structure, in the way information is presented and in terms of what the student can do, to suit the needs and requirements of all students, and to allow them to feel in control of the application.

		Always	Most of the time	Some of the time	Never	comments
1	Does the student have control over the order in which s/he requests information?		✓			
2	Can the student look through a sequence of screens in either direction?		✓			
3	Can the student access a particular screen directly?		✓			
4	Can the student move to different parts of the application as required?		✓			
5	Can the student choose the rate at which information is provided?		✓			
6	Can students tailor certain aspects of the interface for their own preferences or needs?		✓			

7	Are there any comments (good or bad) you wish to add regarding the above issues?

	too technical - don't really know what we're talking about.

8	Overall, how would you rate the application in terms of flexibility and control ? (Please tick appropriate box below.)				
	Very satisfactory	Moderately satisfactory	Neutral	Moderately unsatisfactory	Very unsatisfactory
		✓			

Multimedia Extensions

The multimedia facilities provided by the application should be appropriate and convey useful and valuable information data stimulating both the student interaction and the learning process.

		Always	Most of the time	Some of the time	Never	comments
1	Does the multimedia presentation enhance the educational value of the application?	✓				video OK.
2	Does the multimedia presentation promote the recreational value of the application?	✓				
3	Do the multimedia extensions form an integral part of the application (i.e: they are not simply added on)?	✓				
4	Are the multimedia extensions attractive and naturally engaging?	✓				
5	Do the multimedia extensions provide greater meaningful student interaction?	✓				
6	Is the balance between each multimedia type satisfying?					NA.

7	Are there any comments (good or bad) you wish to add regarding the above issues?
	video material OK.

8	Overall, how would you rate the application in terms of its multimedia presentation ? (Please tick appropriate box below.)				
	Very satisfactory	Moderately satisfactory	Neutral	Moderately unsatisfactory	Very unsatisfactory
	✓				

Applicability for language learning

The application should clearly state what its educational aims and objectives are thus ensuring greater orientation and better learning outcomes.

		Yes	Yes by default	Only indirectly	No	comments
1	Is the purpose of the design (entertainment, educational or edutainment) unambiguous and clearly stated?		✓			
2	If the application is for learning, are learning objectives delimited and quantified?			✓		
3	Does the application clearly indicate the level of language proficiency necessary for performing the tasks?	✓				
4	Does the application require supplementary support material such as a text book to perform the necessary tasks?		✓			
5	Does the application explain if a language learning methodology has been adopted? If so, is it stated?				✓	
6	Does the application recommend pathways or approaches for best learning outcomes?				✓	
7	Does the application suggest or recomment modes of access such as self-access, or teacher-guidance/teacher-led ?				✓	
8	Is the student's input assessed? If so, are assessment criteria clearly stated?				✓	

9	Are there any comments (good or bad) you wish to add regarding the above issues?
	apart from enabling you to access & play with videos – not sure what they try to achieve.

10	Overall, how would you rate the application in terms of applicability for language learning ? (Please tick appropriate box below.)				
	Very satisfactory	Moderately satisfactory	Neutral	Moderately unsatisfactory	Very unsatisfactory
		✓			

Error Prevention and Correction

The application should be designed to minimize the possibility of student error, with inbuilt facilities for detecting and handling those which do occur; students should be able to check their inputs and to correct errors, or potential error situations before the input is processed.

		Always	Most of the time	Some of the time	Never	comments
1	Does the application validate student inputs before processing?				✓	?
2	Does the application clearly and promptly inform the student when it detects an error?				✓	?

		Always	Most of the time	Some of the time	Never	comments
3	Is the student able to check what s/he has entered before it is processed?		✓			
4	Is it easy for the student to correct errors?		✓			?
5	Can the student try out possible actions without the application processing the input?		✓			?
6	Is the application protected against common trivial errors?					don't know
7	Does the application prevent the student from taking actions which s/he is not authorized to take?					" "
8	In general, is the application free from errors and malfunctions?					" "

9	Are there any comments (good or bad) you wish to add regarding the above issues?
	not in a position to say anything, useful

10	Overall, how would you rate the application in terms of error prevention and correction ? (Please tick appropriate box below.)				
	Very satisfactory	Moderately satisfactory	Neutral	Moderately unsatisfactory	Very unsatisfactory
			✓		

Student Guidance and Support

Informative, easy-to-use and relevant guidance and support should be provided, both on the computer (via an on-line help facility) and in hard-copy document form, to help the student understand and use the application.

		Always	Most of the time	Some of the time	Never	comments
1	Is there some form of help facility on the computer to help the student when using the application?		✓			
2	Can the student request this easily from any point in the application?		✓			
3	Is the help facility presented clearly?	✓				Very general
4	Does the help facility clearly explain the possible actions which can be taken?		✓			" "
5	When using the help facility, can the student find relevant information directly, without having to look through unnecessary information?				✓	Same stuff all the time to search through
6	Is there some form of hard-copy guide to the application?					Don't know
7	Is the organization of all forms of student guidance and support related to the tasks which the student can carry out?				✓	
8	Do student guidance and support facilities adequately explain both student and application errors?					Don't K.

9	Are there any comments (good or bad) you wish to add regarding the above issues?

	Could be more specific / helpful .

10	Overall, how would you rate the application in terms of student guidance and support ? (Please tick appropriate box below.)				
	Very satisfactory	Moderately satisfactory	Neutral	Moderately unsatisfactory	Very unsatisfactory
				✓	

Usability Problems

When using the hypermedia CALL application, did you experience problems with any of the following:

		No problems	Minor problems	Major problems	Comments
1	Working out how to use the application		✓		
2	Lack of guidance on how to use the application		✓		
3	Poor application documentation		✓		
4	Understanding how to carry out the tasks		✓		
5	Knowing what to do next			✓	
6	Understanding how the information on the screen relates to what you are doing		✓		
7	Finding the information you want		✓		
8	Information which is difficult to read clearly	✓			
9	Too many colours on the screen	✓			
10	Colours which are difficult to look at for any length of time	✓			
11	An inflexible, rigid application structure		✓		
12	An inflexible HELP (guidance) facility		✓		
13	Losing track of where you are in the application		✓		
14	A general sense of aimlessness			✓	
15	An easily reached boredom threshold		✓		
16	Lack of clear learning indicators			✓	
17	Unexpected actions by the application	✓			
18	Functions which are difficult or awkward to use		✓		
19	Knowing where or how to input information		✓		
20	Working out how to correct errors		✓		
21	Poor assessment mechanisms	✓			
21	Having to carry out the same type of activity in different ways	✓			

General questions on the usability of the application

Please give your views on the usability of the application by answering the questions below in the spaces provided. There are no right or wrong answers.

1	Does the application correspond to what you expected? Why?
	No but overall it's not too bad.
2	What are the best aspects of the application for you as student?
	the multimedia part of it
2	What are the worst aspects of the application ?
	all the fiddly bits + some of the exercises
3	Are there any parts which you found confusing or difficult to fully understand?
	Yes what we were supposed to really do
4	Were there any aspects which you found irritating although they did not cause major problems?
	Lack of clarity & explanations
5	What were the most common mistakes you made when using the application?
	too many to recall.
6	Is this CALL application a valuable learning tool? Why?
	Don't know - possibly but under some form of supervision - control.
7	What changes would you make to the application to make it better from the student's point of view?
	make it simpler - more multimedia
7	Is there anything else about the application you would like to add?
	appealing but deceptively complex

AUDIT
STUDENT EVALUATION

The following usability audit is based on a checklist adapted from Ravden and Johnson (1989).

Information related to the student interaction:

CALL Application:	UP TO STANDARD
Number of students interacting with interface:	2 (group a)
Length of interaction:	3hrs (3 x 1) + 1 hr audit
Date:	11/12/96

Visual Clarity

Information displayed on the screen should be clear, well-organized, unambiguous and easy to read.

		Always	Most of the time	Some of the time	Never	comments
1	Is each screen clearly identified with an informative title or description?			✓		more explanation
2	Is important information highlighted on the screen? (e.g. cursor position, instructions, errors)			✓		
3	When the student enters information on the screen, is it clear where the information should be entered?	✓				
4	Does information appear to be organized logically on the screen?	✓				
5	Does the use of colour help make the displays clear?	✓				
6	Is the information on the screen easy to see and read?	✓				
7	Do screens appear uncluttered?	✓				
8	Is it easy to find the required information on a screen?		✓			

Forward function to next page or exit

9	Are there any comments (good or bad) you wish to add regarding the above issues?
	Don't care much for pictures - old fashioned - don't help do anything

10	Overall, how would you rate the application in terms of visual clarity? (Please tick appropriate box below.)				
	Very satisfactory	Moderately satisfactory	Neutral	Moderately unsatisfactory	Very unsatisfactory
	~~✓~~	✓			

Consistency

The way the application looks and works should be consistent at all times.

		Always	Most of the time	Some of the time	Never	comments
1	Are different colours used consistently throughout the application?	✓				
3	Are icons, symbols, graphical representations and other pictorial information used consistently throughout the application ?	✓				
4	Is the same type of information a) in the same location on the screen b) in the same layout?	✓				
5	Is the method of entering information consistent throughout the application?	✓				
6	Is the method of selecting options (e.g. from a menu) consistent throughout the application?	✓				
7	Is the way the application responds to a particular student consistent at all times	✓				

8	Are there any comments (good or bad) you wish to add regarding the above issues?
	✓ Consistent but doesn't always work well. (Recording)

9	Overall, how would you rate the application in terms of consistency ? (Please tick appropriate box below.)				
	~~Very~~ satisfactory	Moderately satisfactory	Neutral	Moderately unsatisfactory	Very unsatisfactory
	✓	? ✓			

reservation

Adaptability

The way the application looks and works should be adapted to match student expectations.

		Always	Most of the time	Some of the time	Never	comments
1	Where icons, symbols, graphical representations etc, are displayed, are they easy to recognize and understand?			✓		Recording button not clear intention not clear
2	Is information presented and analysed in a way which is familiar to the student?			✓		
3	Are control actions compatible with those used in other applications with which the student may need to interact?			✓		See recording protocol.
4	Is information presented in a way which fits the student's view of the task?		✓			

		Always	Most of the time	Some of the time	Never	comments
5	Does the organization and structure of the application fit the student's perception of the task?		✓			Structure limited
6	Does the sequence of activities required to complete a task follow what the student would expect?		✓			
7	Does the application work in the way the student thinks it should work?					not clear what it is trying to achieve.

8	Are there any comments (good or bad) you wish to add regarding the above issues?
	Recording functions should follow standard protocol. Structure easy enough to identify but is it just about aural comprehension enhanced by exercises ?

9	Overall, how would you rate the application in terms of compatibility ? (Please tick appropriate box below.)				
	Very satisfactory	Moderately satisfactory	Neutral	Moderately unsatisfactory	Very unsatisfactory
		✓			

Informative Feedback

Students should be given clear, informative feedback on where they are in the application, what actions they have taken, whether these actions have been successful and what actions should be taken next.

		Always	Most of the time	Some of the time	Never	comments
1	Are instructions and messages displayed by the application concise and positive?		✓			
2	Are messages displayed by the application relevant?		✓			
3	Do instructions and prompts clearly indicate what to do?			✓		Move on / Exit weird.
4	Is it clear what actions the student can take at any stage?			✓		
5	Is it clear what the student needs to do in order to take a particular action?		✓			
6	When the student enters information on the screen, is it made clear what the information should be?		✓			
7	Do error messages explain clearly: what the errors are? Why they have occurred?		✓			

8	Are there any comments (good or bad) you wish to add regarding the above issues?
	Clear generally – menu given – units identified + exercises – Recording mode / practise not clear enough. Feedback for exercises limited but useful.

9	Overall, how would you rate the application in terms of informative feedback ? (Please tick appropriate box below.)

	Very satisfactory	Moderately satisfactory	Neutral	Moderately unsatisfactory	Very unsatisfactory
		✓			

Explicitness

The way the application works and is structured should be clear to the student.

		Always	Most of the time	Some of the time	Never	Comments
1	Is it clear what stage the application has reached in a task?		✓			
2	Is it clear what the student needs to do in order to complete a task?		✓			not always in practice mode
3	Where the student is presented with a list of options, is it clear what each option means?		✓			
4	Is it clear what part of the application the student is in?	✓	~~✓~~			
5	Is it clear what the different parts of the application do?		✓			After a while
6	Is it clear why the application is organized and structured as it is?	✓	✓			limited technology ? simple structure
7	Is the structure of the application obvious to the student?		✓			
8	Is the application well-organized from the student's point of view?			✓		disappointing recording facility
9	In general, is it clear what the application is doing?		✓			

10	Are there any comments (good or bad) you wish to add regarding the above issues?
	fairly explicit generally - becomes predictable after understanding of functions of a unit

11	Overall, how would you rate the application in terms of explicitness ? (Please tick appropriate box below.)				
	Very satisfactory	Moderately satisfactory	Neutral	Moderately unsatisfactory	Very unsatisfactory
		✓			

Appropriate Functionality

The application should meet the needs and requirements of students when carrying out tasks.

Always | Most of the time | Some of the time | Never | comments

1	Are the functions available to the student appropriate for the tasks to be carried out?	✓		✓		because of recording
2	Is the way in which information is presented appropriate for the tasks?	✓	✓			recording itself though
3	Does each screen contain all the information which the student feels is relevant to the task?	✓				too a de background info + tips.
4	Can the student access all the information which s/he feels is needed for the appropriate task?	✓				would have liked more links.
5	Does the application allow the student to do what s/he feels is necessary in order to carry out a task?		✓			not everything interactive.
6	Is the application feedback appropriate for the task?		✓			poor for a type of exercise.
7	Do the contents of help and tutorial facilities adequate?	✓				yes overall.

8	Are there any comments (good or bad) you wish to add regarding the above issues?
	with limited functionality. application works fine - probably not of its depth when assessing recording, in exercises

9	Overall, how would you rate the application in terms of appropriate functionality ? (Please tick appropriate box below.)				
	~~Very~~ satisfactory	Moderately satisfactory	Neutral	Moderately unsatisfactory	Very unsatisfactory
	✓	✓			

Flexibility and Control

The interface should be sufficiently flexible in structure, in the way information is presented and in terms of what the student can do, to suit the needs and requirements of all students, and to allow them to feel in control of the application.

		Always	Most of the time	Some of the time	Never	comments
1	Does the student have control over the order in which s/he requests information?	✓	✓			yes + no
2	Can the student look through a sequence of screens in either direction?			✓		feeling of being locked in a mode till exercise done.
3	Can the student access a particular screen directly?			✓		
4	Can the student move to different parts of the application as required?			✓		
5	Can the student choose the rate at which information is provided?	✓				
6	Can students tailor certain aspects of the interface for their own preferences or needs?			✓		two levels but limiting

7	Are there any comments (good or bad) you wish to add regarding the above issues?

	Shows rigidity - often frustrating

8	Overall, how would you rate the application in terms of flexibility and control ? (Please tick appropriate box below.)				
	Very satisfactory	Moderately satisfactory	Neutral	Moderately unsatisfactory	Very unsatisfactory
			✓		

Multimedia Extensions

The multimedia facilities provided by the application should be appropriate and convey useful and valuable information data stimulating both the student interaction and the learning process.

		Always	Most of the time	Some of the time	Never	comments
1	Does the multimedia presentation enhance the educational value of the application?			✓		too static - visual limited Sound OK.
2	Does the multimedia presentation promote the recreational value of the application?				✓	
3	Do the multimedia extensions form an integral part of the application (i.e: they are not simply added on)?			✓		only sound + recording,
4	Are the multimedia extensions attractive and naturally engaging?				✓	sound recording poor
5	Do the multimedia extensions provide greater meaningful student interaction?			✓		when recording
6	Is the balance between each multimedia type satisfying?				✓	

7	Are there any comments (good or bad) you wish to add regarding the above issues?
	more could have been made of MM : sound recording poor generally - visual display limited - interaction only enhanced by exercises

8	Overall, how would you rate the application in terms of its multimedia presentation ? (Please tick appropriate box below.)				
	Very satisfactory	Moderately satisfactory	Neutral	Moderately unsatisfactory	Very unsatisfactory
				✓	

Applicability for language learning

The application should clearly state what its educational aims and objectives are thus ensuring greater orientation and better learning outcomes.

		Yes	Yes by default	Only indirectly	No	comments
1	Is the purpose of the design (entertainment, educational or edutainment) unambiguous and clearly stated?	✓				
2	If the application is for learning, are learning objectives delimited and quantified?		✓			what is NVQ level? not quantified.
3	Does the application clearly indicate the level of language proficiency necessary for performing the tasks?	✓				though vague caught open to interpretation.
4	Does the application require supplementary support material such as a text book to perform the necessary tasks?				✓	
5	Does the application explain if a language learning methodology has been adopted? If so, is it stated?				✓	not to study if yes
6	Does the application recommend pathways or approaches for best learning outcomes?	✓				in tips.
7	Does the application suggest or recomment modes of access such as self-access, or teacher-guidance/teacher-led ?	✓				though ambiguous
8	Is the student's input assessed? If so, are assessment criteria clearly stated?	✓				but dodgy.

9	Are there any comments (good or bad) you wish to add regarding the above issues?
	A mixture - yes aims clearly stated NVQ 1 & 2 4 4 language skills but use not sufficiently clearly defined Self study? help of tutor - -

10	Overall, how would you rate the application in terms of applicability for language learning ? (Please tick appropriate box below.)				
	Very satisfactory	Moderately satisfactory	Neutral	Moderately unsatisfactory	Very unsatisfactory
		✓			

Error Prevention and Correction

The application should be designed to minimize the possibility of student error, with inbuilt facilities for detecting and handling those which do occur; students should be able to check their inputs and to correct errors, or potential error situations before the input is processed.

		Always	Most of the time	Some of the time	Never	comments
1	Does the application validate student inputs before processing?					
2	Does the application clearly and promptly inform the student when it detects an error?					

		Always	Most of the time	Some of the time	Never	comments
3	Is the student able to check what s/he has entered before it is processed?					
4	Is it easy for the student to correct errors?					
5	Can the student try out possible actions without the application processing the input?					
6	Is the application protected against common trivial errors?					
7	Does the application prevent the student from taking actions which s/he is not authorized to take?					
8	In general, is the application free from errors and malfunctions?	✓				

9	Are there any comments (good or bad) you wish to add regarding the above issues?
	Not an issue here.

10	Overall, how would you rate the application in terms of error prevention and correction ? (Please tick appropriate box below.)				
	Very satisfactory	Moderately satisfactory	Neutral	Moderately unsatisfactory	Very unsatisfactory
			✓		

Student Guidance and Support

Informative, easy-to-use and relevant guidance and support should be provided, both on the computer (via an on-line help facility) and in hard-copy document form, to help the student understand and use the application.

		Always	Most of the time	Some of the time	Never	comments
1	Is there some form of help facility on the computer to help the student when using the application?	✓				
2	Can the student request this easily from any point in the application?	✓				
3	Is the help facility presented clearly?	✓				
4	Does the help facility clearly explain the possible actions which can be taken?		✓			
5	When using the help facility, can the student find relevant information directly, without having to look through unnecessary information?	✓				
6	Is there some form of hard-copy guide to the application?				✓	not provided
7	Is the organization of all forms of student guidance and support related to the tasks which the student can carry out?	✓				?
8	Do student guidance and support facilities adequately explain both student and application errors?			✓		?

9	Are there any comments (good or bad) you wish to add regarding the above issues?

	trouble-free

10	Overall, how would you rate the application in terms of student guidance and support ? (Please tick appropriate box below.)				
	Very satisfactory	Moderately satisfactory	Neutral	Moderately unsatisfactory	Very unsatisfactory
	✓				

Usability Problems

When using the hypermedia CALL application, did you experience problems with any of the following:

		No problems	Minor problems	Major problems	Comments
1	Working out how to use the application	✓			
2	Lack of guidance on how to use the application	✓			
3	Poor application documentation	✓			NA possibly
4	Understanding how to carry out the tasks	✓			
5	Knowing what to do next		✓		could be at times
6	Understanding how the information on the screen relates to what you are doing	✓			
7	Finding the information you want		✓		navigation limited
8	Information which is difficult to read clearly	✓			
9	Too many colours on the screen	✓			
10	Colours which are difficult to look at for any length of time	✓			
11	An inflexible, rigid application structure			✓	too rigid ..
12	An inflexible HELP (guidance) facility	✓			
13	Losing track of where you are in the application	✓			
14	A general sense of aimlessness		✓		
15	An easily reached boredom threshold		✓	✓	too predictable except exercises.
16	Lack of clear learning indicators		✓		
17	Unexpected actions by the application	✓			
18	Functions which are difficult or awkward to use		✓		recording
19	Knowing where or how to input information	✓			
20	Working out how to correct errors	✓			
21	Poor assessment mechanisms		✓		unsatisfactory in exercises
22	Having to carry out the same type of activity in different ways	✓			

General questions on the usability of the application

Please give your views on the usability of the application by answering the questions below in the spaces provided. There are no right or wrong answers.

1	Does the application correspond to what you expected? Why? No
	not interactive enough – good design but limited functionality not flexible enough
2	What are the best aspects of the application for you as student?
	clear screens / feels well built / appealing colour scheme stable generally –
2	What are the worst aspects of the application ?
	lack of flexibility – predictability –
3	Are there any parts which you found confusing or difficult to fully understand?
	nothing insurmountable
4	Were there any aspects which you found irritating although they did not cause major problems?
	Yes – recording facility – self scoring = disturbing .
5	What were the most common mistakes you made when using the application?
	mistakes in recording mode –
6	Is this CALL application a valuable learning tool? Why?
	in a limited way .. Yes – but too reminiscent of lang lab approach to be really exciting –
7	What changes would you make to the application to make it better from the student's point of view?
	it's got to tell / show what it is meant to be providing = vocab / grammar / progression etc. . . requires more than just 10 seperate units with background + grammar .
7	Is there anything else about the application you would like to add?
	Solid, well made, clear screen display but cannot see motivation sustained in self study mode .

AUDIT
STUDENT EVALUATION

The following usability audit is based on a checklist adapted from Ravden and Johnson (1989).

Information related to the student interaction:

CALL Application:	Up to standard in French
Number of students interacting with interface:	2 (groups)
Length of interaction:	8hrs (3x1) + 1hr audit
Date:	11/12/96

Visual Clarity

Information displayed on the screen should be clear, well-organized, unambiguous and easy to read.

		Always	Most of the time	Some of the time	Never	comments
1	Is each screen clearly identified with an informative title or description?	✓				Yes - think so.
2	Is important information highlighted on the screen? (e.g. cursor position, instructions, errors)		✓			
3	When the student enters information on the screen, is it clear where the information should be entered?		✓			
4	Does information appear to be organized logically on the screen?			✓		
5	Does the use of colour help make the displays clear?			✓		
6	Is the information on the screen easy to see and read?		✓			
7	Do screens appear uncluttered?		✓			
8	Is it easy to find the required information on a screen?		✓			

9	Are there any comments (good or bad) you wish to add regarding the above issues?
	Not bad altogether

10	Overall, how would you rate the application in terms of visual clarity? (Please tick appropriate box below.)				
	Very satisfactory	Moderately satisfactory	Neutral	Moderately unsatisfactory	Very unsatisfactory
		✓			

Consistency

The way the application looks and works should be consistent at all times.

		Always	Most of the time	Some of the time	Never	comments
1	Are different colours used consistently throughout the application?	✓				
3	Are icons, symbols, graphical representations and other pictorial information used consistently throughout the application ?	✓				
4	Is the same type of information a) in the same location on the screen b) in the same layout?	✓				
5	Is the method of entering information consistent throughout the application?	✓				yes but at first no obvious
6	Is the method of selecting options (e.g. from a menu) consistent throughout the application?	✓				
7	Is the way the application responds to a particular student consistent at all times	✓				Think so but don't know

8	Are there any comments (good or bad) you wish to add regarding the above issues?
	Consistent but could be due to ignorance -

9	Overall, how would you rate the application in terms of consistency ? (Please tick appropriate box below.)				
	Very satisfactory	Moderately satisfactory	Neutral	Moderately unsatisfactory	Very unsatisfactory
	✓				

Adaptability

The way the application looks and works should be adapted to match student expectations.

		Always	Most of the time	Some of the time	Never	comments
1	Where icons, symbols, graphical representations etc, are displayed, are they easy to recognize and understand?	✓				
2	Is information presented and analysed in a way which is familiar to the student?		✓			not always certainly
3	Are control actions compatible with those used in other applications with which the student may need to interact?			✓		they had easier ... not used to.

MM

		Always	Most of the time	Some of the time	Never	comments
4	Is information presented in a way which fits the student's view of the task?			✓		
5	Does the organization and structure of the application fit the student's perception of the task?			✓		
6	Does the sequence of activities required to complete a task follow what the student would expect?			✓		
7	Does the application work in the way the student thinks it should work?			✓		

8	Are there any comments (good or bad) you wish to add regarding the above issues?
	Not clear enough – at times frustrating

9	Overall, how would you rate the application in terms of compatibility ? (Please tick appropriate box below.)				
	Very satisfactory	Moderately satisfactory	Neutral	Moderately unsatisfactory	Very unsatisfactory
				✓	

Informative Feedback

Students should be given clear, informative feedback on where they are in the application, what actions they have taken, whether these actions have been successful and what actions should be taken next.

		Always	Most of the time	Some of the time	Never	comments
1	Are instructions and messages displayed by the application concise and positive?		✓			
2	Are messages displayed by the application relevant?		✓			
3	Do instructions and prompts clearly indicate what to do?		✓			
4	Is it clear what actions the student can take at any stage?		✓			
5	Is it clear what the student needs to do in order to take a particular action?		✓			
6	When the student enters information on the screen, is it made clear what the information should be?		✓			
7	Do error messages explain clearly: what the errors are? Why they have occurred?					don't know.

8	Are there any comments (good or bad) you wish to add regarding the above issues?
	Quite good but not always relevant

9	Overall, how would you rate the application in terms of informative feedback ? (Please tick appropriate box below.)				
	Very satisfactory	Moderately satisfactory	Neutral	Moderately unsatisfactory	Very unsatisfactory
		✓			

Explicitness

The way the application works and is structured should be clear to the student.

		Always	Most of the time	Some of the time	Never	Comments
1	Is it clear what stage the application has reached in a task?		✓			
2	Is it clear what the student needs to do in order to complete a task?		✓			
3	Where the student is presented with a list of options, is it clear what each option means?			✓		not always clear to start with.
4	Is it clear what part of the application the student is in?		✓			
5	Is it clear what the different parts of the application do?			✓		not
6	Is it clear why the application is organized and structured as it is?			✓		
7	Is the structure of the application obvious to the student?			✓		
8	Is the application well-organized from the student's point of view?			✓		
9	In general, is it clear what the application is doing?			✓		

10	Are there any comments (good or bad) you wish to add regarding the above issues?
	What is it doing - it's obvious at one level (exercises) but generally not specially clear.

11	Overall, how would you rate the application in terms of explicitness ? (Please tick appropriate box below.)				
	Very satisfactory	Moderately satisfactory	Neutral	Moderately unsatisfactory	Very unsatisfactory
				✓	

Appropriate Functionality

The application should meet the needs and requirements of students when carrying out tasks.

		Always	Most of the time	Some of the time	Never	comments
1	Are the functions available to the student appropriate for the tasks to be carried out?			✓		
2	Is the way in which information is presented appropriate for the tasks?			✓		don't know really
3	Does each screen contain all the information which the student feels is relevant to the task?		✓			
4	Can the student access all the information which s/he feels is needed for the appropriate task?			✓		
5	Does the application allow the student to do what s/he feels is necessary in order to carry out a task?			✓		
6	Is the application feedback appropriate for the task?		✓			
7	Do the contents of help and tutorial facilities adequate?		✓			

8	Are there any comments (good or bad) you wish to add regarding the above issues?
	OK. though we struggled at times

9	Overall, how would you rate the application in terms of appropriate functionality ? (Please tick appropriate box below.)				
	Very satisfactory	Moderately satisfactory	Neutral	Moderately unsatisfactory	Very unsatisfactory
		~~✓~~	✓		

Flexibility and Control

The interface should be sufficiently flexible in structure, in the way information is presented and in terms of what the student can do, to suit the needs and requirements of all students, and to allow them to feel in control of the application.

		Always	Most of the time	Some of the time	Never	comments
1	Does the student have control over the order in which s/he requests information?		~~✓~~	✓		
2	Can the student look through a sequence of screens in either direction?			✓		but also confusing at times

3	Can the student access a particular screen directly?			✓		
4	Can the student move to different parts of the application as required?			✓		
5	Can the student choose the rate at which information is provided?			✓		
6	Can students tailor certain aspects of the interface for their own preferences or needs?			✓		

7	Are there any comments (good or bad) you wish to add regarding the above issues?
	too inflexible really

8	Overall, how would you rate the application in terms of flexibility and control ? (Please tick appropriate box below.)				
	Very satisfactory	Moderately satisfactory	Neutral	Moderately unsatisfactory	Very unsatisfactory
				✓	✓

Multimedia Extensions

The multimedia facilities provided by the application should be appropriate and convey useful and valuable information data stimulating both the student interaction and the learning process.

		Always	Most of the time	Some of the time	Never	comments
1	Does the multimedia presentation enhance the educational value of the application?		✓			
2	Does the multimedia presentation promote the recreational value of the application?	✓				
3	Do the multimedia extensions form an integral part of the application (i.e: they are not simply added on)?		✓			
4	Are the multimedia extensions attractive and naturally engaging?		✓			
5	Do the multimedia extensions provide greater meaningful student interaction?		✓			
6	Is the balance between each multimedia type satisfying?			✓		

7	Are there any comments (good or bad) you wish to add regarding the above issues?
	Video / animation would have been nice

8	Overall, how would you rate the application in terms of its multimedia presentation ? (Please tick appropriate box below.)				
	Very	Moderately	Neutral	Moderately	Very

	satisfactory	satisfactory		unsatisfactory	unsatisfactory
		✓			

Applicability for language learning

The application should clearly state what its educational aims and objectives are thus ensuring greater orientation and better learning outcomes.

		Yes	Yes by default	Only indirectly	No	comments
1	Is the purpose of the design (entertainment, educational or edutainment) unambiguous and clearly stated?		✓			
2	If the application is for learning, are learning objectives delimited and quantified?			✓		in introduction
3	Does the application clearly indicate the level of language proficiency necessary for performing the tasks?	✓				Yes but not clearly
4	Does the application require supplementary support material such as a text book to perform the necessary tasks?					Don't know but probably
5	Does the application explain if a language learning methodology has been adopted? If so, is it stated?				✓	to my knowledge
6	Does the application recommend pathways or approaches for best learning outcomes?			✓		
7	Does the application suggest or recomment modes of access such as self-access, or teacher-guidance/teacher-led ?				✓	not directly
8	Is the student's input assessed? If so, are assessment criteria clearly stated?	✓				in some cases yes.

9	Are there any comments (good or bad) you wish to add regarding the above issues?
	Objectives not clear enough – limited – better with book – in class?

10	Overall, how would you rate the application in terms of applicability for language learning ? (Please tick appropriate box below.)				
	Very satisfactory	Moderately satisfactory	Neutral	Moderately unsatisfactory	Very unsatisfactory
			✓		

Error Prevention and Correction

The application should be designed to minimize the possibility of student error, with inbuilt facilities for detecting and handling those which do occur; students should be able to check their inputs and to correct errors, or potential error situations before the input is processed.

		Always	Most of the time	Some of the time	Never	comments
1	Does the application validate student inputs before processing?	✓				Yes (I think).
2	Does the application clearly and promptly inform the student when it detects an error?			✓		don't know.
3	Is the student able to check what s/he has entered before it is processed?					″
4	Is it easy for the student to correct errors?		✓			
5	Can the student try out possible actions without the application processing the input?				✓	″
6	Is the application protected against common trivial errors?					″
7	Does the application prevent the student from taking actions which s/he is not authorized to take?					″
8	In general, is the application free from errors and malfunctions?					″

9	Are there any comments (good or bad) you wish to add regarding the above issues?
	Not in a position to answer really.

10	Overall, how would you rate the application in terms of error prevention and correction ? (Please tick appropriate box below.)				
	Very satisfactory	Moderately satisfactory	Neutral	Moderately unsatisfactory	Very unsatisfactory
			✓		

Student Guidance and Support

Informative, easy-to-use and relevant guidance and support should be provided, both on the computer (via an on-line help facility) and in hard-copy document form, to help the student understand and use the application.

		Always	Most of the time	Some of the time	Never	comments
1	Is there some form of help facility on the computer to help the student when using the application?	✓				
2	Can the student request this easily from any point in the application?	✓				
3	Is the help facility presented clearly?		✓			
4	Does the help facility clearly explain the possible actions which can be taken?		✓			
5	When using the help facility, can the student find relevant information directly, without having to look through unnecessary information?		✓			
6	Is there some form of hard-copy guide to the application?					Don't know
7	Is the organization of all forms of student guidance and support related to the tasks which the student can carry out?		✓			
8	Do student guidance and support facilities adequately explain both student and application errors?					?

9	Are there any comments (good or bad) you wish to add regarding the above issues?
	Some things a bit obscure - 4/5 there was Guidance + help - though not always what you wanted.

10	Overall, how would you rate the application in terms of student guidance and support ? (Please tick appropriate box below.)				
	Very satisfactory	Moderately satisfactory	Neutral	Moderately unsatisfactory	Very unsatisfactory
		✓			

Usability Problems

When using the hypermedia CALL application, did you experience problems with any of the following:

		No problems	Minor problems	Major problems	Comments
1	Working out how to use the application		✓		
2	Lack of guidance on how to use the application	✓			
3	Poor application documentation				NA
4	Understanding how to carry out the tasks	✓			
5	Knowing what to do next		✓		in some cases
6	Understanding how the information on the screen relates to what you are doing		✓		''
7	Finding the information you want		✓		
8	Information which is difficult to read clearly		✓		
9	Too many colours on the screen	✓			
10	Colours which are difficult to look at for any length of time	✓			
11	An inflexible, rigid application structure		✓		
12	An inflexible HELP (guidance) facility	✓			
13	Losing track of where you are in the application			✓	if you get lost
14	A general sense of aimlessness		✓		
15	An easily reached boredom threshold		✓		
16	Lack of clear learning indicators			✓	
17	Unexpected actions by the application		✓		
18	Functions which are difficult or awkward to use		✓		
19	Knowing where or how to input information		✓		
20	Working out how to correct errors	✓			?
21	Poor assessment mechanisms	✓			?
21	Having to carry out the same type of activity in different ways	✓			?

General questions on the usability of the application

Please give your views on the usability of the application by answering the questions below in the spaces provided. There are no right or wrong answers.

1	Does the application correspond to what you expected? Why?
	Didn't know what to expect
2	What are the best aspects of the application for you as student?
	aural comprehension . prompts . background information
2	What are the worst aspects of the application ?
	recording facility
3	Are there any parts which you found confusing or difficult to fully understand?
	It's all pretty straightforward really - we're just thick!
4	Were there any aspects which you found irritating although they did not cause major problems?
	When you can't get out of the [illegible] an exercise yes it's annoying
5	What were the most common mistakes you made when using the application?
	don't remember - made too many .
6	Is this CALL application a valuable learning tool? Why?
	Can't see it like this - spent too much time getting it to work - but prompts - don't know really .
7	What changes would you make to the application to make it better from the student's point of view?
	more attractive ? more explicit - more originality more multimedia
7	Is there anything else about the application you would like to add?
	no - .

AUDIT
STUDENT EVALUATION

The following usability audit is based on a checklist adapted from Ravden and Johnson (1989).

Information related to the student interaction:

CALL Application:	A la recherche d'un emploi
Number of students interacting with interface:	2 (Group A).
Length of interaction:	3hrs (3 x 1hr) + 1hr audit.
Date:	12/2/97

Visual Clarity

Information displayed on the screen should be clear, well-organized, unambiguous and easy to read.

		Always	Most of the time	Some of the time	Never	comments
1	Is each screen clearly identified with an informative title or description?	✓				
2	Is important information highlighted on the screen? (e.g. cursor position, instructions, errors)	✓				
3	When the student enters information on the screen, is it clear where the information should be entered?	✓				
4	Does information appear to be organized logically on the screen?	✓				
5	Does the use of colour help make the displays clear?			✓		poor colour changes.
6	Is the information on the screen easy to see and read?		✓			
7	Do screens appear uncluttered?		✓			
8	Is it easy to find the required information on a screen?		✓			

9	Are there any comments (good or bad) you wish to add regarding the above issues?
	Good generally - poor colour changes though. but very good reference section.

10	Overall, how would you rate the application in terms of visual clarity? (Please tick appropriate box below.)				
	Very satisfactory	Moderately satisfactory	Neutral	Moderately unsatisfactory	Very unsatisfactory
	[illegible]	✓			

colours.

Consistency

The way the application looks and works should be consistent at all times

		Always	Most of the time	Some of the time	Never	comments
1	Are different colours used consistently throughout the application?		✓			
3	Are icons, symbols, graphical representations and other pictorial information used consistently throughout the application ?	✓				
4	Is the same type of information a) in the same location on the screen b) in the same layout?		✓			varies with exercises
5	Is the method of entering information consistent throughout the application?		✓			not typing.
6	Is the method of selecting options (e.g. from a menu) consistent throughout the application?	✓				
7	Is the way the application responds to a particular student consistent at all times	✓				

8	Are there any comments (good or bad) you wish to add regarding the above issues?
	pretty consistent throughout - windows-based - windows - mouse-driven buttons - one exception: necessary use of keyboard every so often.

9	Overall, how would you rate the application in terms of consistency ? (Please tick appropriate box below.)				
	Very satisfactory	Moderately satisfactory	Neutral	Moderately unsatisfactory	Very unsatisfactory
	✓	✓			typing.

Adaptability

The way the application looks and works should be adapted to match student expectations.

		Always	Most of the time	Some of the time	Never	comments
1	Where icons, symbols, graphical representations etc, are displayed, are they easy to recognize and understand?	✓				
2	Is information presented and analysed in a way which is familiar to the student?	✓				
3	Are control actions compatible with those used in other applications with which the student may need to interact?	✓				

4	Is information presented in a way which fits the student's view of the task?		✓			
5	Does the organization and structure of the application fit the student's perception of the task?		✓			
6	Does the sequence of activities required to complete a task follow what the student would expect?		✓			
7	Does the application work in the way the student thinks it should work?		✓			

8	Are there any comments (good or bad) you wish to add regarding the above issues?
	performance of task straightforward. no particular problem.

9	Overall, how would you rate the application in terms of compatibility ? (Please tick appropriate box below.)				
	Very satisfactory	Moderately satisfactory	Neutral	Moderately unsatisfactory	Very unsatisfactory
	✓				

Informative Feedback

Students should be given clear, informative feedback on where they are in the application, what actions they have taken, whether these actions have been successful and what actions should be taken next.

		Always	Most of the time	Some of the time	Never	comments
1	Are instructions and messages displayed by the application concise and positive?	✓				
2	Are messages displayed by the application relevant?		✓			in one case it wasn't!
3	Do instructions and prompts clearly indicate what to do?	✓				
4	Is it clear what actions the student can take at any stage?		✓			
5	Is it clear what the student needs to do in order to take a particular action?	✓				
6	When the student enters information on the screen, is it made clear what the information should be?	✓				though not always clear when doing activity
7	Do error messages explain clearly: what the errors are? Why they have occurred?	✓				then we've seen.

8	Are there any comments (good or bad) you wish to add regarding the above issues?
	good generally.

9	Overall, how would you rate the application in terms of informative feedback (Please tick appropriate box below.)				
	Very satisfactory	Moderately satisfactory	Neutral	Moderately unsatisfactory	Very unsatisfactory
	✓				

Explicitness

The way the application works and is structured should be clear to the student.

		Always	Most of the time	Some of the time	Never	Comments
1	Is it clear what stage the application has reached in a task?			✓		we had problems
2	Is it clear what the student needs to do in order to complete a task?			✓		here - !
3	Where the student is presented with a list of options, is it clear what each option means?	✓				NA ? or simulation?
4	Is it clear what part of the application the student is in?		✓			Ref / Lessons Yes.
5	Is it clear what the different parts of the application do?	✓				
6	Is it clear why the application is organized and structured as it is?			✓		
7	Is the structure of the application obvious to the student?		✓			
8	Is the application well-organized from the student's point of view?		✓			
9	In general, is it clear what the application is doing?			✓		

10	Are there any comments (good or bad) you wish to add regarding the above issues?
	Could be clearer - the 2 sections are quite clearly separated but the activity part is not clear enough.

11	Overall, how would you rate the application in terms of explicitness ? (Please tick appropriate box below.)				
	Very satisfactory	Moderately satisfactory	Neutral	Moderately unsatisfactory	Very unsatisfactory
		✓			

Appropriate Functionality

The application should meet the needs and requirements of students when carrying out tasks.

		Always	Most of the time	Some of the time	Never	comments
1	Are the functions available to the student appropriate for the tasks to be carried out?	✓				
2	Is the way in which information is presented appropriate for the tasks?		✓			
3	Does each screen contain all the information which the student feels is relevant to the task?	✓				
4	Can the student access all the information which s/he feels is needed for the appropriate task?	✓				
5	Does the application allow the student to do what s/he feels is necessary in order to carry out a task?	ok	✓			videos a problem
6	Is the application feedback appropriate for the task?		✓			but fine – [illegible] in terms of corrections
7	Do the contents of help and tutorial facilities adequate?		✓			

8	Are there any comments (good or bad) you wish to add regarding the above issues?
	Functions are generally good – well designed but can be stretched by variety & complexity of exercises – in particular simulation + video control.

9	Overall, how would you rate the application in terms of appropriate functionality ? (Please tick appropriate box below.)				
	Very satisfactory	Moderately satisfactory	Neutral	Moderately unsatisfactory	Very unsatisfactory
		✓			

Flexibility and Control

The interface should be sufficiently flexible in structure, in the way information is presented and in terms of what the student can do, to suit the needs and requirements of all students, and to allow them to feel in control of the application.

		Always	Most of the time	Some of the time	Never	comments
1	Does the student have control over the order in which s/he requests information?	✓				
2	Can the student look through a sequence of screens in either direction?	✓				

3	Can the student access a particular screen directly?	✓					
4	Can the student move to different parts of the application as required?	✓					
5	Can the student choose the rate at which information is provided?						NA
6	Can students tailor certain aspects of the interface for their own preferences or needs?						NA

7	Are there any comments (good or bad) you wish to add regarding the above issues?
	OK. no comment

8	Overall, how would you rate the application in terms of flexibility and control ? (Please tick appropriate box below.)				
	Very satisfactory	Moderately satisfactory	Neutral	Moderately unsatisfactory	Very unsatisfactory
	✓				

Multimedia Extensions

The multimedia facilities provided by the application should be appropriate and convey useful and valuable information data stimulating both the student interaction and the learning process.

		Always	Most of the time	Some of the time	Never	comments
1	Does the multimedia presentation enhance the educational value of the application?	✓				
2	Does the multimedia presentation promote the recreational value of the application?	✓				
3	Do the multimedia extensions form an integral part of the application (i.e: they are not simply added on)?	✓				
4	Are the multimedia extensions attractive and naturally engaging?			✓		could have been better.
5	Do the multimedia extensions provide greater meaningful student interaction?		✓			sp: stimulation.
6	Is the balance between each multimedia type satisfying?		✓			good sound use.

7	Are there any comments (good or bad) you wish to add regarding the above issues?
	multimedia is well exploited considering limitations of software. + oral presentation good + good in lang. context. but quality + attraction down.

8	Overall, how would you rate the application in terms of its multimedia presentation ? (Please tick appropriate box below.)				
	Very	Moderately	Neutral	Moderately	Very

	satisfactory	satisfactory		unsatisfactory	unsatisfactory
		✓			

Applicability for language learning

The application should clearly state what its educational aims and objectives are thus ensuring greater orientation and better learning outcomes.

		Yes	Yes by default	Only indirectly	No	comments
1	Is the purpose of the design (entertainment, educational or edutainment) unambiguous and clearly stated?			✓		
2	If the application is for learning, are learning objectives delimited and quantified?			✓		
3	Does the application clearly indicate the level of language proficiency necessary for performing the tasks?	✓				apparently.
4	Does the application require supplementary support material such as a text book to perform the necessary tasks?	~~wh~~			✓	Should need oth though not text book - against convention
5	Does the application explain if a language learning methodology has been adopted? If so, is it stated?				✓	
6	Does the application recommend pathways or approaches for best learning outcomes?				✓	
7	Does the application suggest or recomment modes of access such as self-access, or teacher-guidance/teacher-led ?				✓	
8	Is the student's input assessed? If so, are assessment criteria clearly stated?			✓		

9	Are there any comments (good or bad) you wish to add regarding the above issues?
	main flaw of software - no educational aims & obj. are provided & there is a need for greater info but not in a written form - it should all be on screen somehow!

10	Overall, how would you rate the application in terms of applicability for language learning ? (Please tick appropriate box below.)				
	Very satisfactory	Moderately satisfactory	Neutral	Moderately unsatisfactory	Very unsatisfactory
					✓

Error Prevention and Correction

The application should be designed to minimize the possibility of student error, with inbuilt facilities for detecting and handling those which do occur; students should be able to check their inputs and to correct errors, or potential error situations before the input is processed.

		Always	Most of the time	Some of the time	Never	comments
1	Does the application validate student inputs before processing?			✓		when required
2	Does the application clearly and promptly inform the student when it detects an error?		✓			
3	Is the student able to check what s/he has entered before it is processed?	✓				
4	Is it easy for the student to correct errors?	•	✓			
5	Can the student try out possible actions without the application processing the input?		✓			
6	Is the application protected against common trivial errors?	✓				
7	Does the application prevent the student from taking actions which s/he is not authorized to take?		✓			imagine so!
8	In general, is the application free from errors and malfunctions?	✓				Yes but don't know!

9	Are there any comments (good or bad) you wish to add regarding the above issues?
	Good - nothing to complain about. Through doing Q, not application.

10	Overall, how would you rate the application in terms of error prevention and correction ? (Please tick appropriate box below.)				
	Very satisfactory	Moderately satisfactory	Neutral	Moderately unsatisfactory	Very unsatisfactory
		✓			

Student Guidance and Support

Informative, easy-to-use and relevant guidance and support should be provided, both on the computer (via an on-line help facility) and in hard-copy document form, to help the student understand and use the application.

		Always	Most of the time	Some of the time	Never	comments
1	Is there some form of help facility on the computer to help the student when using the application?	✓				
2	Can the student request this easily from any point in the application?	✓				
3	Is the help facility presented clearly?	✓				
4	Does the help facility clearly explain the possible actions which can be taken?	✓				
5	When using the help facility, can the student find relevant information directly, without having to look through unnecessary information?	✓				though info succinct.
6	Is there some form of hard-copy guide to the application?				✓	wh to knowledge of students
7	Is the organization of all forms of student guidance and support related to the tasks which the student can carry out?			✓		not responding always to expectations
8	Do student guidance and support facilities adequately explain both student and application errors?		✓			

9	Are there any comments (good or bad) you wish to add regarding the above issues?
	Good generally – remembered on lack of expected response. –

10	Overall, how would you rate the application in terms of student guidance and support ? (Please tick appropriate box below.)				
	Very satisfactory	Moderately satisfactory	Neutral	Moderately unsatisfactory	Very unsatisfactory
	✓				

Usability Problems

When using the hypermedia CALL application, did you experience problems with any of the following:

		No problems	Minor problems	Major problems	Comments
1	Working out how to use the application	✓			
2	Lack of guidance on how to use the application		✓		in exercises particularly.
3	Poor application documentation		✓		
4	Understanding how to carry out the tasks		✓		
5	Knowing what to do next		✓		
6	Understanding how the information on the screen relates to what you are doing		✓		
7	Finding the information you want		✓		
8	Information which is difficult to read clearly		✓	✓	though could be major problems
9	Too many colours on the screen		✓	✓	
10	Colours which are difficult to look at for any length of time		✓	✓	
11	An inflexible, rigid application structure		✓		
12	An inflexible HELP (guidance) facility	✓			
13	Losing track of where you are in the application		✓		
14	A general sense of aimlessness			✓	
15	An easily reached boredom threshold			✓	
16	Lack of clear learning indicators		✓	✓	
17	Unexpected actions by the application		✓		
18	Functions which are difficult or awkward to use		✓		
19	Knowing where or how to input information		✓		
20	Working out how to correct errors		✓		
21	Poor assessment mechanisms		✓		
22	Having to carry out the same type of activity in different ways		✓		

General questions on the usability of the application

Please give your views on the usability of the application by answering the questions below in the spaces provided. There are no right or wrong answers.

1	Does the application correspond to what you expected? Why?
	It quickly did – but not initially – obviously.
2	What are the best aspects of the application for you as student?
	freedom of movement – control – reference especially. Could be a good source of info if info correct.
2	What are the worst aspects of the application ?
	Some of exercises are far fetched – crude – approach can be patronising – the material in files could have been better adapted to us or our needs.
3	Are there any parts which you found confusing or difficult to fully understand?
	what they wanted to achieve: learning / teaching / using skills to get jobs -- none of this clear.
4	Were there any aspects which you found irritating although they did not cause major problems?
	Yes many – characters – some clowns – some chatting some exercises . . .
5	What were the most common mistakes you made when using the application?
	none really – NA
6	Is this CALL application a valuable learning tool? Why?
	Don't know – I think it might be a bit of a task to sell it to students
7	What changes would you make to the application to make it better from the student's point of view?
	make explicit its use – make grammar more appealing – integrate it properly. make the whole interaction a better experience with clear outcomes
7	Is there anything else about the application you would like to add?
	Software with great potential but too much contrast between commercially-based app. & university which are too dry & boring.

AUDIT
STUDENT EVALUATION

The following usability audit is based on a checklist adapted from Ravden and Johnson (1989).

Information related to the student interaction:

CALL Application:	A la Recherche d'un Emploi
Number of students interacting with interface:	2 (Group b).
Length of interaction:	3hrs (3 x 1hr) + 1hr audit.
Date:	12/2/97

Visual Clarity

Information displayed on the screen should be clear, well-organized, unambiguous and easy to read.

		Always	Most of the time	Some of the time	Never	comments
1	Is each screen clearly identified with an informative title or description?	✓				
2	Is important information highlighted on the screen? (e.g. cursor position, instructions, errors)	✓				depends on info
3	When the student enters information on the screen, is it clear where the information should be entered?		✓			some exercises are hidden.
4	Does information appear to be organized logically on the screen?		✓			weird fashion
5	Does the use of colour help make the displays clear?			✓		
6	Is the information on the screen easy to see and read?		✓			cannot be read at times
7	Do screens appear uncluttered?		✓			
8	Is it easy to find the required information on a screen?			✓		problems understanding structure

9	Are there any comments (good or bad) you wish to add regarding the above issues?
	Overall feeling: display a bit dull - some colours unattractive - b/w seems unnecessary.

10	Overall, how would you rate the application in terms of visual clarity? (Please tick appropriate box below.)				
	Very satisfactory	Moderately satisfactory	Neutral	Moderately unsatisfactory	Very unsatisfactory
		✓			

Consistency

The way the application looks and works should be consistent at all times.

		Always	Most of the time	Some of the time	Never	comments
1	Are different colours used consistently throughout the application?		✓			not sure .
3	Are icons, symbols, graphical representations and other pictorial information used consistently throughout the application ?	✓				well done.
4	Is the same type of information a) in the same location on the screen b) in the same layout?	✓				
5	Is the method of entering information consistent throughout the application?		✓			It varies with exercises ← typing!
6	Is the method of selecting options (e.g. from a menu) consistent throughout the application?	✓				
7	Is the way the application responds to a particular student consistent at all times		✓			though not sure .

8	Are there any comments (good or bad) you wish to add regarding the above issues?
	pretty consistent though there shouldn't be any typing to do in some of the exercises !

9	Overall, how would you rate the application in terms of consistency ? (Please tick appropriate box below.)				
	Very satisfactory	Moderately satisfactory	Neutral	Moderately unsatisfactory	Very unsatisfactory
	X ←	→ ✓			X typing

Adaptability

The way the application looks and works should be adapted to match student expectations.

		Always	Most of the time	Some of the time	Never	comments
1	Where icons, symbols, graphical representations etc, are displayed, are they easy to recognize and understand?	✓				
2	Is information presented and analysed in a way which is familiar to the student?		✓			not too bad
3	Are control actions compatible with those used in other applications with which the student may need to interact?			✓		? not sure ? understand question

4	Is information presented in a way which fits the student's view of the task?			✓		not obvious at times.
5	Does the organization and structure of the application fit the student's perception of the task?			✓		" "
6	Does the sequence of activities required to complete a task follow what the student would expect?			✓		
7	Does the application work in the way the student thinks it should work?			✓		

8	Are there any comments (good or bad) you wish to add regarding the above issues?
	It's not clear what it is trying to do - you have menus that's OK but that's about all.

9	Overall, how would you rate the application in terms of compatibility ? (Please tick appropriate box below.)				
	Very satisfactory	Moderately satisfactory	Neutral	Moderately unsatisfactory	Very unsatisfactory
				✓	

Informative Feedback

Students should be given clear, informative feedback on where they are in the application, what actions they have taken, whether these actions have been successful and what actions should be taken next.

		Always	Most of the time	Some of the time	Never	comments
1	Are instructions and messages displayed by the application concise and positive?		✓			all answers were I suppose.
2	Are messages displayed by the application relevant?		✓			didn't like them in exercises
3	Do instructions and prompts clearly indicate what to do?	✓				
4	Is it clear what actions the student can take at any stage?	✓		.		
5	Is it clear what the student needs to do in order to take a particular action?	✓		✓		depends on exercises
6	When the student enters information on the screen, is it made clear what the information should be?			✓		" "
7	Do error messages explain clearly: what the errors are? Why they have occurred?	✓				

8	Are there any comments (good or bad) you wish to add regarding the above issues?
	the feedback is OK as far as overall functions are concerned it seems a bit iffy when doing the exercises

9	Overall, how would you rate the application in terms of informative feedback ? (Please tick appropriate box below.)				
	Very satisfactory	Moderately satisfactory	Neutral	Moderately unsatisfactory	Very unsatisfactory
			✓		

Explicitness

The way the application works and is structured should be clear to the student.

		Always	Most of the time	Some of the time	Never	Comments
1	Is it clear what stage the application has reached in a task?			✓		
2	Is it clear what the student needs to do in order to complete a task?			✓		
3	Where the student is presented with a list of options, is it clear what each option means?		✓			
4	Is it clear what part of the application the student is in?			✓		
5	Is it clear what the different parts of the application do?		✓			not at first.
6	Is it clear why the application is organized and structured as it is?				✓	
7	Is the structure of the application obvious to the student?			✓		
8	Is the application well-organized from the student's point of view?			✓		Could do a lot better.
9	In general, is it clear what the application is doing?			✓		

10	Are there any comments (good or bad) you wish to add regarding the above issues?
	re current problem - application does not make it clear enough what it is trying to do and how it goes about doing it.

11	Overall, how would you rate the application in terms of explicitness ? (Please tick appropriate box below.)				
	Very satisfactory	Moderately satisfactory	Neutral	Moderately unsatisfactory	Very unsatisfactory
				✓	

Appropriate Functionality

The application should meet the needs and requirements of students when carrying out tasks.

		Always	Most of the time	Some of the time	Never	comments
1	Are the functions available to the student appropriate for the tasks to be carried out?		✓			
2	Is the way in which information is presented appropriate for the tasks?		✓			
3	Does each screen contain all the information which the student feels is relevant to the task?		✓			
4	Can the student access all the information which s/he feels is needed for the appropriate task?			✓		we didn't try them all.
5	Does the application allow the student to do what s/he feels is necessary in order to carry out a task?	✓				I suppose so but ?? ?
6	Is the application feedback appropriate for the task?			✓		
7	Do the contents of help and tutorial facilities adequate?	✓				Quite good on the whole

8	Are there any comments (good or bad) you wish to add regarding the above issues?
	All the functions are complex to use - i.e. simulation which require a whole sequence of tasks to perform.

9	Overall, how would you rate the application in terms of appropriate functionality ? (Please tick appropriate box below.)				
	Very satisfactory	Moderately satisfactory	Neutral	Moderately unsatisfactory	Very unsatisfactory
		✓			

Flexibility and Control

The interface should be sufficiently flexible in structure, in the way information is presented and in terms of what the student can do, to suit the needs and requirements of all students, and to allow them to feel in control of the application.

		Always	Most of the time	Some of the time	Never	comments
1	Does the student have control over the order in which s/he requests information?	✓				
2	Can the student look through a sequence of screens in either direction?	✓				

3	Can the student access a particular screen directly?		✓			I think so!
4	Can the student move to different parts of the application as required?	✓				
5	Can the student choose the rate at which information is provided?				✓	don't understand Q
6	Can students tailor certain aspects of the interface for their own preferences or needs?				✓	don't think so.

7	Are there any comments (good or bad) you wish to add regarding the above issues?
	navigation is OK.

8	Overall, how would you rate the application in terms of flexibility and control ? (Please tick appropriate box below.)				
	Very satisfactory	Moderately satisfactory	Neutral	Moderately unsatisfactory	Very unsatisfactory
	✓				

Multimedia Extensions

The multimedia facilities provided by the application should be appropriate and convey useful and valuable information data stimulating both the student interaction and the learning process.

		Always	Most of the time	Some of the time	Never	comments
1	Does the multimedia presentation enhance the educational value of the application?		✓			
2	Does the multimedia presentation promote the recreational value of the application?	✓				
3	Do the multimedia extensions form an integral part of the application (i.e: they are not simply added on)?	✓				
4	Are the multimedia extensions attractive and naturally engaging?			✓		
5	Do the multimedia extensions provide greater meaningful student interaction?		✓			
6	Is the balance between each multimedia type satisfying?		✓			

7	Are there any comments (good or bad) you wish to add regarding the above issues?
	Videos are great - though background + characters dull. also: Sound/oral explanations too fast - we should have English over it.

8	Overall, how would you rate the application in terms of its multimedia presentation ? (Please tick appropriate box below.)				
	Very	Moderately	Neutral	Moderately	Very

	satisfactory	satisfactory		unsatisfactory	unsatisfactory
		✓			

Applicability for language learning

The application should clearly state what its educational aims and objectives are thus ensuring greater orientation and better learning outcomes.

		Yes	Yes by default	Only indirectly	No	comments
1	Is the purpose of the design (entertainment, educational or edutainment) unambiguous and clearly stated?				✓	
2	If the application is for learning, are learning objectives delimited and quantified?			✓		
3	Does the application clearly indicate the level of language proficiency necessary for performing the tasks?	✓				Yes but does mean much
4	Does the application require supplementary support material such as a text book to perform the necessary tasks?					don't know but it feels like it.
5	Does the application explain if a language learning methodology has been adopted? If so, is it stated?				✓	
6	Does the application recommend pathways or approaches for best learning outcomes?				✓	
7	Does the application suggest or recomment modes of access such as self-access, or teacher-guidance/teacher-led ?	✓				Yes in introductory text but not stories.
8	Is the student's input assessed? If so, are assessment criteria clearly stated?			✓		Sort of

9	Are there any comments (good or bad) you wish to add regarding the above issues?
	Learning outcomes not clearly explained. There could be improvement in this area.

10	Overall, how would you rate the application in terms of applicability for language learning ? (Please tick appropriate box below.)				
	Very satisfactory	Moderately satisfactory	Neutral	Moderately unsatisfactory	Very unsatisfactory
			✓		

Error Prevention and Correction

The application should be designed to minimize the possibility of student error, with inbuilt facilities for detecting and handling those which do occur; students should be able to check their inputs and to correct errors, or potential error situations before the input is processed.

		Always	Most of the time	Some of the time	Never	comments
1	Does the application validate student inputs before processing?			✓		
2	Does the application clearly and promptly inform the student when it detects an error?	✓				
3	Is the student able to check what s/he has entered before it is processed?		✓			not here.
4	Is it easy for the student to correct errors?		✓			not here.
5	Can the student try out possible actions without the application processing the input?		✓			
6	Is the application protected against common trivial errors?	✓				?
7	Does the application prevent the student from taking actions which s/he is not authorized to take?			✓		correcting in exercises for instance.
8	In general, is the application free from errors and malfunctions?		✓			

9	Are there any comments (good or bad) you wish to add regarding the above issues?
	this wasn't an issue, really.

10	Overall, how would you rate the application in terms of error prevention and correction ? (Please tick appropriate box below.)				
	Very satisfactory	Moderately satisfactory	Neutral	Moderately unsatisfactory	Very unsatisfactory

Student Guidance and Support

Informative, easy-to-use and relevant guidance and support should be provided, both on the computer (via an on-line help facility) and in hard-copy document form, to help the student understand and use the application.

		Always	Most of the time	Some of the time	Never	comments
1	Is there some form of help facility on the computer to help the student when using the application?	✓				
2	Can the student request this easily from any point in the application?	✓				
3	Is the help facility presented clearly?	✓				
4	Does the help facility clearly explain the possible actions which can be taken?		✓			
5	When using the help facility, can the student find relevant information directly, without having to look through unnecessary information?		✓			
6	Is there some form of hard-copy guide to the application?					don't know
7	Is the organization of all forms of student guidance and support related to the tasks which the student can carry out?	✓				
8	Do student guidance and support facilities adequately explain both student and application errors?		✓			

9	Are there any comments (good or bad) you wish to add regarding the above issues?
	generally good to the point

10	Overall, how would you rate the application in terms of student guidance and support ? (Please tick appropriate box below.)				
	Very satisfactory	Moderately satisfactory	Neutral	Moderately unsatisfactory	Very unsatisfactory
	✓				

Usability Problems

When using the hypermedia CALL application, did you experience problems with any of the following:

		No problems	Minor problems	Major problems	Comments
1	Working out how to use the application	✓			but not what to do with it
2	Lack of guidance on how to use the application			✓	
3	Poor application documentation		✓		
4	Understanding how to carry out the tasks		✓		
5	Knowing what to do next		✓		
6	Understanding how the information on the screen relates to what you are doing			✓	in some cases
7	Finding the information you want			✓	if you don't know where it is
8	Information which is difficult to read clearly		✓		
9	Too many colours on the screen	✓			
10	Colours which are difficult to look at for any length of time		✓		
11	An inflexible, rigid application structure		✓		
12	An inflexible HELP (guidance) facility	✓			
13	Losing track of where you are in the application			✓	
14	A general sense of aimlessness			✓	
15	An easily reached boredom threshold		✓		
16	Lack of clear learning indicators			✓	
17	Unexpected actions by the application	✓			
18	Functions which are difficult or awkward to use		✓		
19	Knowing where or how to input information	✓			
20	Working out how to correct errors	✓			
21	Poor assessment mechanisms		✓		
21	Having to carry out the same type of activity in different ways	✓			don't really understand.

General questions on the usability of the application

Please give your views on the usability of the application by answering the questions below in the spaces provided. There are no right or wrong answers.

1	Does the application correspond to what you expected? Why?
	no! – didn't know what to expect. though we knew it was a learning appl. + hypermedia.
2	What are the best aspects of the application for you as student?
	the simulation / the video material
2	What are the worst aspects of the application ?
	Some unexpected exercises where you have to type in answers – v. boring.
3	Are there any parts which you found confusing or difficult to fully understand?
	Yes – many – feeling you didn't know where you were what would happen next.
4	Were there any aspects which you found irritating although they did not cause major problems?
	Yes – in the film – the characters were irritating – also the typos –
5	What were the most common mistakes you made when using the application?
	'deliberate' ones when trying to find out answers in exercises before they were completed.
6	Is this CALL application a valuable learning tool? Why?
	Could be! but in self access mode – you need to be told what to do – why – in what context and be tested on it if you want students to do what you want them to do.
7	What changes would you make to the application to make it better from the student's point of view?
	make it more adaptable – closer to our needs – more attractive + better integrated or presented
7	Is there anything else about the application you would like to add?
	—

AUDIT
STUDENT EVALUATION

The following usability audit is based on a checklist adapted from Ravden and Johnson (1989).

Information related to the student interaction:

CALL Application:	France InterActive.
Number of students interacting with interface:	2 (Group A).
Length of interaction:	2 user walkthroughs 3/3/97 // 10/3/97
Date:	~~3/3/97~~ 12/3/97.

Visual Clarity

Information displayed on the screen should be clear, well-organized, unambiguous and easy to read.

		Always	Most of the time	Some of the time	Never	comments
1	Is each screen clearly identified with an informative title or description?	✓				
2	Is important information highlighted on the screen? (e.g. cursor position, instructions, errors)	✓				but not highlighted.
3	When the student enters information on the screen, is it clear where the information should be entered?	✓				
4	Does information appear to be organized logically on the screen?	✓				
5	Does the use of colour help make the displays clear?	✓				
6	Is the information on the screen easy to see and read?	✓				
7	Do screens appear uncluttered?	✓				
8	Is it easy to find the required information on a screen?		✓			need for a visual backup following oral explanations

9	Are there any comments (good or bad) you wish to add regarding the above issues?
	no problem with visual clarity

10	Overall, how would you rate the application in terms of visual clarity? (Please tick appropriate box below.)				
	Very satisfactory	Moderately satisfactory	Neutral	Moderately unsatisfactory	Very unsatisfactory
	✓				

Consistency

The way the application looks and works should be consistent at all times.

		Always	Most of the time	Some of the time	Never	comments
1	Are different colours used consistently throughout the application?	✓				
3	Are icons, symbols, graphical representations and other pictorial information used consistently throughout the application ?	✓				
4	Is the same type of information a) in the same location on the screen b) in the same layout?		✓			It tends to change depending on exercises.
5	Is the method of entering information consistent throughout the application?	✓				
6	Is the method of selecting options (e.g. from a menu) consistent throughout the application?	✓				
7	Is the way the application responds to a particular student consistent at all times	✓	✓			though not sure

8	Are there any comments (good or bad) you wish to add regarding the above issues?
	Yes – generally consistent.

9	Overall, how would you rate the application in terms of consistency ? (Please tick appropriate box below.)				
	Very satisfactory	Moderately satisfactory	Neutral	Moderately unsatisfactory	Very unsatisfactory
	✓				

Adaptability

The way the application looks and works should be adapted to match student expectations.

		Always	Most of the time	Some of the time	Never	comments
1	Where icons, symbols, graphical representations etc, are displayed, are they easy to recognize and understand?	✓				
2	Is information presented and analysed in a way which is familiar to the student?	✓				almost too familiar. Why should we be constantly reminded of books etc.
3	Are control actions compatible with those used in other applications with which the student may need to interact?	✓				

4	Is information presented in a way which fits the student's view of the task?			✓		too complex, fiddly at times -
5	Does the organization and structure of the application fit the student's perception of the task?			✓		not if you consider the weird use of "stop"
6	Does the sequence of activities required to complete a task follow what the student would expect?		✓			when in a unit.
7	Does the application work in the way the student thinks it should work?			✓		when you're well briefed otherwise it's confusing

8	Are there any comments (good or bad) you wish to add regarding the above issues?
	Clear explanation should be given outright as to how it should be working / when interacting with a unit = good adaptability

9	Overall, how would you rate the application in terms of compatibility ? (Please tick appropriate box below.)				
	Very satisfactory	Moderately satisfactory	Neutral	Moderately unsatisfactory	Very unsatisfactory
	✓ for unit.		✓ for system		

Informative Feedback

Students should be given clear, informative feedback on where they are in the application, what actions they have taken, whether these actions have been successful and what actions should be taken next.

		Always	Most of the time	Some of the time	Never	comments
1	Are instructions and messages displayed by the application concise and positive?	✓				
2	Are messages displayed by the application relevant?	✓				ignoring stop.
3	Do instructions and prompts clearly indicate what to do?	.	✓			instructions can be
4	Is it clear what actions the student can take at any stage?		✓			a bit too vague.
5	Is it clear what the student needs to do in order to take a particular action?		✓			not when it becomes complex.
6	When the student enters information on the screen, is it made clear what the information should be?		✓			
7	Do error messages explain clearly: what the errors are? Why they have occurred?		✓			error indicated.

8	Are there any comments (good or bad) you wish to add regarding the above issues?
	not bad but feel it could be better = room for improvement = more precise instruction (matching oral ones?)

9	Overall, how would you rate the application in terms of informative feedback ? (Please tick appropriate box below.)				
	Very satisfactory	Moderately satisfactory	Neutral	Moderately unsatisfactory	Very unsatisfactory
		✓			

Explicitness

The way the application works and is structured should be clear to the student.

		Always	Most of the time	Some of the time	Never	Comments
1	Is it clear what stage the application has reached in a task?	✓				pretty good
2	Is it clear what the student needs to do in order to complete a task?		✓			not always, as in in exercises
3	Where the student is presented with a list of options, is it clear what each option means?	✓				
4	Is it clear what part of the application the student is in?	✓				
5	Is it clear what the different parts of the application do?	✓	?			imagine so though not everything explained
6	Is it clear why the application is organized and structured as it is?				no	it should be.
7	Is the structure of the application obvious to the student?				no	it should be.
8	Is the application well-organized from the student's point of view?			✓		
9	In general, is it clear what the application is doing?			✓		when you understand how it works catch 22

10	Are there any comments (good or bad) you wish to add regarding the above issues?
	Goes with pt previously made the structure of the appl. should be more specific & explicit

11	Overall, how would you rate the application in terms of explicitness ? (Please tick appropriate box below.)				
	Very satisfactory	Moderately satisfactory	Neutral	Moderately unsatisfactory	Very unsatisfactory
				✓	

Appropriate Functionality

The application should meet the needs and requirements of students when carrying out tasks.

		Always	Most of the time	Some of the time	Never	comments
1	Are the functions available to the student appropriate for the tasks to be carried out?	✓				
2	Is the way in which information is presented appropriate for the tasks?		✓			could be better presented at times
3	Does each screen contain all the information which the student feels is relevant to the task?	✓				
4	Can the student access all the information which s/he feels is needed for the appropriate task?	✓				not everything tried.
5	Does the application allow the student to do what s/he feels is necessary in order to carry out a task?	✓				
6	Is the application feedback appropriate for the task?		✓			not always.
7	Do the contents of help and tutorial facilities adequate?		✓			" "

8	Are there any comments (good or bad) you wish to add regarding the above issues?
	What was experienced was OK.

9	Overall, how would you rate the application in terms of appropriate functionality ? (Please tick appropriate box below.)				
	Very satisfactory	Moderately satisfactory	Neutral	Moderately unsatisfactory	Very unsatisfactory
		✓			

Flexibility and Control

The interface should be sufficiently flexible in structure, in the way information is presented and in terms of what the student can do, to suit the needs and requirements of all students, and to allow them to feel in control of the application.

		Always	Most of the time	Some of the time	Never	comments
1	Does the student have control over the order in which s/he requests information?			✓		not enough. already discussed.
2	Can the student look through a sequence of screens in either direction?			✓		

3	Can the student access a particular screen directly?			✓		
4	Can the student move to different parts of the application as required?			~~yes~~	no	not allowed
5	Can the student choose the rate at which information is provided?				✓	not sure I understand.
6	Can students tailor certain aspects of the interface for their own preferences or needs?				no	but some info in English or translation available.

7	Are there any comments (good or bad) you wish to add regarding the above issues?
	Structure not flexible enough limiting what students can do.

8	Overall, how would you rate the application in terms of flexibility and control ? (Please tick appropriate box below.)				
	Very satisfactory	Moderately satisfactory	Neutral	Moderately unsatisfactory	Very unsatisfactory
					✓

Multimedia Extensions

The multimedia facilities provided by the application should be appropriate and convey useful and valuable information data stimulating both the student interaction and the learning process.

		Always	Most of the time	Some of the time	Never	comments
1	Does the multimedia presentation enhance the educational value of the application?	✓				
2	Does the multimedia presentation promote the recreational value of the application?	✓				
3	Do the multimedia extensions form an integral part of the application (i.e: they are not simply added on)?	✓				
4	Are the multimedia extensions attractive and naturally engaging?		✓			quality material but poor pictures.
5	Do the multimedia extensions provide greater meaningful student interaction?	✓				
6	Is the balance between each multimedia type satisfying?		✓			not always

7	Are there any comments (good or bad) you wish to add regarding the above issues?
	appealing, good, professionally delivered. (shame about quality of pictures in video though)

8	Overall, how would you rate the application in terms of its multimedia presentation ? (Please tick appropriate box below.)				
	Very	Moderately	Neutral	Moderately	Very

	satisfactory	satisfactory		unsatisfactory	unsatisfactory
	✓			pictures	

Applicability for language learning

The application should clearly state what its educational aims and objectives are thus ensuring greater orientation and better learning outcomes.

		Yes	Yes by default	Only indirectly	No	comments
1	Is the purpose of the design (entertainment, educational or edutainment) unambiguous and clearly stated?	✓				
2	If the application is for learning, are learning objectives delimited and quantified?	✓				but not for the whole of the application
3	Does the application clearly indicate the level of language proficiency necessary for performing the tasks?		?			we were told it was for beginners.
4	Does the application require supplementary support material such as a text book to perform the necessary tasks?				✓	not to our K
5	Does the application explain if a language learning methodology has been adopted? If so, is it stated?				✓	" "
6	Does the application recommend pathways or approaches for best learning outcomes?	✓				in fact they are imposed.
7	Does the application suggest or recomment modes of access such as self-access, or teacher-guidance/teacher-led ?	✓				we were told it was student-centred + tutorial advised.
8	Is the student's input assessed? If so, are assessment criteria clearly stated?			✓		depends on assessment

9	Are there any comments (good or bad) you wish to add regarding the above issues?
	clearer objectives could be set + overview of program available.

10	Overall, how would you rate the application in terms of applicability for language learning ? (Please tick appropriate box below.)				
	Very satisfactory	Moderately satisfactory	Neutral	Moderately unsatisfactory	Very unsatisfactory
		✓			

Error Prevention and Correction

The application should be designed to minimize the possibility of student error, with inbuilt facilities for detecting and handling those which do occur; students should be able to check their inputs and to correct errors, or potential error situations before the input is processed.

		Always	Most of the time	Some of the time	Never	comments
1	Does the application validate student inputs before processing?			✓		don't know
2	Does the application clearly and promptly inform the student when it detects an error?	✓				
3	Is the student able to check what s/he has entered before it is processed?	✓				? possibly
4	Is it easy for the student to correct errors?		✓			
5	Can the student try out possible actions without the application processing the input?					NA ?
6	Is the application protected against common trivial errors?					don't know
7	Does the application prevent the student from taking actions which s/he is not authorized to take?	✓				YES ?
8	In general, is the application free from errors and malfunctions?		✓			didn't have problems

9	Are there any comments (good or bad) you wish to add regarding the above issues?
	OK.

10	Overall, how would you rate the application in terms of error prevention and correction ? (Please tick appropriate box below.)				
	Very satisfactory	Moderately satisfactory	Neutral	Moderately unsatisfactory	Very unsatisfactory
	✓				

Student Guidance and Support

Informative, easy-to-use and relevant guidance and support should be provided, both on the computer (via an on-line help facility) and in hard-copy document form, to help the student understand and use the application.

		Always	Most of the time	Some of the time	Never	comments
1	Is there some form of help facility on the computer to help the student when using the application?	✓				
2	Can the student request this easily from any point in the application?	✓				
3	Is the help facility presented clearly?	✓				
4	Does the help facility clearly explain the possible actions which can be taken?			✓		Instructions not always sufficiently clear
5	When using the help facility, can the student find relevant information directly, without having to look through unnecessary information?					NA.
6	Is there some form of hard-copy guide to the application?					? Don't know
7	Is the organization of all forms of student guidance and support related to the tasks which the student can carry out?		✓			
8	Do student guidance and support facilities adequately explain both student and application errors?					

9	Are there any comments (good or bad) you wish to add regarding the above issues?
	Didn't have to resort to Help - which is good but Instructions were on the succinct side.

10	Overall, how would you rate the application in terms of student guidance and support ? (Please tick appropriate box below.)				
	Very satisfactory	Moderately satisfactory	Neutral	Moderately unsatisfactory	Very unsatisfactory
		✓			

Usability Problems

When using the hypermedia CALL application, did you experience problems with any of the following:

		No problems	Minor problems	Major problems	Comments
1	Working out how to use the application			✓	navigating · or trying to!
2	Lack of guidance on how to use the application	✓			
3	Poor application documentation		✓		doc would have helped.
4	Understanding how to carry out the tasks		✓		
5	Knowing what to do next	✓			
6	Understanding how the information on the screen relates to what you are doing	✓			except when navigating.
7	Finding the information you want	✓			
8	Information which is difficult to read clearly	✓			
9	Too many colours on the screen	✓			
10	Colours which are difficult to look at for any length of time	✓			
11	An inflexible, rigid application structure			✓	stop.
12	An inflexible HELP (guidance) facility	✓			
13	Losing track of where you are in the application	✓			
14	A general sense of aimlessness		✓		
15	An easily reached boredom threshold		✓		wrong level
16	Lack of clear learning indicators	✓			good at unit level.
17	Unexpected actions by the application			✓	see 11
18	Functions which are difficult or awkward to use		✓		fiddly at times
19	Knowing where or how to input information	✓			
20	Working out how to correct errors	✓			
21	Poor assessment mechanisms		✓		
21	Having to carry out the same type of activity in different ways	✓			

General questions on the usability of the application

Please give your views on the usability of the application by answering the questions below in the spaces provided. There are no right or wrong answers.

1	Does the application correspond to what you expected? Why?
	did not know what to expect.
2	What are the best aspects of the application for you as student?
	Clearly set out, good & motivating interface, good multimedia capability & interaction potential.
2	What are the worst aspects of the application ?
	rigidity of structure - quality of video pictures - awful [illegible] before you get out of application.
3	Are there any parts which you found confusing or difficult to fully understand?
	Overall it's easy to understand.
4	Were there any aspects which you found irritating although they did not cause major problems?
	little things relating to minor aspects of functions (video recording / buttons), complexity of actions at times
5	What were the most common mistakes you made when using the application?
	did not make many. pressing wrong button in dialogue mode. possible ?
6	Is this CALL application a valuable learning tool? Why?
	Yes - despite problems feels very good (good ?) for beginners but they need to be told how to use it and towards which goal
7	What changes would you make to the application to make it better from the student's point of view?
	introduce more multimedia explanations in application - esp in the reference section which is bland & boring. Introduce clearer learning objectives for all course & improve quality of pictures, make it more navigation interactive
7	Is there anything else about the application you would like to add?
	video material much better than what we saw in previous system = (A la Recherche d'un emploi) full marks for that!

AUDIT
STUDENT EVALUATION

The following usability audit is based on a checklist adapted from Ravden and Johnson (1989).

Information related to the student interaction:

CALL Application:	France InterAction
Number of students interacting with interface:	2 Group (b)
Length of interaction:	2 user walkthroughs 3/7/97 // 10/7/97
Date:	17/7/97

Visual Clarity

Information displayed on the screen should be clear, well-organized, unambiguous and easy to read.

		Always	Most of the time	Some of the time	Never	comments
1	Is each screen clearly identified with an informative title or description?	✓				
2	Is important information highlighted on the screen? (e.g. cursor position, instructions, errors)	✓				
3	When the student enters information on the screen, is it clear where the information should be entered?	✓				
4	Does information appear to be organized logically on the screen?	✓				
5	Does the use of colour help make the displays clear?	✓				
6	Is the information on the screen easy to see and read?	✓				
7	Do screens appear uncluttered?	✓				
8	Is it easy to find the required information on a screen?	✓				

9	Are there any comments (good or bad) you wish to add regarding the above issues?
	Clarity not an issue here.

10	Overall, how would you rate the application in terms of visual clarity? (Please tick appropriate box below.)				
	Very satisfactory	Moderately satisfactory	Neutral	Moderately unsatisfactory	Very unsatisfactory
	✓				

Consistency

The way the application looks and works should be consistent at all times.

		Always	Most of the time	Some of the time	Never	comments
1	Are different colours used consistently throughout the application?	✓				
3	Are icons, symbols, graphical representations and other pictorial information used consistently throughout the application ?	✓				very hesitant
4	Is the same type of information a) in the same location on the screen b) in the same layout?	✓				about nature of
5	Is the method of entering information consistent throughout the application?	✓				questions.
6	Is the method of selecting options (e.g. from a menu) consistent throughout the application?	✓				
7	Is the way the application responds to a particular student consistent at all times	✓				poor understanding

8	Are there any comments (good or bad) you wish to add regarding the above issues?
	no problem with consistency.

9	Overall, how would you rate the application in terms of consistency ? (Please tick appropriate box below.)				
	Very satisfactory	Moderately satisfactory	Neutral	Moderately unsatisfactory	Very unsatisfactory
	✓				

Adaptability

The way the application looks and works should be adapted to match student expectations.

		Always	Most of the time	Some of the time	Never	comments
1	Where icons, symbols, graphical representations etc, are displayed, are they easy to recognize and understand?	✓				
2	Is information presented and analysed in a way which is familiar to the student?	✓				
3	Are control actions compatible with those used in other applications with which the student may need to interact?	✓				

4	Is information presented in a way which fits the student's view of the task?	✓				
5	Does the organization and structure of the application fit the student's perception of the task?			✓		yes 1st: unit. after 1st: system.
6	Does the sequence of activities required to complete a task follow what the student would expect?		✓			
7	Does the application work in the way the student thinks it should work?			✓		problems with navigation

8	Are there any comments (good or bad) you wish to add regarding the above issues?
	too rigid. really.

9	Overall, how would you rate the application in terms of compatibility ? (Please tick appropriate box below.)				
	Very satisfactory	Moderately satisfactory	Neutral	Moderately unsatisfactory	Very unsatisfactory
		✓			

Informative Feedback

Students should be given clear, informative feedback on where they are in the application, what actions they have taken, whether these actions have been successful and what actions should be taken next.

		Always	Most of the time	Some of the time	Never	comments
1	Are instructions and messages displayed by the application concise and positive?	✓				
2	Are messages displayed by the application relevant?	✓				
3	Do instructions and prompts clearly indicate what to do?	✓				
4	Is it clear what actions the student can take at any stage?		✓			
5	Is it clear what the student needs to do in order to take a particular action?		✓			not always when confronted with exercise.
6	When the student enters information on the screen, is it made clear what the information should be?		✓			
7	Do error messages explain clearly: what the errors are? Why they have occurred?	✓				

8	Are there any comments (good or bad) you wish to add regarding the above issues?
	there could be greater feedback

9	Overall, how would you rate the application in terms of informative feedback ? (Please tick appropriate box below.)				
	Very satisfactory	Moderately satisfactory	Neutral	Moderately unsatisfactory	Very unsatisfactory
		✓			

Explicitness

The way the application works and is structured should be clear to the student.

		Always	Most of the time	Some of the time	Never	Comments
1	Is it clear what stage the application has reached in a task?	✓				
2	Is it clear what the student needs to do in order to complete a task?	✓				
3	Where the student is presented with a list of options, is it clear what each option means?	✓				
4	Is it clear what part of the application the student is in?	✓				
5	Is it clear what the different parts of the application do?	✓				
6	Is it clear why the application is organized and structured as it is?			✓		
7	Is the structure of the application obvious to the student?			✓		
8	Is the application well-organized from the student's point of view?			✓		
9	In general, is it clear what the application is doing?			✓		

10	Are there any comments (good or bad) you wish to add regarding the above issues?
	Should have been made more explicit at the start.

11	Overall, how would you rate the application in terms of explicitness ? (Please tick appropriate box below.)				
	Very satisfactory	Moderately satisfactory	Neutral	Moderately unsatisfactory	Very unsatisfactory
				✓	

Appropriate Functionality

The application should meet the needs and requirements of students when carrying out tasks.

		Always	Most of the time	Some of the time	Never	comments
1	Are the functions available to the student appropriate for the tasks to be carried out?	✓				
2	Is the way in which information is presented appropriate for the tasks?	✓				
3	Does each screen contain all the information which the student feels is relevant to the task?		✓			need for more explanation
4	Can the student access all the information which s/he feels is needed for the appropriate task?		✓			
5	Does the application allow the student to do what s/he feels is necessary in order to carry out a task?		✓			
6	Is the application feedback appropriate for the task?		✓			
7	Do the contents of help and tutorial facilities adequate?		✓			

8	Are there any comments (good or bad) you wish to add regarding the above issues?

9	Overall, how would you rate the application in terms of appropriate functionality ? (Please tick appropriate box below.)				
	Very satisfactory	Moderately satisfactory	Neutral	Moderately unsatisfactory	Very unsatisfactory
		✓			

Flexibility and Control

The interface should be sufficiently flexible in structure, in the way information is presented and in terms of what the student can do, to suit the needs and requirements of all students, and to allow them to feel in control of the application.

		Always	Most of the time	Some of the time	Never	comments
1	Does the student have control over the order in which s/he requests information?		✓			in the unit.
2	Can the student look through a sequence of screens in either direction?			✓		

DH/PHD

3	Can the student access a particular screen directly?			✓		
4	Can the student move to different parts of the application as required?			✓		
5	Can the student choose the rate at which information is provided?			✓		
6	Can students tailor certain aspects of the interface for their own preferences or needs?				✓	

7	Are there any comments (good or bad) you wish to add regarding the above issues?
	already said it was too rigid.

8	Overall, how would you rate the application in terms of flexibility and control ? (Please tick appropriate box below.)				
	Very satisfactory	Moderately satisfactory	Neutral	Moderately unsatisfactory	Very unsatisfactory
				✓	

Multimedia Extensions

The multimedia facilities provided by the application should be appropriate and convey useful and valuable information data stimulating both the student interaction and the learning process.

		Always	Most of the time	Some of the time	Never	comments
1	Does the multimedia presentation enhance the educational value of the application?	✓				
2	Does the multimedia presentation promote the recreational value of the application?	✓				
3	Do the multimedia extensions form an integral part of the application (i.e: they are not simply added on)?	✓				
4	Are the multimedia extensions attractive and naturally engaging?	✓				
5	Do the multimedia extensions provide greater meaningful student interaction?	✓				
6	Is the balance between each multimedia type satisfying?	✓				

7	Are there any comments (good or bad) you wish to add regarding the above issues?
	Good.

8	Overall, how would you rate the application in terms of its multimedia presentation ? (Please tick appropriate box below.)				
	Very	Moderately	Neutral	Moderately	Very

	satisfactory	satisfactory		unsatisfactory	unsatisfactory
	✓				

Applicability for language learning

The application should clearly state what its educational aims and objectives are thus ensuring greater orientation and better learning outcomes.

		Yes	Yes by default	Only indirectly	No	comments
1	Is the purpose of the design (entertainment, educational or edutainment) unambiguous and clearly stated?		✓			
2	If the application is for learning, are learning objectives delimited and quantified?		✓			
3	Does the application clearly indicate the level of language proficiency necessary for performing the tasks?		✓			
4	Does the application require supplementary support material such as a text book to perform the necessary tasks?				✓	it could help though
5	Does the application explain if a language learning methodology has been adopted? If so, is it stated?				✓	?
6	Does the application recommend pathways or approaches for best learning outcomes?				✓	?
7	Does the application suggest or recomment modes of access such as self-access, or teacher-guidance/teacher-led ?				✓	?
8	Is the student's input assessed? If so, are assessment criteria clearly stated?			✓		

9	Are there any comments (good or bad) you wish to add regarding the above issues?

10	Overall, how would you rate the application in terms of applicability for language learning ? (Please tick appropriate box below.)				
	Very satisfactory	Moderately satisfactory	Neutral	Moderately unsatisfactory	Very unsatisfactory
			✓	✓	

Error Prevention and Correction

The application should be designed to minimize the possibility of student error, with inbuilt facilities for detecting and handling those which do occur; students should be able to check their inputs and to correct errors, or potential error situations before the input is processed.

		Always	Most of the time	Some of the time	Never	comments
1	Does the application validate student inputs before processing?					Don't Know.
2	Does the application clearly and promptly inform the student when it detects an error?					" "
3	Is the student able to check what s/he has entered before it is processed?		✓			
4	Is it easy for the student to correct errors?		✓			
5	Can the student try out possible actions without the application processing the input?					" "
6	Is the application protected against common trivial errors?	✓				?
7	Does the application prevent the student from taking actions which s/he is not authorized to take?		✓			?
8	In general, is the application free from errors and malfunctions?		✓			

9	Are there any comments (good or bad) you wish to add regarding the above issues?
	pretty much free of errors. but questions difficult to relate to interactive experience.

10	Overall, how would you rate the application in terms of error prevention and correction ? (Please tick appropriate box below.)				
	Very satisfactory	Moderately satisfactory	Neutral	Moderately unsatisfactory	Very unsatisfactory
		✓			

Student Guidance and Support

Informative, easy-to-use and relevant guidance and support should be provided, both on the computer (via an on-line help facility) and in hard-copy document form, to help the student understand and use the application.

		Always	Most of the time	Some of the time	Never	comments
1	Is there some form of help facility on the computer to help the student when using the application?	✓				not sure
2	Can the student request this easily from any point in the application?	✓				" "
3	Is the help facility presented clearly?					
4	Does the help facility clearly explain the possible actions which can be taken?	✓				
5	When using the help facility, can the student find relevant information directly, without having to look through unnecessary information?		✓			not sure Q. understood
6	Is there some form of hard-copy guide to the application?					don't know.
7	Is the organization of all forms of student guidance and support related to the tasks which the student can carry out?	✓				think so not sure.
8	Do student guidance and support facilities adequately explain both student and application errors?					don't know.

9	Are there any comments (good or bad) you wish to add regarding the above issues?
	didn't use it enough to form a valid opinion.

10	Overall, how would you rate the application in terms of student guidance and support ? (Please tick appropriate box below.)				
	Very satisfactory	Moderately satisfactory	Neutral	Moderately unsatisfactory	Very unsatisfactory
			✓		

Usability Problems

When using the hypermedia CALL application, did you experience problems with any of the following:

		No problems	Minor problems	Major problems	Comments
1	Working out how to use the application		✓		because of rigidity
2	Lack of guidance on how to use the application			✓	
3	Poor application documentation				NA
4	Understanding how to carry out the tasks		✓		
5	Knowing what to do next		✓		
6	Understanding how the information on the screen relates to what you are doing	✓			
7	Finding the information you want		✓		
8	Information which is difficult to read clearly	✓			
9	Too many colours on the screen	✓			
10	Colours which are difficult to look at for any length of time	✓			
11	An inflexible, rigid application structure			✓	
12	An inflexible HELP (guidance) facility	✓			
13	Losing track of where you are in the application	✓			
14	A general sense of aimlessness	✓			
15	An easily reached boredom threshold	✓			
16	Lack of clear learning indicators		✓		
17	Unexpected actions by the application		✓		
18	Functions which are difficult or awkward to use	✓			
19	Knowing where or how to input information	✓			
20	Working out how to correct errors	✓			
21	Poor assessment mechanisms		✓		
21	Having to carry out the same type of activity in different ways	✓			[illegible]

General questions on the usability of the application

Please give your views on the usability of the application by answering the questions below in the spaces provided. There are no right or wrong answers.

1	Does the application correspond to what you expected? Why?
	Didn't have preconceived ideas
2	What are the best aspects of the application for you as student?
	video – multimedia in general
2	What are the worst aspects of the application ?
	rigid support. – better done in class.
3	Are there any parts which you found confusing or difficult to fully understand?
	As long as you understand how it works it's fine At times it's difficult to fully grasp what you're supposed to do when you first get into an exercise
4	Were there any aspects which you found irritating although they did not cause major problems?
	apart from above – not really
5	What were the most common mistakes you made when using the application?
	can't remember – – . pressing wrong buttons when doing the exercises
6	Is this CALL application a valuable learning tool? Why?
	Yes – it's a good support
7	What changes would you make to the application to make it better from the student's point of view?
	make it more self access + more multimedia
7	Is there anything else about the application you would like to add?
	— .

17.4 Appendix 4: Audits - Quantitative Analysis

AUDITS: QUANTITATIVE ANALYSIS OF RESULTS											
GROUP A (EXPERIENCED STUDENTS)											
a = Visual Clarity / b = Consistency / c = Adaptability / d = Informative Feedback / e = Explicitness											
f = Appropriate Functionality / g = Flexibility and Control / h = Multimedia Extensions											
i = Applicability for Language Learning / j = Error Prevention & Correction											
k = Student Guidance & Support											
TELE-TEXTES:											
Answers to specific questions in percentages											
	Very Good		Satisfactory		Unsatisfactory		Very Poor		No Answer		Total
a	12.50%		0.00%		50.00%		37.50%				100.00%
b	33.33%		16.67%		50.00%		0.00%				100.00%
c	0.00%		0.00%		28.57%		71.43%				100.00%
d	0.00%		0.00%		71.43%		28.57%				100.00%
e	0.00%		11.11%		66.67%		22.22%				100.00%
f	0.00%		14.29%		57.14%		28.57%				100.00%
g	33.33%		33.33%		16.67%		16.67%				100.00%
h	33.33%		50.00%		16.67%		0.00%				100.00%
i	12.50%		12.50%		12.50%		62.50%				100.00%
j	12.50%		12.50%		12.50%		25.00%		37.50%		100.00%
k	12.50%		0.00%		50.00%		37.50%				100.00%
Total:	150.00%		150.40%		432.14%		329.96%		37.50%		1100.00%
100.00%	13.64%		13.67%		39.29%		29.99%		3.41%		100.00%
Good/Poor			27.31%				69.28%				
Answers to question 10:											
			V. Satisfact.		Mod. Sat.		Neutral		Mod. Unsat.		V. Unsat.
a Visual Clarity											1
b Consistency									1		
c Adaptability											1
d Inform. Feedback											1
e Explicitness											1
f App. Functionality									1		
g Flexibility & Control					1						
h Multimedia					1						
i Appl. for L. Learning									1		
j Error Prev. & Correction							1				
k Guidance & Support							1				
Total:			0		2		2		3		4
Usability Problems:											
No problems:			22.73%	(8,9,10,17,22)							

Minor problems	59.09%	(1,2,3,5,6,7,11,12,13,18,19,20,21)
Major Problems:	18.18%	(4,14,15,16)

AUDITS: QUANTITATIVE ANALYSIS OF RESULTS

GROUP A (EXPERIENCED STUDENTS)

a = Visual Clarity / b = Consistency / c = Adaptability / d = Informative Feedback / e = Explicitness

f = Appropriate Functionality / g = Flexibility and Control / h = Multimedia Extensions

i = Applicability for Language Learning / j = Error Prevention & Correction

k = Student Guidance & Support

UP TO STANDARD IN FRENCH

Answers to specific questions in percentages

	Very Good	Satisfactory	Unsatisfactory	Very Poor	No Answer	Total
a	62.50%	12.50%	25.00%	0.00%		100.00%
b	100.00%	0.00%	0.00%	0.00%		100.00%
c	0.00%	42.86%	42.85%	0.00%	14.29%	100.00%
d	0.00%	71.43%	28.57%	0.00%		100.00%
e	11.11%	77.78%	11.11%	0.00%		100.00%
f	42.86%	42.85%	14.29%	0.00%		100.00%
g	16.67%	16.67%	66.67%	0.00%		100.00%
h	0.00%	0.00%	50.00%	50.00%		100.00%
i	62.50%	12.50%	0.00%	25.00%		100.00%
j	12.50%	0.00%	0.00%	0.00%	87.50%	100.00%
k	62.50%	12.50%	12.50%	12.50%		100.00%
Total:	370.64%	289.08%	250.99%	87.50%	101.79%	1099.99%
100.00%	33.69%	26.28%	22.82%	7.95%	9.25%	99.99%
Good/Poor		59.97%		30.77%		

Answers to question 10:

	V. Satisfact.	Mod. Sat.	Neutral	Mod. Unsat.	V. Unsat.
a Visual Clarity		1			
b Consistency		1			
c Adaptability		1			
d Inform. Feedback		1			
e Explicitness		1			
f App. Functionality		1			
g Flexibility & Control			1	1	
h Multimedia				1	
i Appl. for L. Learning		1			
j Error Prev. & Correction			1		
k Guidance & Support	1				
Total:	1	7	2	2	0

Usability Problems:		
No problems:	63.64%	(1,2,3,4,6,8,9,10,12,13,17,19,20,22)
Minor problems	31.81%	(5,7,14,15,16,18,21)
Major Problems:	9.09%	(11,15)

AUDITS: QUANTITATIVE ANALYSIS OF RESULTS

GROUP A (EXPERIENCED STUDENTS)

a = Visual Clarity / b = Consistency / c = Adaptability / d = Informative Feedback / e = Explicitness

f = Appropriate Functionality / g = Flexibility and Control / h = Multimedia Extensions

i = Applicability for Language Learning / j = Error Prevention & Correction

k = Student Guidance & Support

A LA RECHERCHE D'UN EMPLOI

Answers to specific questions in percentages

	Very Good	Satisfactory	Unsatisfactory	Very Poor	No Answer	Total
a	50.00%	37.50%	12.50%	0.00%		100.00%
b	50.00%	50.00%	0.00%	0.00%		100.00%
c	42.86%	57.14%	0.00%	0.00%		100.00%
d	71.43%	28.57%	0.00%	0.00%		100.00%
e	22.22%	33.33%	44.44%	0.00%		100.00%
f	42.86%	57.14%	0.00%	0.00%		100.00%
g	50.00%	16.67%	0.00%	0.00%	33.33%	100.00%
h	50.00%	33.33%	16.67%	0.00%		100.00%
i	12.50%	0.00%	37.50%	50.00%		100.00%
j	37.50%	50.00%	12.50%	0.00%		100.00%
k	62.50%	12.50%	12.50%	12.50%		100.00%
Total:	491.87%	376.18%	136.11%	62.50%	33.33%	1099.99%
100.00%	44.72%	34.20%	12.37%	5.68%	3.03%	100.00%
Good/Poor		78.92%		18.05%		

Answers to question 10:

	V. Satisfact.	Mod. Sat.	Neutral	Mod. Unsat.	V. Unsat.
a Visual Clarity		1			
b Consistency	1	1			
c Adaptability	1				
d Inform. Feedback	1				
e Explicitness		1			
f App. Functionality		1			
g Flexibility & Control	1				
h Multimedia		1			

i Appl. for L. Learning											1
j Error Prev. & Correction					1						
k Guidance & Support			1								
Total:			5		6		0		0		1
Usability Problems:											
No problems:			9.09%	(1,12)							
Minor problems			77.27%	(2,3,4,5,6,7,8,9,10,11,13,17,18,19,20,21,22)							
Major Problems:			27.27%	(8,9,10,14,15,16)							

AUDITS: QUANTITATIVE ANALYSIS OF RESULTS											
GROUP A (EXPERIENCED STUDENTS)											
a = Visual Clarity / b = Consistency / c = Adaptability / d = Informative Feedback / e = Explicitness											
f = Appropriate Functionality / g = Flexibility and Control / h = Multimedia Extensions											
i = Applicability for Language Learning / j = Error Prevention & Correction											
k = Student Guidance & Support											
FRANCE INTERACTIVE											
Answers to specific questions in percentages											
	Very Good		Satisfactory		Unsatisfactory		Very Poor		No Answer		Total
a	87.50%		12.50%		0.00%		0.00%				100.00%
b	83.33%		16.67%		0.00%		0.00%				100.00%
c	42.86%		14.29%		42.85%		0.00%				100.00%
d	28.57%		71.43%		0.00%		0.00%				100.00%
e	44.44%		11.11%		22.22%		22.22%				100.00%
f	57.14%		42.86%		0.00%		0.00%				100.00%
g	0.00%		0.00%		50.00%		50.00%				100.00%
h	66.67%		33.33%		0.00%		0.00%				100.00%
i	50.00%		12.50%		12.50%		25.00%				100.00%
j	37.50%		25.00%		12.50%		0.00%		25.00%		100.00%
k	37.50%		12.50%		12.50%		0.00%		37.50%		100.00%
Total:	535.51%		252.19%		152.57%		97.22%		62.50%		1099.99%
100.00%	48.68%		22.93%		13.87%		8.84%		5.68%		100.00%
Good/Poor			71.61%				22.71%				
Answers to question 10:											
			V. Satisfact.		Mod. Sat.		Neutral		Mod. Unsat.		V. Unsat.
a Visual Clarity			1								
b Consistency			1								
c Adaptability			1				1				
d Inform. Feedback					1						
e Explicitness									1		

f App. Functionality					1						
g Flexibility & Control											1
h Multimedia			1						1		
i Appl. for L. Learning					1						
j Error Prev. & Correction			1								
k Guidance & Support					1						
Total:			5		4		1		2		1
Usability Problems:											
No problems:			59.09%	(2,5,6,7,8,9,10,12,13,16,19,20,22)							
Minor problems			27.27%	(3,4,14,15,18,21)							
Major Problems:			13.64%	(1,11,17)							

AUDITS: QUANTITATIVE ANALYSIS OF RESULTS											
GROUP B (INEXPERIENCED STUDENTS)											
a = Visual Clarity / b = Consistency / c = Adaptability / d = Informative Feedback / e = Explicitness											
f = Appropriate Functionality / g = Flexibility and Control / h = Multimedia Extensions											
i = Applicability for Language Learning / j = Error Prevention & Correction											
k = Student Guidance & Support											
TELE-TEXTES											
Answers to specific questions in percentages											
	Very Good		Satisfactory		Unsatisfactory		Very Poor		No Answer		Total
a	12.50%		25.00%		25.00%		37.50%				100.00%
b	33.33%		33.33%		33.33%		0.00%				99.99%
c	0.00%		14.29%		85.71%		0.00%				100.00%
d	42.86%		42.86%		14.29%		0.00%				100.00%
e	11.11%		0.00%		44.44%		44.44%				100.00%
f	14.29%		57.14%		28.57%		0.00%				100.00%
g	0.00%		100.00%		0.00%		0.00%				100.00%
h	83.33%		0.00%		0.00%		0.00%		16.67%		100.00%
i	12.50%		25.00%		12.50%		50.00%				100.00%
j	0.00%		37.50%		0.00%		25.00%		37.50%		100.00%
k	12.50%		37.50%		0.00%		25.00%		25.00%		100.00%
Total:	222.42%		372.62%		243.85%		181.94%		79.17%		1100.00%
100.00%	20.22%		33.87%		22.17%		16.54%		7.20%		100.00%
Good/Poor			54.09%				38.71%				
Answers to question 10:											
			V. Satisfact		Mod. Sat.		Neutral		Mod. Unsat.		V. Unsat.
a Visual Clarity									1		

b Consistency					1						
c Adaptability									1		
d Inform. Feedback					1						
e Explicitness									1		
f App. Functionality							1				
g Flexibility & Control							1				
h Multimedia			1						1		
i Appl. for L. Learning									1		
j Error Prev. & Correction							1				
k Guidance & Support									1		
Total:			1		2		3		6		0
Usability Problems:											
No problems:			27.27%	(8,9,10,17,21,22)							
Minor problems			59.09%	(1,2,3,4,6,7,11,12,13,15,18,19,20)							
Major Problems:			13.64%	(5,14,16)							

AUDITS: QUANTITATIVE ANALYSIS OF RESULTS											
GROUP B (INEXPERIENCED STUDENTS)											
a = Visual Clarity / b = Consistency / c = Adaptability / d = Informative Feedback / e = Explicitness											
f = Appropriate Functionality / g = Flexibility and Control / h = Multimedia Extensions											
i = Applicability for Language Learning / j = Error Prevention & Correction											
k = Student Guidance & Support											
UP TO STANDARD IN FRENCH											
Answers to specific questions in percentages											
	Very Good		Satisfactory		Unsatisfactory		Very Poor		No Answer		Total
a	12.50%		62.50%		25.00%		0.00%				100.00%
b	100.00%		0.00%		0.00%		0.00%				100.00%
c	14.29%		14.29%		71.43%		0.00%				100.00%
d	0.00%		85.71%		0.00%		0.00%		14.29%		100.00%
e	0.00%		33.33%		66.67%		0.00%				100.00%
f	0.00%		42.86%		57.14%		0.00%				100.00%
g	0.00%		0.00%		33.33%		66.67%				100.00%
h	16.67%		66.67%		16.67%		0.00%				100.00%
i	25.00%		12.50%		25.00%		25.00%		12.50%		100.00%
j	12.50%		12.50%		12.50%		12.50%		50.00%		100.00%
k	25.00%		50.00%		0.00%		0.00%		25.00%		100.00%
Total:	205.95%		380.35%		307.73%		104.17%		101.79%		1099.99%
100.00%	18.72%		34.58%		27.98%		9.47%		9.25%		100.00%
Good/Poor			53.30%				37.45%				

Answers to question 10:						
	V. Satisfact		Mod. Sat.	Neutral	Mod. Unsat.	V. Unsat.
a Visual Clarity			1			
b Consistency	1					
c Adaptability					1	
d Inform. Feedback			1			
e Explicitness					1	
f App. Functionality				1		
g Flexibility & Control					1	
h Multimedia			1		1	
i Appl. for L. Learning			1			
j Error Prev. & Correction				1		
k Guidance & Support			1			
Total:	1		5	2	4	0
Usability Problems:						
No problems:	36.36%	(2,4,9,10,12,20,21,22)				
Minor problems	50.00%	(1,5,6,7,8,11,14,15,17,18,19)				
Major Problems:	9.09%	(13,16)				

AUDITS: QUANTITATIVE ANALYSIS OF RESULTS						
GROUP B (INEXPERIENCED STUDENTS)						
a = Visual Clarity / b = Consistency / c = Adaptability / d = Informative Feedback / e = Explicitness						
f = Appropriate Functionality / g = Flexibility and Control / h = Multimedia Extensions						
i = Applicability for Language Learning / j = Error Prevention & Correction						
k = Student Guidance & Support						
A LA RECHERCHE D'UN EMPLOI						
Answers to specific questions in percentages						
	Very Good	Satisfactory	Unsatisfactory	Very Poor	No Answer	Total
a	25.00%	50.00%	25.00%	0.00%		100.00%
b	50.00%	50.00%	0.00%	0.00%		100.00%
c	14.29%	14.29%	71.43%	0.00%		100.00%
d	42.86%	28.57%	28.57%	0.00%		100.00%
e	0.00%	22.22%	66.67%	11.11%		100.00%
f	28.57%	42.86%	28.57%	0.00%		100.00%
g	50.00%	16.67%	0.00%	33.33%		100.00%
h	33.33%	50.00%	16.67%	0.00%		100.00%
i	25.00%	0.00%	25.00%	37.50%	12.50%	100.00%
j	25.00%	50.00%	25.00%	0.00%		100.00%

k	50.00%		37.50%		0.00%		0.00%		12.50%		100.00%
Total:	344.05%		362.10%		286.90%		81.94%		25.00%		1099.99%
100.00%	31.28%		32.92%		26.08%		7.45%		2.27%		100.00%
Good/Poor			64.20%				33.53%				
Answers to question 10:											
			V. Satisfact		Mod. Sat.		Neutral		Mod. Unsat.		V. Unsat.
a Visual Clarity					1						
b Consistency			1		1						1
c Adaptability									1		
d Inform. Feedback							1				
e Explicitness									1		
f App. Functionality					1						
g Flexibility & Control			1								
h Multimedia					1				1		
i Appl. for L. Learning							1				
j Error Prev. & Correction			1		1						
k Guidance & Support			1								
Total:			4		5		2		3		1
Usability Problems:											
No problems:			31.81%	(1,9,12,17,19,20,22)							
Minor problems			40.91%	(3,4,5,7,10,11,15,18,21)							
Major Problems:			27.27%	(2,6,7,13,14,16)							

AUDITS: QUANTITATIVE ANALYSIS OF RESULTS											
GROUP B (INEXPERIENCED STUDENTS)											
a = Visual Clarity / b = Consistency / c = Adaptability / d = Informative Feedback / e = Explicitness											
f = Appropriate Functionality / g = Flexibility and Control / h = Multimedia Extensions											
i = Applicability for Language Learning / j = Error Prevention & Correction											
k = Student Guidance & Support											
FRANCE INTERACTIVE											
Answers to specific questions in percentages											
	Very Good		Satisfactory		Unsatisfactory		Very Poor		No Answer		Total
a	100.00%		0.00%		0.00%		0.00%				100.00%
b	100.00%		0.00%		0.00%		0.00%				100.00%
c	57.14%		14.29%		28.57%		0.00%				100.00%
d	57.14%		42.86%		0.00%		0.00%				100.00%
e	55.56%		0.00%		44.44%		0.00%				100.00%
f	28.57%		71.43%		0.00%		0.00%				100.00%

g	0.00%		16.67%		66.67%		16.67%				100.00%
h	100.00%		0.00%		0.00%		0.00%				100.00%
i	0.00%		37.50%		12.50%		50.00%				100.00%
j	12.50%		50.00%		0.00%		0.00%		37.50%		100.00%
k	50.00%		12.50%		0.00%		0.00%		37.50%		100.00%
Total:	560.91%		245.24%		152.18%		66.67%		75.00%		1099.99%
100.00%	51.00%		22.30%		13.84%		6.06%		6.80%		100.00%
Good/Poor			73.30%				19.90%				
Answers to question 10:											
			V. Satisfact		Mod. Sat.		Neutral		Mod. Unsat.		V. Unsat.
a Visual Clarity			1								
b Consistency			1								
c Adaptability					1						
d Inform. Feedback					1						
e Explicitness									1		
f App. Functionality					1						
g Flexibility & Control							1				
h Multimedia			1						1		
i Appl. for L. Learning									1		
j Error Prev. & Correction					1						
k Guidance & Support							1				
Total:			3		4		2		3		0
Usability Problems:											
No problems:			54.54%	(6,8,9,10,12,13,14,15,18,19,20,22)							
Minor problems			31.81%	(1,4,5,16,17,21)							
Major Problems:			9.09%	(2,11)							

17.5 Appendix 5: Design Guidelines for Authoring Hypermedia Language Learning Applications

I Pre-Design Considerations

I.1 Technical and Practical Authoring Requirements

1. **Market:** *Survey the existing market: Clearly ascertain the availability and potential suitability of similar commercial packages specifically authored to be used in language learning or teaching environments.* Warning: although at first glance, such applications might appear to be attractive and suitable, they might not necessarily provide an authoring mode.

2. **Approach:** *Choose an appropriate hypermedia approach: The range of features and versatility of the shell will vary according to the chosen hypermedia approach.* For instance, do not confuse frame-based platforms supporting hierarchical structures, data abstraction and orientation with relational databases and sophisticated Windows-based applications such as desktop publishing.

3. **Specifications:** *Ensure that the existing hardware specifications match that of the desired software*: The full functionality and expected performance of the chosen technology are predicated upon the right combination of processing power to provide adequate speed, random access memory to manipulate large amounts of data and finally, important memory saving capacity to store sizeable data.

4. **Potential:** *As language specialists, ensure that you fully appreciate the potential and the limitations of the selected hypermedia authoring software before considering it as a suitable design tool*: Match its functionality with the desired usability of the application to be authored within a learning environment.

5. **Planning:** *Ensure that the planned design and development process of the application to be authored is adequately and realistically timed and affordable*: Do not underestimate the value of a feasibility study even if it is initially seen as counter-productive.

6. **Expertise:** *Establish the existing level and range of expertise that can be called upon as well as the technical and design support that can be made available when considering the validity and feasibility of the design project*: Whilst the design tools are tailored to the adopted learning strategies by the language specialist, as subject expert author and course design specialist, the ultimate success of the project lies in the adequate combination of specialist knowledge to reflect areas of expertise such as: software engineering, graphic design and user interface design. Although hypermedia development is best achieved by a design team comprising professional developers, it is feasible for one author to combine the necessary knowledge to conceive and build appropriate and satisfactory educational applications.

I.2 Aims & Objectives:

7. **Learning Context:** *Clearly establish the learning context within which the application is to be designed and subsequently used as this will have important repercussions on the design of the interface.* For instance, will the application to be authored be used under teacher supervision or conversely will it be designed for self-access.

8. **Learning Strategy:** *Ascertain which learning strategy is more appropriate and suitable to potential students given the chosen or imposed learning context.* For example, certain aspects of language learning, by encouraging a memorization process based on exploratory modes and generally inductive methods will tend to favour the implicit learning approach with its emphasis on student-controlled interaction. Conversely, a more traditional deductive

approach, emphasizing rules and direct applications will be more appropriate for an explicit learning method.

9. **Learning Goals:** *Clearly identify the language learning or teaching goals to be achieved by the application.* These should suit the needs of the prospective students in relation to the linguistic skills to be acquired.

I-3 Task requirements:

10. **Task Support:** *Clearly ascertain that the range of tasks to be undertaken by the targeted learners are adequately supported by the chosen hypermedia system.* For instance, will the authored hypermedia courseware be able to promote a language-based exploratory environment if a conducive approach is chosen?

11. **Learning Environment:** *Consider the most suitable learning or teaching environment that can be provided, both feasibly and realistically, by hypermedia in conjunction with the clear presentation of stated aims and objectives.*

12. **Usability Study:** *Define the projected usability of the application to be designed with a view to optimizing the expected language learning process within the above mentioned learning goals.* Remember that such a process cannot be sustained by simply providing students with navigation facilities and information retrieval mechanisms. The discrepancy which may arise out of a tendency to offer a multiplicity of choice or, indeed, too much peripheral user control to customize the interface, whilst paying too little attention to the necessary supporting guiding mechanisms might undermine the expected learning process.

13. **Student Requirements:** *Ensure that the information, tasks and interaction meet the needs of prospective students in terms of acquired language skills and levels of language attainments.*

14. **Student Support:** *Provide an acceptable level of support tailored to the available range of in-built learning strategies offered to students.* For instance, authors should pay particular attention to the provision of adequate support, such as on-help facilities, tutorials and error messages, for all students with a view to reducing the front-loaded cognitive load likely to be experienced by such learners.

15. **Task Metaphor:** *Consider the need to provide students with an easily and readily recognizable metaphor encapsulating the nature of the tasks offered with a view to increasing usability and learnability.*

I.4 Structure planning:

16. **Organization:** *Consider the hypermedia shell essentially as an explicit, organizing structure*

designed to support a broad, albeit finite, selection of learning tasks. Plan such a structure, be it linear, hierarchical, web, tree, linked to outside component, according to its suitability to the chosen learning strategy and task requirements.

17. **Conceptualization:** *As an unskilled software designer, initially adopt a top-down approach to structure design as opposed to premature bottom-up thinking.* An early paper-based conceptualization of the structural dimensions and considerations will stimulate and facilitate the subsequent design process of the given structure. Conversely, the bottom-up approach, by concentrating on detailed aspects of the structure, is more likely to obscure the necessary conceptual overview. It will also undermine the author's position by making it more vulnerable to design expediencies such as design shortcuts and ready-made technological facilities.

18. **Mapping:** *Map out a clear and manageable overall structure for the application to be authored, matching the previously adopted learning strategy and conceived within the well established technological constraints imposed by the chosen system.* Adopt a clear conceptual approach to the document structure highlighting its configuration. If incompatibility is discovered at this pre-design stage, go back to earlier findings of the feasibility study. This could apply in cases when structures are required for large and complex documents.

19. **Navigation:** *Establish a clear distinction between navigational facilities.* Navigation should stimulate informational, macro level controls, locating information within the whole structured data, whilst browsing should emphasize node links and attributes.

I.5 User-interface design considerations:

20. **Compatibility:** *Ensure that the design of the user interface is specifically tailored to match and reciprocate the expected context of use and the chosen learning modes.* For instance, students must be given appropriate means to control the expected interaction in relation to the chosen learning approach and context, be it self-directed, laboratory-based etc.

21. **Effectiveness:** *Design a user interface, including learning data, activities and their screen presentation, capable of delivering the most effective learning strategy.* For instance, do not unjustifiably highlight auxiliary features which may create unnecessary distraction leading to a slower, shallower learning process and reduced interactive potentiality.

II Design Considerations

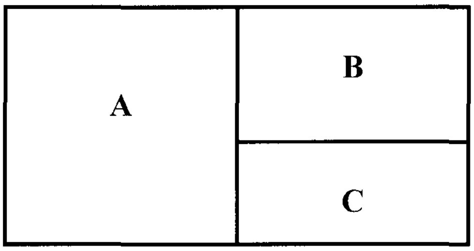
II.1 Screen layout:

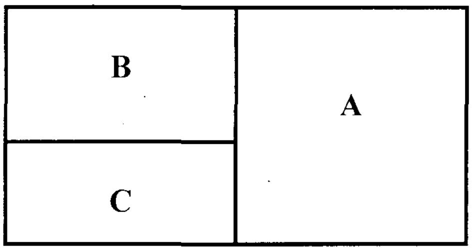
22. **Optimization:** *Plan the visual display of information so that students scanning the screen make the most of the display as quickly and as usefully as possible.* Wagner (1988) suggests

that the scanning sequential order is predicated upon the eye movement, often conditioned to go from top to bottom and from left to right, which, additionally "naturally moves from a larger image to a smaller; a saturated colour to an unsaturated colour; a bright colour to a dull colour; from colour to black and white; from a non-symmetrical to a symmetrical form; from moving object to a stationary object". Therefore, the screen display fulfils two important functions: it triggers the visual behaviour of users whilst providing important visual interactive cues.

23. **Presentation:** *Establish appropriate screen divisions and design clear and consistently-positioned functional areas on screen according to the content they display, text, graphics, image, video.* The larger informational areas should ideally occupy a central position.

The following display patterns could apply:





Allowing for additional control menu bars at top, bottom or sides, the above displays illustrate how texts A and C can be presented in conjunction with a general illustration B.

24. **Customization:** *Group functions and design customized screens for main and peripheral interactive modes linked to specific task requirements.* Functional modes should be labelled and clearly identifiable, on the basis of their own specific layout and display features, for easy recognition and ease of use. For instance, such modes could include text-based activities, interactive dialogue and recording facilities, video displays and ICALL language-based exercises .

25. **Standardization:** *Standardize all permanent screen information, such as interactive fields, menus, command buttons and recurrent features like help notes, references and error messages, within each of the identified interactive modes.*

26. **Consistency:** *Consistently display all permanent screen information, such as interactive fields, menus, command buttons and recurrent features like help notes, references and error messages, within each of the identified interactive modes.*

27. **Clarity:** *Ensure that the display is clear and uncluttered.* Do not provide too much information at any one time. Avoid cramming too many commands and unnecessary items onto the screen.

28. **Colour:** *Colour should be used sparingly and only when it is justified.* Clarke (1992)

proposes a number of guidelines related to the use and functions of colour in a learning environment, derived from individual pieces of research. The selection below was felt to be particularly relevant:

- Avoid incompatible colour combinations such as:
  red/green
  blue/yellow
  green/blue
  red/blue

- Short term memory limits of five to nine colours

- More than seven colours may cause learners to access less material

- Use shape as well as colour to overcome colour blindness

- Learners prefer a dark foreground on a light background

- Increasing density of display will make the identification of information more difficult

- Consistency in the functional use of colour is important.

29. **Design Process:** *Sketch out the screen layout or create an early prototype of it. Get a feel for the selected layout, consider potential alternatives and seek reactions, impressions and recommendations from colleagues and students alike.* If available, seek and heed professional advice as you progress. Proceed iteratively: keep going back to the drawing board until you are reasonably satisfied with the layout

II.2 On-line text:

30. **Characters:** *Rely on small characters.* Do not subscribe to the well established view that big is beautiful when it comes to inputing text on screen. Evidence indicates that the greater eye fixation required to read large characters is not rewarded by increased cognition and comprehension.

31. **Presentation:** *Optimize the readibility and comprehension of the textual material by appropriately choosing the most suitable typeface, fontsize, line spacing and linebreaks.* Specific design guidelines related to typeface, size, lines, lines spacing, margins, linebreaks case and colours are proposed by Clarke (1992), Horton (1990), Wagner (1988) a selection of which is presented below:

    - 80 character text, using a slab-serif or a sans-serif font, is best suited to continuous reading

- Lines should be reasonably short - between 8 and 10 words. It is recommended to use columns to break down a high-density text, although the content matter or the student screen-reading ability might influence such an approach.

- Line spacing should be 1.5 or double line, depending the length of the displayed text

- Break down the information to be displayed into chunks, such as short meaningful statements or recognizable paragraphs, within reason

- Use lower and upper cases but avoid full capitalization of text.

32. **Length:** *Provide authentic textual material.* Texts do not have to be necessarily rewritten or simplified for the screen with shorter and simpler sentences. Even if, as claimed by Krull and Ruben (1984), longer sentences slightly reduce reading speed, they do not have an adverse effect on the more relevant comprehension and memory retention. However, note that high text density on screen may alter perception.

33. **Scrolling:** *Long texts can be scrolled.* Ensure that the scrolling facility is used appropriately, under student's control, for the display of informational databases and search devices. For instance, avoid scrolling a text which is the basis of specific interactive activities. Use a frame-based approach instead.

34. **Emphasis:** *Emphasize text moderately using familiar conventions such as bold, underline and italics.* Alternatively, colour can be used. Horton (1990) suggests that not more than three should be used per display and not more than four should be used per document.

35. **Contrasts:** *Restrict and justify the need for colours.* Use them economically to create contrasts and emphasis. According to Clarke (1992) comprehension of continuous texts is enhanced by "keeping a high contrast between text colour and background". Too great a concentration of colours will only blur the display and confuse the students

II.3 Images:

36. *Images, illustrations, graphics should not be used for decorative purposes.* Horton describes their need as a means: "to explain and describe; to express visual and spatial concepts; to help learners imagine complex processes; to highlight important points; to attract and focus attention; to show complex relationships; to motivate and attract users; NOT for decoration...". For a further study of effects and display presentation of pictures see Clarke (1992).

II.4 Animation:

37. *Use animation recording facilities to highlight learning.* Functions such as zooming in and out to present specific and general information: animated displays of learning processes like substitutions, language alternatives, progressions; provision of animated display commands like play, replay, recording etc.

II. 5 Sound:

38. *Good sound facilities are crucial to hypermedia applications for foreign language learning.* Use sound for integrated interactive dialogues and general aural and oral exercises. Provide a customized and recognizable display with its relevant, dedicated functions replicating, for example, a conventional audiocassette recorder.

II.6 Video:

39. Being the latest multimedia resource to be made available in recent hypermedia shells, a good video facility is still very much predicated upon technological and professional considerations in terms of equipment, storage, quality and additional skills. However, and in lieu of guidelines, Horton (1990) makes the following recommendations:

- Use moving pictures for subjects that teach psychomotor skills or demonstrate three dimensional devices in motion. Do not use them to discuss abstract concepts and philosophies.
- Show things moving, not just people talking.
- Keep segments short.

II.7 *Structure*:

40. **Consistency:** *When designing the application structure, refrain from being unduly influenced by technology-led solutions purposefully enhanced by the software manufacturer to the point of losing sight of stated objectives.* Typical examples of design consequences such a direction might generate can be found in the predominant use of link facilities, unwarranted proliferation of nodes, confusingly wide range of displayed commands, highlighted interactive fields and colours.

41. **Orientation:** *Limit the number of explicit outlinks from any one node.* It is suggested that no more than five such links should be used so as to prevent disorientation and additional cognitive strains.

42. **Data Recognition:** *Ensure that the knowledge base is sufficiently recognizable and manageable for the range of targeted students and their required tasks.* A large database with a seemingly wide choice of links may confuse and disorientate them.

43. **Information:** *Provide structural information and access facilities embedded into the knowledge base to enable students to relate to and appreciate the nature and extent of the available database.*

44. **On-line Help:** *Provide clear overviews, guiding mechanisms and tutoring facilities such as maps, indexes as well as suggested tours and learning approaches.* Make access to such structure-based devices always available and applicable. A consistent and systematic display of orientational cues and navigational information will increase the usability and potentiality of the designed hypermedia application. Maps or browsers are particularly suited to provide necessary navigation information. Indexes are more likely to be required in directed learning situations. Alternatively, 'soft tutoring' such as tours are particularly designed to cater for beginners or near-beginners, more easily prepared to trade off control in exchange for speedier and easier language acquisition.

45. **Data accessing:** *Ensure that the selected interaction, expected of and controlled by students, to access specific information according to their level of proficiency is predictable and unambiguous.* Whilst allowing for potential structural and informational shortcuts, remember that too many alternative choices make a structure artificially complex and inevitably lead to confusion, demoralization and error-prone responses.

II.8 Interaction:

46. **Linguistic Interaction:** *Optimize the level of linguistic interaction by ensuring that students can control their own appropriate progression through customized nodes and learning tasks.* These can take the form of reading textual material in the target language, playing a participatory role in structured and fully interactive dialogues, preparing language-based exercises and drills and taking tests.

47. **Interactive Match:** *Tailor the nature of the interaction and instructional control to the level of language proficiency of targeted students.* The more knowledgeable, the more likely students will benefit from self-directed learning approaches.

48. **Quality:** *Ensure that students are actively engaged in the process of understanding and learning and not just passive recipients of a large quantity of informational data.* Introduce a wide range of additional interactive activities such as quizzes, gap-filling exercises, text and phrase jumbling facilities and audio-visual interactive exchanges.

49. **Add-Ons:** *Avoid unnecessary and overtly distractive displayed attractions which, as a result of being too easily construed as potential cues or attention-seekers, might mislead learners.* Make wise and restricted use of peripheral devices, such as the wide range of 'live' activated

objects and customizable animations chosen for their convenient availability and potential to 'liven up' the screen, as they will invariably distract attention away from required goal if used artificially.

II.9 Evaluation

50. *Iteratively evaluate the authored application throughout the design process.* Adopt evaluation methods, such as user walk-throughs involving colleagues and students, to assess the usability and learnability of the application. Evaluate repeatedly and adjust the design accordingly.

17.6 Appendix 6: Copies of Published Related Material

PAGE/PAGES EXCLUDED UNDER INSTRUCTION FROM UNIVERSITY

17.7 Appendix 7: First Evaluation of Guidelines

The evaluation of the design guidelines was based on a two-pronged approach designed to focus on an assessment of their comprehensiveness, comprehensibility and ease of use.

The comprehensive nature of the proposed guidelines was evaluated by means of a checklist designed by Ravden and Johnson (1989) and adapted for the purpose of testing the relevance and subsequent applicability of the guidelines to a wide range of design issues. In other words, could the guidelines, if relevant and adequately applied, satisfactorily meet a comprehensive set of design criteria.

The comprehensibility and ease of use of the proposed guidelines were evaluated by means of walkthroughs involving three identified language experts with an interest and some experience in hypermedia authoring. Each one of the three walkthroughs comprised two parts clearly linked to both notions of relevance to a given design issue and general explicitness and friendliness of all the proposed guidelines in the selection process.

Checklist

Visual Clarity

	Relevant	**Irrelevant**
Is each screen clearly identified with an informative title or description?	**✓ 19,20,24,26**	
Is important information highlighted on the screen?	**✓ 24,25,26**	
When the user enters information on the screen, is it clear: where the information should be entered? b) in what format it should be entered?	**not specifically covered**	
Where the user over types information on the screen, does the system clear the previous information?		✓
Does information appear to be organized logically on the screen?	**✓ 25,26**	
Are different types of information clearly separated from each other on the screen?	**✓ 25**	
Are columns of information clearly aligned on the screen?	**✓ 25,26**	
Are bright or light colours displayed on a dark background?	**✓ 24,34**	
Does the use of colour help make the displays clear?	**✓ 33,34**	
Where colour is used, will all aspects of the display be easy to see if used on a monochrome screen, or if the user is colour-blind?	**✓ not covered**	
Is the information on the screen easy to see and read?	**✓ 29,30**	
Do screens appear uncluttered?	**✓25,27**	
Are schematic and pictorial displays clearly drawn and annotated?	**✓35**	
Is it easy to find the required information on a screen?	**✓ 24,25,26,27,40,41**	

Consistency

	Relevant	Irrelevant
Are different colours used consistently throughout the system?	✓ 26,32	
Are abbreviations, acronyms and codes used consistently throughout the system?	✓ 26,32	
Are icons, symbols, graphical representations and other pictorial information used consistently throughout the system?	✓ 26,16	
Is the same type of information a) in the same location on the screen b) in the same layout?	✓ 25,26,27	
Does the cursor appear in the same initial position on displays of a similar type?	✓not covered	
Is the same item of information displayed in the same format?	✓ 26	
Is the format in which the user should enter particular types of information on the screen consistent throughout the system?		✓Windows-based features
Is the method of entering information consistent throughout the system?		" " " not covered
Is the action required to move the cursor consistent.?		✓" " "
Is the method of selecting options consistent.?	✓ 26,27	
Where a keyboard is used, are the same keys used for the same functions throughout the system?		✓not covered
Is the way the system responds to a particular user consistent?	✓ 25,26,27	

Compatibility

	Relevant	Irrelevant
Are colours assigned according to conventional associations?	✓not covered	
Where abbreviations, acronyms, codes etc are displayed: are they easy to recognize and understand? b) do they follow conventions where these exist?	✓16,26	
Where icons, symbols, graphical representations etc, are displayed: are they easy to recognize and understand? b) do they follow conventions where these exist?	16,24,25,26,27 ✓	
Where jargon and terminology is used, is it familiar to the user?	✓ 45,46,47	
Are established conventions followed for the format in which particular types of information are displayed?	25	
Is information presented and analysed in the units with which the user normally works?	✓not specifically covered	
Is the format of displayed information compatible with the form in which it is entered into the system?	✓ 31,36,37,38	
Is the format and sequence in which information is printed compatible with the way it is displayed on the screen?		✓
Are control actions compatible with those used in other systems with which the user may need to interact?		✓Windows-based features
Is information presented in a way which fits the user's view of the task?	✓ 13,14,15	

Are graphical displays compatible with the user's view of what they are representing?	✓ 19,20	
Does the organization and structure of the system fit the user's perception of the task?	✓ 11,12,13	
Does the sequence of activities required to complete a task follow what the user would expect?	✓ 15,19	
Does the system work in the way the user thinks it should work?	✓ 23	

Informative Feedback

	Relevant	Irrelevant
Are instructions and messages displayed by the system concise and positive?	26,27	
Are messages displayed by the system relevant?		Windows-based features
Do instructions and prompts clearly indicate what to do?		✓ " " "
Is it clear what actions the user can take at any stage?	✓ 19,27,40	
Is it clear what the user needs to do in order to take a particular action?	✓ 21,43,44	
When the user enters information on the screen, is it made clear what the information should be?	✓ 45,46,47	
Is it made clear what shortcuts, if any, are possible?	✓ 43,44	
Is it made clear what changes occur on the screen as a result of a user input or action?	✓ 27	
Is there always an appropriate system response to a user input or action?	not specifically covered	
Are status messages informative and accurate?	not specifically covered	
Does the system clearly inform the user when it completes a requested action?	✓ specific to CALL	Windows-based features
Does the system promptly inform the user of any delay?		✓ " " "
Do error messages explain clearly: what the errors are? Why they have occurred?	26 specific to CALL	
Is it clear to the user what should be done to correct an error?	26 specific to CALL	
Where there are several modes of operation, does the system clearly indicate which mode the user is currently in?	✓ 43,44	

Explicitness

	Relevant	Irrelevant
Is it clear what stage the system has reached in a task?	✓ 17,19,43	
Is it clear what the user needs to do in order to complete a task?	not specifically covered	
Where a user presented with a list of options, is it clear what each option means?	✓ 20,21,44	
Is it clear what part of the system the user is in?	✓ 42,43,44	
Is it clear what the different parts of the system do?	✓ 41,42	
Is it clear how, where and why changes in one part of the system affect other parts of the system?	✓ 27	
Is it clear why the system is organized and structured as it is?	✓ 19,20,43	
Is it clear why a series of screens are sequenced as they are?	✓ 43,45	

Is the structure of the system obvious to the user?	✓ **19,20,21,43**	
Is the system well-organized from the user's point of view?	✓ **17,39,40,41,42,43**	
Where an interface metaphor is used, is this made explicit?	✓ **16**	
Where a metaphor is employed, and is only applicable to certain parts of the system, is this made explicit?	**not specifically covered**	
In general, is it clear what the system is doing?	✓ **see above**	

Appropriate Functionality

	Relevant	Irrelevant
Is the input device available to the user appropriate for the tasks to be carried out?	✓ **2,3,4,15**	
Is the way in which information is presented appropriate for the tasks?	✓ **9,10,11**	
Does each screen contain all the information which the user feels is relevant to the task?	✓ **22,24,26**	
Are users provided with all the options which they feel are necessary at any particular stage in a task?	✓ **22,23**	
Can users access all the information which they feel they need for their current task?	✓ **26**	
Does the system allow users to do what they feel is necessary in order to carry out a task?	✓ **2,3,4,15,23**	
Is system feedback appropriate for the task?	✓ **26,43**	
Do the contents of help and tutorial facilities make use of realistic task data and problems?	**not specifically covered**	
Is task-specific jargon and terminology defined at an early stage in the task?	**not specifically covered**	
Where interface metaphors are used, are they relevant to the tasks carried out using the system?	✓ **16**	
Where task sequences are particularly long, are they broken into appropriate sub-sequences?	**not specifically covered**	

Flexibility and Control

	Relevant	Irrelevant
Is there an easy way to 'undo' an action?		✓
Where the user can 'undo', is it possible to 'redo'?		✓
Are shortcuts available when required?	✓ **44**	
Do users have control over the order in which they request information, or carry out a series of activities?	✓ **45,46,47**	
Can the user look through a sequence of screens in either direction?	✓ **26,40,42**	
Can the user access a particular screen directly?	✓ **26,43**	
In menu-based systems, is it easy to return to the main menu from any part of the system?	✓ **26,43**	
Can the user move to different parts of the system as required?	✓ **26,43**	
Can the user choose the rate at which information is provided?	✓ **45,46,47**	
Can the user choose how to name and organize information which may need to be recalled at a later stage?	✓ **2,12**	
Can users tailor certain aspects of the interface for their own preferences or needs?	✓**2,12**	

Error Prevention and Correction

	Relevant	Irrelevant
Does the system validate user inputs before processing?	only with CALL exercises	
Does the system clearly and promptly inform the user when it detects an error?		✓Windows-based features
Are users able to check what they have entered before it is processed?	✓only with CALL exercises	
Is there some form of cancel key?		✓Windows-based features
Is it easy for the user to correct errors?	not specifically covered	
Does the system ensure that the user corrects all detected errors before the input is processed?		✓Windows-based features
Can the user try out possible actions without the system processing the input?	not specifically covered	" " "
Is the system protected against common trivial errors?	not specifically covered	" " "
Is the system protected against possible knock-on effects of changes in one part of the system?	not specifically covered	" " "
Does the system prevent users from taking actions which they are not authorized to take?	✓ 2,3,4	
In general, is the system free from errors and malfunctions?	not specifically covered	" " "
When system errors occur, can the user access all necessary diagnostic information to resolve the problem?	only with CALL exercises	" " "

User Guidance and Support

	Relevant	Irrelevant
Is there some form of help facility on the computer to help the user when using the system?	✓ 42,43	
Can the user request this easily from any point in the system?	✓ 43	
Is the help facility presented clearly?	✓ 43	
Does the help facility clearly explain the possible actions which can be taken?	not specifically covered	
When using the help facility, can the user find relevant information directly, without having to look through unnecessary information?	not specifically covered	
Is there some form of hard-copy guide to the system?	✓ not covered	
Is the organization of all forms of user guidance and support related to the tasks which the user can carry out?	✓ 42,43	
Do user guidance and support facilities adequately explain both user and system errors?	not specifically covered	Windows-based features
Are all forms of user guidance and support maintained up-to-date?		✓

User Walkthroughs

The user walkthroughs, which took place in a computer laboratory, were based on an in-house, experimental, multi-framed tutorial initially developed using Multimedia ToolBook. The main design objective of this application was to present a range of features offered by this particular authoring software in conjunction with a purposefully flawed user interface design, riddled with design issues, with a view to illustrating concretely some of the potential pitfalls easily encountered when authoring.

The three subjects who had agreed to participate in the experiment were selected on the basis of their specific representativeness of the targeted author / user group. Each subject was given a user walkthrough sheet and the set of proposed guidelines extracted from the body of this project. Each sheet contained two different types of activities. The first exercise, which consisted of three questions specifically focusing on different design issues related to the interface design of the above-mentioned application, was conceived to evaluate the general relevance of the guidelines. The second task asked the subjects to read all the guidelines and to evaluate their explicitness and user-friendliness in the process, using the rating scale provided.

Following a short period of familiarization with the multimedia tutorial, subjects were required to spend not more than ten minutes at a time to find guidelines from their attached set relevant to the design issue raised in the question.

Results:

Part 1:

To the question:

Are the navigational controls sufficiently well displayed?

A and B found both: 17, 19, 20, 21 as *all relevant*
C found: 24, 26, 27, 42, 43 as *all relevant*

To the question:

Is the textual material adequately presented?

A found: 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34 as *all relevant*
B found: 24, 25, 26, 29, 30, 31, 32, 33 as *all relevant*
C found: 22, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34 as *all relevant*

To the question:

How predictable and meaningful is the user interaction with the application's interface?

A found: 35, 36, 37, 38, 40, 42, 43, 44, 45, 46, 47, 48 as *all mostly relevant*
B found: 36, 37, 45, 46, 47, 48 as *all relevant*
C found: 11, 12, 31, 35, 36, 37, 40, 41, 42, 43, 44, 45, 46, 47, 48 as *partly relevant*

Part 2:

Results indicate that the majority of guidelines range from being comprehensible and practicable to being very clear and easy to use. However, it is interesting to note that a small number of guidelines hardly pass the scanning test:

A rated 2 the following guidelines: 20, 27, 36 and 41 and 1: 21 criticizing their lack of clarity and simplicity

B rated 2 the following guidelines: 10, 14, 21, 42

C: rated 2 the following guidelines: 12, 22, 32

Critical Analysis and Interpretation of Results

In the light of the data provided by the dual evaluation approach of the checklist and user walkthroughs, the following points related to the proposed set of guidelines can be made:

Checklist:

- Guidelines were generally found to be relevant and directly or indirectly applicable to the exhaustive list of design issues presented in the checklist. However, the range and nature of the design queries to be addressed by the guidelines have, interestingly, highlighted a number of deficiencies, most noticeably in the areas of error prevention and correction, user guidance and support and to a minor extend in informative feedback.

- Such deficiencies, as highlighted by the checklist, stem from two observable features: the ubiquity, due to recurrence, of a small subset of guidelines suggesting a general applicability far more on a par with high-level guidelines than with domain-specific guidelines and secondly, the apparent dearth of appropriate and identifiable guidelines in areas considered relevant but not covered or not felt to be specifically covered by the set.

- Therefore, greater attention should be paid to the following: 26 and 27 should be broken into more specific and more easily applicable guidelines; more emphasis should be placed on the need to provide guidance not only for clearer instructions on screen, early task-specific tutorials, better customized help facilities but also for clearer informative feedback and adequate error prevention mechanisms especially in relation to Computer-Assisted-Language-Learning interfaces.

- Finally, although the apparent duplication which seems to affect some guidelines across the sections presented in the set of guidelines is largely justified, see the following discussion, it might be appropriate to consider the small but noticeable degree of overlapping within these sections as highlighted by the range of selected guidelines.

User Walkthroughs:

- Once familiarized with the proposed hypermedia presentation, the subjects, who were computer-literate language specialists with varying authoring expertise, made the following comments: the time given to scan through the guidelines was not sufficient to adequately read, fully understand and appreciate the range and nature of design issues covered by the guidelines. The list of guideline numbers was, therefore, the result of a quick and superficial scan rather than the fruit of a proper and thorough read through. It was further suggested that such an approach would not do justice to the guidelines as the allocated time span would inevitably make them more predisposed to prefer and adopt shorter rather than longer guidelines.

- In spite of the above-mentioned comments, results generated by the quick scan approach were very positive, supporting the notion that the proposed guidelines were generally easy to find and above all relevant. However, it is interesting to note that, first of all, the degree of relevance fluctuated as the lists provided slightly different sets of guidelines felt to be appropriate. Secondly, the number of guidelines found to be relevant was significant, suggesting abundance and adequate coverage of stipulated design issues but also possible duplication, as previously mooted. Finally, such a profusion of relevant guidelines could be interpreted as being confusing and therefore counter-productive. In one instance at least, the cheer number of guidelines found by C to be relevant to the last question was probably so overpowering that he did not know anymore whether all the selected guidelines were, after all, relevant or not.

- The second part of the user walkthrough also reaped interesting results in its own right. Although subjects were not given an imposed time span to read through the guidelines, they conducted the test in the same spirit as in part 1, going through the guidelines speedily and efficaciously. Each guideline was read once and its comprehensibility and clarity evaluated immediately and systematically. Generally, the guidelines were felt to be clear and easy to use, as the vast majority of them were rated either 3 or 4. However, a finite number of guidelines were poorly rated on the basis of their abstruse and/or obtuse formulation, their impracticality or their redundant nature.

- Although limited in scope and time, the user walkthroughs produced valuable evaluation data inasmuch as it tested the immediate cognitive impact the proposed guidelines had on the subjects whilst evaluating their responsiveness and receptiveness to such a presentation. The trade-off attached to this approach was that the subjects would not be in a position, given the nature of the exercise, to appreciate and benefit from the presentation of guidelines designed to encompass the whole of the authoring process from the pre-design stage to the evaluation of the finished product. The decision to establish the usability and relevance of the guidelines to specific, albeit discrete design issues, through a linear deciphering process has, in many respects, prevented subjects from considering the need to approach the guidelines by section. The overlap or potential duplication noticed by the subjects mostly stemmed from this inability to 'see the wood for the trees' as, indeed, the same design issues had to be treated differently when considered in the planning stage or in the design process. Similarly, some design considerations related to major or salient features of the system to be developed had, by their overwhelming nature, a higher incidence due to the potential design ramifications and influence on other aspects of the design.

To conclude this critical analysis of the results yielded by the evaluation, the following adjustment are proposed:

- To further highlight the section-based approach of the presentation.

- To clarify and streamline the "Aims & Objectives" section as well as "task requirements" since both of which proved to be the least comprehensible and usable.

- To expand on design considerations related to both screen layout, seen to be too dense and therefore too generally applicable, and specific guidelines related to on-line text, as directing subjects to referenced manuals was not felt to be particularly helpful.

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Conceptual Framework for Authoring Hypermedia for Language learning

Coherence

"One of the most important factors influencing whether or not studying will actually lead to knowledge acquisition is the degree to which students become actively involved in trying to make sense out of the material to be presented" (Anderson-Inman, 1989: 27).

"A document is coherent if a reader can construct a mental model from it that corresponds to facts and relations in a possible world" (Johnson-Laird, 1989).

"The problem is to design the system so that, first, it follows a consistent, coherent conceptualization - a design model - and, second, so that the user can develop a mental model of that system - a user model - consistent with the design model" (Norman, 1986: 46)

Coherence must initially be considered at two levels: the macro level, also referred to as strategic or global level (Thüring et al., 1995), which, encompasses the context of use within which the information base is to be structured, its adjacent learning strategies, the nature of the content of the information base, architectures and context overviews. Conversely, the micro level, also known as the local or tactical level, comprises the provision and support for the environment to be designed, component and node links and content presentation in terms of selection of information and interface design (Hardman, 1995). Practically, macro level design considerations will require appropriate design decisions whereas micro level considerations will tend to generate more concrete design solutions.

Links

Macro coherence: Strategic / global
Micro coherence: Local / tactical

Macro Coherence

At the global or strategic level design considerations must initially focus on:

- The Context of Use.
- The Nature of the Content Material.
- The chosen Language Learning Strategy if any for the expected student interaction.
- An appropriate Structural Architecture and identified macro components related to above points.

Context, content and learning strategies

Macro Coherence

Initially, macro coherence must be conceptualized at the broad level of general usability and achievability. In other words, questions such as "how is it intended to be used? In which learning context is it being designed for?" and "what is it trying to achieve in terms of aims and objectives?" must be addressed. On such a premise, coherence is to a large extent predicated upon the establishment of factors such as credibility, validity and, ultimately, legitimacy. Therefore, it is necessary to consider the context of use of the application to be designed, in terms of role, function, access, environment and interactive output as well as the specific nature of its language learning content within such a computed context and the appropriate learning strategy to adopt.

Links

Context of Use / Physical / Cognitive
Interactive Construct: Role / Function
Physical Context of Use: Access Modes / Environment
Cognitive Context of Use: Learner Group / Interactive Output

Content:
Nature of Content Material

Language Learning Strategies:
Instructional
Constructive Learning
No Learning Strategy

Context of Use: Physical / Cognitive

Context, content and learning strategies
Macro Coherence

The context of use is a crucial pre-design consideration inasmuch as it focuses on the expected role and function of the interface as an interactive construct, the physical environment and access modes and, finally, the cognitive context related to establishing a match between the targeted learner group and anticipated learning objectives and output.

Links

Interactive_Construct
Physical Context of Use: Access Modes / Environment
Cognitive Context of Use: Learner Group / Interactive Output

Interactive Construct: Role / Function

Context of Use / Physical / Cognitive
Macro Coherence

"Provided the students are clear about the role of the computer, and any limitations a computer tutor is known to have, then they will not be drawn into ascribing to the computer an infallibility that is not warranted, and they will use their own judgements to filter the feedback they receive" (Levy, 1997: 213).

"The fallacy of many Computer-Based Training projects can be ascribed to an overestimation of the communicative power of predetermined dialogues, which pretend to react on the student's answers, but soon show a narrow bandwidth and cause boring wait-and-see reactions at the student's side" (Kommers, 1996: 23; McGraw, 1994).

Refer to Section 6.1.1 on Role and Function of the Computer in the Learning Process

Selected Mental Models

Experienced Students

· Learning models elicited by students were invariably rooted in their known learning environment with its own, clearly established, almost perennial criteria such as a structured approach, a rigid and compulsive framework, a method of assessment, a learning feedback and support mechanism.
· Worse still, there was very little evidence to suggest that the students felt the need, nor the urge, to learn anything from either the material they interacted with, or their own interaction. Interestingly, the construction of a well-entrenched model based on the structured and assessed learning approach, coupled with its repudiation created a negative duality, which would prompt them into adopting a neutral, uncommitted and ultimately passive role. Subsequently, this passiveness was often camouflaged as a provocative ploy to test and challenge the authority and power of an application.
· The previously mentioned mental model of the learning environment, in turn, highlighted the students' model of the multimedia database and its learning potential. By contrast, multimedia was considered ludic, in terms of access, control, delivery and entertainment values as opposed to the more hypertext-based interaction which ambiguously and insidiously gave students control of, therefore the onus on, their action, whilst implicitly forcing them into a structured and disciplined approach.
· The hypermedia interface, according to students' mental models, highlighted inadequacies and limitations of the design as well as its functionality. Therefore, hypermedia had to be machine-driven but, at this stage in its development, also needed to adopt a teacher-led approach providing a structured framework and greater feedback.

Inexperienced Students

· Students compensated for their seeming inadequacies and general lack of confidence by adopting a systematic and linear approach to their interaction, reasonably and realistically exploring the language environment. Their learning model, at this level, suggested the endorsement of a progressive but safe exposure to new learning material inculcated by proper learning practices.
· Mental models of the learning platform as formed by the students were very much influenced by their functional and two-dimensional interaction, which was often conveniently compared to comprehension exercises performed in audio language laboratory conditions. As a result, the students' model was not so much a learning as an environmental one, conditioning their behaviour and navigational progress throughout the interaction.
· The students interpreted student control in the form of a negative or minimalist model. As a result, the language environment presented by the hypermedia platform was seen as freed from imposed learning constraints, by dint of having control over them.
· Overall, students interacted with applications in a methodical and systematic fashion. The

overwhelming model, which they projected, suggested that they primarily relied on and responded to instructions.

Research / Testing Artefact

Interactive Construct: Role / Function
Context of Use / Physical / Cognitive
Context / Content / Strategies
Macro Coherence

· The overall aim and objective of the hypermedia application to be designed must be clearly indicated. Jacobson (1994) and Levy (1997) usefully highlight the need to differentiate between hypermedia used as a theory construction and testing artefact conceived to "test or 'falsify' a particular theory and hypermedia as a prescriptive artefact design for learning purposes (p.142) within an identified context.
· CALL research-based hypermedia projects must highlight in their presentation and evaluation the language learning theories or specific interface design issues earmarked for consideration in order not to mislead readers and prospective students.
· As corollary, a hypermedia CALL environment designed for authentic, contextualized interaction with students can be successfully used to evaluate user interface design aspects or to observe and record student reactions and reflections within the confines of formative and summative evaluation sessions.

Refer to Chapter 6 for further details.

Links:

Research-dependent macro components

Learning Tool

Interactive Construct: Role / Function
Context of Use / Physical / Cognitive
Context / Content / Strategies
Macro Coherence

The main characteristics linked to the role and functions of the hypermedia language learning tool can be usefully reiterated:

· As a learning tool (Levy, 1997), the hypermedia system is viewed as a non-directive or self-directed resource whose interface, in a wider physical sense, must accommodate the intervention or collaboration of the teacher.
· The computer does not evaluate the student.
· The computer functions like a tool, which supports student initiatives and student-led activities.
· The functionality of the interface must facilitate and enhance authentic learning activities.
· As a learning support, it is designed to facilitate the student interaction, therefore, its functionality must be as transparent and intuitive as possible.
· The design of a hypermedia language learning support is, to a greater extent, based on the design of its tool-related components and, to a lesser extent, on its language-related elements.
· The authoring platform, itself, is an active learning tool, in the sense that it supports the learning process with particular emphasis on knowledge reprocessing and presentation, data storage, problem-solving and collaborative work.
· Implementation of autonomous learning needs to be facilitated by preparation and training.

Refer to Section 6.1.1. See also the Tutor-tool framework in Levy (1997: 178)

Selected Student Requirements

Refer to Chapter 11 for further details.

Experienced Students

· (22) The students must be given full control over their interaction
· (23) The students must be allowed unrestricted movement.
· (26) The interaction must be self-sufficient.
· (50) A hypermedia system must be a completely self-sufficient learning platform.

Inexperienced Students

· (17) Provide a flexible interaction.
· (20) Provide means to enable students to better control their actions.
· (27) Provide a greater sense of purpose.

Design Guidelines

Refer to Design Guidelines for Authoring Hypermedia Language Learning Applications in Appendix 5 for further details.

11. Learning Environment: Consider the most suitable learning or teaching environment that can be provided, both feasibly and realistically, by hypermedia in conjunction with the clear presentation of stated aims and objectives.

46. Linguistic Interaction: Optimize the level of linguistic interaction by ensuring that students can control their own appropriate progression through customized nodes and learning tasks. These can take the form of reading textual material in the target language, playing a participatory role in structured and fully interactive dialogues, preparing language-based exercises and drills and taking tests.

47. Interactive Match: Tailor the nature of the interaction and instructional control to the level of language proficiency of targeted students. The more knowledgeable, the more likely students will benefit from self-directed learning approaches.

Design Trade-offs

· Trade-off between student control / student autonomy and the right level and type of guidance or feedback.
· Trade-off between student control and task understandability.
· Trade-off between options and production or achievability.

Links

Physical: Access modes / Environment
Cognitive: Learner group / Interactive output
No learning strategy
Browsable / Learning tool

High Level Design Decisions

· Training and Induction: Hypermedia CALL, used as a learning tool, is more applicable to experienced than inexperienced students. Therefore, if the decision is made to adopt this approach, students will require induction and training. The steep learning curve at authoring level coupled with limited authoring skills and limited exposure to the authoring platform mean that introducing hypermedia CALL as a fully-fledged learning tool is a tall order. A more feasible suggestion is to capitalize on the novelty and attraction offered by the net and exploit easier hypertext links in a web-based html environment.
· Educational Setting: On the basis of the marked discrepancy between mental models expressed by students, highlighting their degree of conditioning to existing, traditional practices, and requirements seeking full interactive control, the learning tool must be harnessed within a recognizable educational setting and a more structured approach for greater learning output.
· Design Pointers: If the authoring platform itself is to be considered as a learning tool, then students must be provided with evidence of good practice first giving them design pointers in terms of suggestions and expectations.
· Supervision: Mental models and student requirements indicated that some adapted form of supervision was welcome or required for feedback, advice but also to clarify aims and objectives and to channel and guide the expected output.

Instructional Environment

Interactive Construct: Role / Function
Context of Use / Physical / Cognitive
Context / Content / Strategies
Macro Coherence

"With the restricted number of language skills and the more routine and predictable parts of foreign language teaching being the chief areas of language addressed, the role of the computer as tutor is one that is strictly limited" (Levy, 1997, 206).

· The instructional function is the most common and the least mastered computer-based approach in CALL. Since a computer is as 'intelligent' as its program and database, its role as tutor or instructor is necessarily restricted by the artificiality of its domain knowledge, which cannot be as rich and complex as that of the learner's. It would be impossible to expect the computer to behave like a human being or, even, to provide answers in all and every case. By the same token, the computer is more apt at handling mechanistic tasks than stimulating metaknowledge skills in learners (Cumming and Self, 1989).

· Aside from the limitations of the computer itself, instructional learning is ultimately about the degree of control over the student interaction. This problem is at the core of hypermedia CALL and, judging by existing courseware and current practices, the instructional paradigm, describing language learning as a controlled process, is still generally favoured.

However limited, the role and function of the hypermedia instructional environment can be broadly circumscribed by the following features:

· In the instructional environment the computer substitutes for the teacher and plays a tutorial and evaluative, role.
· The hypermedia platform supports the instructional paradigm depicting the learning process under the control of the teacher. Therefore, "in the instructional role, the computer program presents material and conducts practice activities as an authority figure (Wyatt, 1984: 6).
· The role of the tutor / instructor is to present structured content, prescribe relevant tasks and evaluate student interaction.
· Program and task-based on-line help must be provided to support the instructional approach and expected learner interaction.

Refer to Chapter 6 on Hypermedia CALL for further details

Selected Mental Models

Experienced Students

· Whilst the pedagogical potentiality of hypermedia applications was dismissed, students often took systems to task to ascertain their authoritative strength and test the true capacity of an application. Students resorted to techniques ranging from making deliberate mistakes to insubordinate reactions to command and error messages. The students' mental model elicited in this case was that of the deeply rooted and crucial relationship between master and learner, although somewhat exacerbated by the knowledge that the would-be master was a mere machine with a flawed and inadequately designed user interface.

Inexperienced Students

· Interestingly, when the interface clearly stipulated that the student interaction and language progression had been conceived on the basis of the unit, the student behaviour changed radically. Such an approach forced students to adopt a more clearly structured and identified classroom-based learning model within which progression became essentially linear and systematic, whilst exercises were attempted and to a large extent completed.
· Students felt the need to assert and enhance their linguistic competence in order to establish clearer demarcations and reaffirm their own superiority, albeit limited, vis à vis the machine.

However, the system was never challenged in the same way as experienced students had done, inasmuch as the computer was not compared to or associated with the position or role of the master tutor.

Selected Student Requirements

Refer to Chapter 11 for further details.

Experienced Students

· (13) Ensure errors or bugs do not creep in if you want to retain teaching status and credibility.
· (17) Provide relevant and helpful task-based feedback instead of warnings and locking mechanism.
· (27) Interactive aims and objectives must be clearly stated.
· (57) Highlight the difference between a hypermedia and a conventional presentation.

Inexperienced Students

· (10) Provide clear objectives.
· (15) Instructions must clearly indicate what actions are required.
· (22) Provide clear explanations regarding the learning approach.
· (26) Provide supervision.

Guidelines

Refer to Design Guidelines for Authoring Hypermedia Language Learning Applications in Appendix 5 for further details.

11. Learning Environment: Consider the most suitable learning or teaching environment that can be provided, both feasibly and realistically, by hypermedia in conjunction with the clear presentation of stated aims and objectives.

13. Student Requirements: Ensure that the information, tasks and interaction meet the needs of prospective students in terms of acquired language skills and levels of language attainments.

47. Interactive Match: Tailor the nature of the interaction and instructional control to the level of language proficiency of targeted students. The more knowledgeable, the more likely students will benefit from self-directed learning approaches.

48. Quality: Ensure that students are actively engaged in the process of understanding and learning and not just passive recipients of a large quantity of informational data. Introduce a wide range of additional interactive activities such as quizzes, gap-filling exercises, text and phrase jumbling facilities and audio-visual interactive exchanges.

Design Trade-offs

· Trade-off between instruction and intuitive interaction.
· Trade-off between motivation and coercion.

Links

Physical: Access modes / Environment
Educational setting
Instructional

High Level Design Decisions

· Technological Limitations: The instructional mode is better suited to inexperienced than to experienced students. Avoid such an approach with the latter since they are likely to quickly identify its inherent technological and pedagogical limitations.

· Identities and Applicability: If the instructional approach is the chosen interactive mode, exploit what the computer is good at and do not attempt to camouflage the fact that computers are machines. There is a fine line between using intuitive devices and resorting to simplistic means which can be seen as patronizing by students or, simply, confusing issues and identities.
· Motivation: In an instructional mode, provide as wide a variety of different exercises and activities as possible within the technological capabilities of the hypermedia platform with a view to sustaining the students' motivation.
· Integration: If hypermedia CALL is instrumental in breaking the traditionally instructional mould, then integrate the approach as a valuable, albeit mechanistic, remedial support within a student-controlled interactive environment. For example, students often expressed their disappointment when discovering that having taken the trouble to go to the grammar database for information, they were faced with a non-interactive paper-based version.

Mixed Learning Environment

Interactive Construct: Role / Function
Context of Use / Physical / Cognitive
Context / Content / Strategies
Macro Coherence

In many respects, the mixed learning environment, combining both learning tool and instructional elements, represents the construct most interacted with by the students within the hypermedia CALL environment. Ironically, this approach also suited their lack of clear references concerning language learning strategies and methodologies. The learning tool aspects, which gave students navigational and interactive controls was criticized, by default, for generating a negative, counterproductive interaction based on existing models of assessed and non-assessed work. Conversely, the instructional domain came under direct criticisms for being too coercive and limited showing, in the process, the flaws and inadequacies of the computer.

Refer to Chapter 6 on Hypermedia CALL for further details.

Selected Student Requirements

Refer to Chapter 11 for further details.

Experienced Students

· (22) The students must be given full control over their interaction.
· (23) The students must be allowed unrestricted movement.
· (27) Interactive aims and objectives must be clearly stated.
· (28) The interface must provide clear, obvious, interactive support.
· (45) The interaction must be self-sufficient.

Inexperienced Students

· (10) Provide clear objectives.
· (15) Instructions must clearly indicate what actions are required.
· (17) Provide a flexible interaction.
· (20) Provide means to enable students to better control their actions.
· (24) Provide recommended actions.

Design Guidelines

Refer to Design Guidelines for Authoring Hypermedia Language Learning Applications in Appendix 5 for further details.

11. Learning Environment: Consider the most suitable learning or teaching environment that can be provided, both feasibly and realistically, by hypermedia in conjunction with the clear presentation of stated aims and objectives.

13. Student Requirements: Ensure that the information, tasks and interaction meet the needs of prospective students in terms of acquired language skills and levels of language attainments.

46. Linguistic Interaction: Optimize the level of linguistic interaction by ensuring that students can control their own appropriate progression through customized nodes and learning tasks. These can take the form of reading textual material in the target language, playing a participatory role in structured and fully interactive dialogues, preparing language-based exercises and drills and taking tests.

47. Interactive Match: Tailor the nature of the interaction and instructional control to the level of language proficiency of targeted students. The more knowledgeable, the more likely students will benefit from self-directed learning approaches.

48. Quality: Ensure that students are actively engaged in the process of understanding and learning and not just passive recipients of a large quantity of informational data. Introduce a wide range of additional interactive activities such as quizzes, gap-filling exercises, text and phrase jumbling facilities and audio-visual interactive exchanges.

Design Trade-offs

· Trade-off between overall structural consistency and adaptability.
· Trade-off between technological capabilities and task-based solutions.
· Trade-off between language theories and design strategies.
· Trade-off between student control and instructions.

Links

Physical: Access modes / Environment
Cognitive: Learner group / Interactive output
Constructive learning
Mixed learning environment: controlled / free interaction

High Level Design Decisions

· Fit: The mixed learning environment can be seen as the preferred option as it corresponds more closely to mental models and fits student requirements better.
· Recognition: It is, increasingly, a model students can recognize and relate to within their real hyper learning context and networked resources and facilities, such as the WWW (Levy, 1998).
· Complementarity: It can also be seen as a bridge between two approaches, which are valid in their own right and complementary by the nature of their role and function and the complexity of the language learning process.
· Flexibility: It is more flexible inasmuch as the use of technology can be more easily targeted.
· Aims and Objectives: To adopt this interactive construct, it is important to set clear aims and objectives to enable students to understand what is expected of them.
· Student Control: This environment is only viable if students are allowed a high level of student control within clearly stated targets.
· Structure: Identify the interactive nature of and relationship between nuclei.
· Support: Provide fully integrated and interactive learning supports.

Physical Context of Use: Access Modes / Environment

Context of Use / Physical / Cognitive
Context / Content / Strategies
Macro Coherence

· If the context of use, in terms of role and function of the interface, needs to be defined and integrated within the design, it must be, similarly, clarified at the level of physical access.
· The main concern is how to accommodate and facilitate learning as an autonomous process within the design of the user interface.
· According to Dickinson (1994) learning autonomy is a combination of attitudes to learning such as motivation and a favourable disposition towards independent learning as well as learning skills, such as set own learning objectives; select appropriate material, learning strategies and monitor their own learning progress.

Links

Interactive Construct: Role / Function
Language Learning Strategies

Collaborative Learning Environment

Interactive Construct: Role / Function
Context of Use / Physical / Cognitive
Context / Content / Strategies
Macro Coherence

"Language learning without the involvement of other humans apart from the learner is intrinsically limited" (Fox, 1994).
· The learning strategy, if any, must be articulated by the teacher and / or student within the wider interface. As such, the elaboration and implementation of the learning task stems from collaborative work between computer, student and teacher.
· As a result, the aim of collaborative learning is to encourage and stimulate learning in partnership instead of resorting to instructional means.
· Within this model of collaborative hypermedia CALL, the learner is an autonomous entity, whilst the task and task performance are perceived and apprehended at different levels. On the one hand, the learner is free to navigate through the information base and undertake appropriate language learning activities to develop skills and knowledge, on the other, the distance, reflection, and, generally, the metaknowledge is discussed collaboratively with the teacher or a fellow student.
· Access to the underlying language is best achieved by discovery steered equally by "learner-controlled exploration" and "teacher-controlled demonstration" (Laurillard, 1991).
· Hypermedia interactive learning generates collaborative learning by facilitating the social construction of meaning.

Refer to Chapter 6 on Hypermedia CALL for further details.

Selected Student Requirements

Refer to Chapter 11 for further details.

Experienced Students

Overwhelmingly, the students supported free user interaction and favoured collaboration between students by pairing them together. Aside from stressing the need for clear learning strategies, objectives and outcomes, there was no mention of assessment facilities and teacher-controlled demonstration.

· (22) The students must be given full control over their interaction.
· (23) The students must be allowed unrestricted movement.
· (27) Interactive aims and objectives must be clearly stated.
· (28) The interface must provide clear, obvious, interactive support.
· (41) Provide an adequate and relevant context for the designed environment.
· (42) Pair students together whenever possible.
· (45) The interaction must be self-sufficient.

Inexperienced Students

Inexperienced students were more inclined to seek direction, flexible but recommended interaction and instructions. Likewise, no specific mention of self-access was made.

· (10) Provide clear objectives.
· (15) Instructions must clearly indicate what actions are required.
· (17) Provide a flexible interaction.
· (20) Provide means to enable students to better control their actions.
· (24) Provide recommended actions.
· (26) Provide supervision.

Design Guidelines

Refer to Design Guidelines for Authoring Hypermedia Language Learning Applications in Appendix 5 for further details.

7. Learning Context: Clearly establish the learning context within which the application is to be designed and subsequently used as this will have important repercussions on the design of the interface. For instance, will the application to be authored be used under teacher supervision or conversely will it be designed for self-access.

13. Student Requirements: Ensure that the information, tasks and interaction meet the needs of prospective students in terms of acquired language skills and levels of language attainments.

46. Linguistic Interaction: Optimize the level of linguistic interaction by ensuring that students can control their own appropriate progression through customized nodes and learning tasks. These can take the form of reading textual material in the target language, playing a participatory role in structured and fully interactive dialogues, preparing language-based exercises and drills and taking tests.

47. Interactive Match: Tailor the nature of the interaction and instructional control to the level of language proficiency of targeted students. The more knowledgeable, the more likely students will benefit from self-directed learning approaches.

48. Quality: Ensure that students are actively engaged in the process of understanding and learning and not just passive recipients of a large quantity of informational data. Introduce a wide range of additional interactive activities such as quizzes, gap-filling exercises, text and phrase jumbling facilities and audio-visual interactive exchanges.

Design Trade-offs

· Trade-off between collaborative work and access facilities.
· Trade-off between group work and monitoring.

Links

Nature of content material
Language learning strategies
Mixed / learning environment: controlled / free interaction

High Level Design Decisions

· Nature of Collaboration: According to mental models and student requirements, a degree of collaboration or group work seems to be favoured by students. Supervision, requested by the more inexperienced students, can be provided in the form of instructions and / or recommendations, which can be both computed and teacher-led.
· Interaction: Collaborative work can be generated by the provision of student control, access, pairing, clear strategies and an identified context of use.
· Access: Collaborative work can be stimulated by providing access to an information base relevant to students' needs and interest, realistic problem-solving situations, access to interactive learning supports, databases and libraries as well as search facilities, facilitating knowledge reprocessing and communications.

Self-Access

Physical: Access Modes / Environment
Context of Use / Physical / Cognitive
Context / Content / Strategies
Macro Coherence

· The concept and implications of the appropriate type of access to the information base must be considered at the conceptual level of the interface design as it impacts on its development.
· A self-access mode implies an interface with adequate learner support in terms of feedback, guidance and help as well as with the appropriate provision of devices and structural information to facilitate navigation and exploration and help overcome problems linked to autonomy and self-sufficiency.
· To be successful, the self-access mode must highlight learning objectives and strategies as well as provide the means for self-assessment, involving self-appraisal of achievements and of objectives reached, seeking expert advice and corrections.
· Ultimately, it must ensure that the expected interaction generates the desired sustained motivation on the part of students, which, in turn, can stimulate endeavour and self-discipline.

Selected Student Requirements

Refer to Chapter 11 for further details.

Self-access, was not singled out as a specific issue by the students, mainly because it is generally assumed that hypermedia CALL is tailor-made for self-access mode. Selected requirements only focused on support and help facilities as well as aims and objectives.

Experienced Students

· (15) Display contextualized on-line help.
· (24) Ensure that the students' motivation is maintained throughout the interaction.
· (25) Interactive links must be designed to facilitate access to the relevant information.
· (27) Interactive aims and objectives must be clearly stated.
· (28) The interface must provide clear, obvious, interactive support.
· (30) Provide optional introductory information related to the concept of the design and context.
· (39) Provide an overview of progress on request.
· (45) The interaction must be self-sufficient.
· (46) Learning objectives must be clearly delimited and explained.

Inexperienced Students

· (10) Provide clear objectives.
· (13) Provide a versatile Help facility.
· (20) Provide means to enable students to better control their actions.
· (25) Provide clear learning markers.

Design Guidelines

Refer to Design Guidelines for Authoring Hypermedia Language Learning Applications in Appendix 5 for further details.

7. Learning Context: Clearly establish the learning context within which the application is to be designed and subsequently used as this will have important repercussions on the design of the interface. For instance, will the application to be authored be used under teacher supervision or conversely will it be designed for self-access.

8. Learning Strategy: Ascertain which learning strategy is more appropriate and suitable to potential students given the chosen or imposed learning context. For example, certain aspects of language learning, by encouraging a memorization process based on exploratory modes and generally inductive methods will tend to favour the implicit learning approach with its emphasis

on student-controlled interaction. Conversely, a more traditional deductive approach, emphasizing rules and direct applications will be more appropriate for an explicit learning method.

10. Task Support: Clearly ascertain that the range of tasks to be undertaken by the targeted learners are adequately supported by the chosen hypermedia system. For instance, will the authored hypermedia courseware be able to promote a language-based exploratory environment if a conducive approach is chosen?

11. Learning Environment: Consider the most suitable learning or teaching environment that can be provided, both feasibly and realistically, by hypermedia in conjunction with the clear presentation of stated aims and objectives.

13. Student Requirements: Ensure that the information, tasks and interaction meet the needs of prospective students in terms of acquired language skills and levels of language attainments.

14. Student Support: Provide an acceptable level of support tailored to the available range of in-built learning strategies offered to students. For instance, authors should pay particular attention to the provision of adequate support, such as on-help facilities, tutorials and error messages, for all students with a view to reducing the front-loaded cognitive load likely to be experienced by such learners.

20. Compatibility: Ensure that the design of the user interface is specifically tailored to match and reciprocate the expected context of use and the chosen learning modes. For instance, students must be given appropriate means to control the expected interaction in relation to the chosen learning approach and context, be it self-directed, laboratory-based etc.

Design Trade-offs

· Trade-off between control and autonomy.
· Trade-off between appeal and monitoring.
· Trade-off between display of learning support and screen space.
· Trade-off between learning support devices and speed of application.

High Level Design Decisions

· Versatility and Compatibility: If the self-access mode is adopted, as indirectly presupposed by requirements, then a high degree of versatility and task compatibility must be built into the hypermedia CALL application since students with different levels of ICT skills, expertise and confidence will require adaptable levels of support and control, clear aims and objectives for increased self-sufficiency as well as pointers regarding progression and levels of attainment to facilitate self-monitoring.
· Support Design Features: Such a design decision can be supported by the following design features. Clearly display the learning strategy as an introductory default window with a bypass facility. Provide a guided tour of expected interaction. Provide informative and forgiving messages to stimulate and reassure students. Provide a scoring device to be displayed on request only. Provide a trailing and tracking mechanism for self-monitoring of progress and orientation.

Educational Setting: Classroom Access

Physical: Access Modes / Environment
Context of Use / Physical / Cognitive
Context / Content / Strategies
Macro Coherence

· There is no incompatibility between self-access and classroom access, inasmuch as autonomous learning can be integrated into a conventional educational setting and an instructional approach can support a task-based interaction in learning autonomy mode.

Selected Student Requirements

None specifically expressed

Design Guidelines

Refer to Design Guidelines for Authoring Hypermedia Language Learning Applications in Appendix 5 for further details.

7. Learning Context: Clearly establish the learning context within which the application is to be designed and subsequently used as this will have important repercussions on the design of the interface. For instance, will the application to be authored be used under teacher supervision or conversely will it be designed for self-access.

8. Learning Strategy: Ascertain which learning strategy is more appropriate and suitable to potential students given the chosen or imposed learning context. For example, certain aspects of language learning, by encouraging a memorization process based on exploratory modes and generally inductive methods will tend to favour the implicit learning approach with its emphasis on student-controlled interaction. Conversely, a more traditional deductive approach, emphasizing rules and direct applications will be more appropriate for an explicit learning method.

10. Task Support: Clearly ascertain that the range of tasks to be undertaken by the targeted learners are adequately supported by the chosen hypermedia system. For instance, will the authored hypermedia courseware be able to promote a language-based exploratory environment if a conducive approach is chosen?

14. Student Support: Provide an acceptable level of support tailored to the available range of in-built learning strategies offered to students. For instance, authors should pay particular attention to the provision of adequate support, such as on-help facilities, tutorials and error messages, for all students with a view to reducing the front-loaded cognitive load likely to be experienced by such learners.

20. Compatibility: Ensure that the design of the user interface is specifically tailored to match and reciprocate the expected context of use and the chosen learning modes. For instance, students must be given appropriate means to control the expected interaction in relation to the chosen learning approach and context, be it self-directed, laboratory-based etc.

Links

Interactive Construct: Role / Function
Cognitive: Learner Group / Interactive Output
Nature of Content Material
Language Learning Strategies

High Level Design Decisions

· If classroom access is adopted as default access, build in provision for self-access mode.
· Provide illustrated aims and objectives on request for autonomous learning mode.
· Provide on-line help and feedback, informative and forgiving messages to stimulate and reassure

students.
· Provide a scoring device.
· Provide a student's notepad facility for assessment purposes.
· Provide a trailing and tracking mechanism for self-monitoring of progress and orientation.

Cognitive Context of Use: Learner Group / Interactive Output

Context of Use / Physical / Cognitive
Context / Content / Strategies
Macro Coherence

· Within the cognitive context of use, authors must establish an appropriate match between the characteristics, needs and levels of the targeted learner group and the type, range, presentation and delivery mode of the learning material.
· Similarly, aims and objectives of the language learning interaction must be on a par with students' level of achievement and degree of expectation.

Mental Models

Refer to selected mental models in Interactive Construct: Role / Function.

Globally, experienced students could relatively easily interact with the various types of interface put to them but had difficulties in sustaining their concentration and motivation. Conversely, inexperienced students ran into problems when trying to understand the functionality of the interface, generally, but were far more likely to adopt and retain a steady, sequential path whenever possible, and follow instructions.

Selected Student Requirements

Refer to Chapter11 for further details.

Experienced students reacted strongly against the treatment they felt they were subjected to by the computer, when it pretended to be other than a machine.

Experienced Students

· (11) Treat students like normal human beings.
· (14) The material used must be attractive and identifiable.
· (18) Do not attempt to design an interface with a view to making the computer look and respond more like a human.
· (44) Make exercises relevant and realistic.
· (48) State clearly the target level of language proficiency.
· (54) Ensure that the multimedia content is adaptable to students' needs.
· (55) Specify the type and range of linguistic material used.

Inexperienced Students

· (9) Make the design adaptable to the different levels of student needs and expertise.
· (17) Provide a flexible interaction.

Design Guidelines

Refer to Design Guidelines for Authoring Hypermedia Language Learning Applications in Appendix 5 for further details.

13. Student Requirements: Ensure that the information, tasks and interaction meet the needs of prospective students in terms of acquired language skills and levels of language attainments.

20. Compatibility: Ensure that the design of the user interface is specifically tailored to match and reciprocate the expected context of use and the chosen learning modes. For instance, students must be given appropriate means to control the expected interaction in relation to the chosen learning approach and context, be it self-directed, laboratory-based etc.

42. Data Recognition: Ensure that the knowledge base is sufficiently recognizable and manageable for the range of targeted students and their required tasks. A large database with a

seemingly wide choice of links may confuse and disorientate them.

45. Data accessing: Ensure that the selected interaction, expected of and controlled by students, to access specific information according to their level of proficiency is predictable and unambiguous. Whilst allowing for potential structural and informational shortcuts, remember that too many alternative choices make a structure artificially complex and inevitably lead to confusion, demoralization and error-prone responses.

Links

Interactive Construct: Role / Function
Physical: Access Modes / Environment
Nature of Content Material
Language Learning Strategies
Cognitive Issues

Design Trade-offs

Trade-off between a learner centred design and a technologically based functionality.
Trade-off between motivation and instructions.
Trade-off between flexibility and speed.
Trade-off between display of flexible functionality and screen space.
Trade-off between intuition and functions.

High Level Design Decisions

· Appreciation of Needs: Seek an appreciation of students' characteristics and needs through discussions, observation and interaction.
· Match: Seek an early match between students' expectations and tasks.
· Environment: Promote easy recognition of and access to computed environment.
· Interaction: Ensure that the information, tasks and interaction meet the needs of prospective students in terms of acquired language skills and levels of language attainments.

Nature of Content Material

Context / Content / Strategies
Macro Coherence

· At this conceptual level of design, the content of the learning material must be decomposable into broadly defined modules or composites and be compatible with the chosen role and function to be played by the interface and the adopted language learning strategy.
· This will involve identifying the nature of the content at the unit, module and composite levels as well as relevant themes and potential tasks.

Selected Student Requirements

Refer to Chapter 11 for further details.

Experienced Students

· (44) Make exercises relevant and realistic.
· (54) Ensure that the multimedia content is adaptable to students' needs.
· (55) Specify the type and range of linguistic material used.
· (56) Increase the language learning potential.

Inexperienced Students

· (18) Multimedia must provide a new, attractive, interactive, environment.

Design Guidelines

Refer to Design Guidelines for Authoring Hypermedia Language Learning Applications in Appendix 5 for further details.

16. Organization: Consider the hypermedia shell essentially as an explicit, organizing structure designed to support a broad, albeit finite, selection of learning tasks. Plan such a structure, be it linear, hierarchical, web, tree, linked to outside component, according to its suitability to the chosen learning strategy and task requirements.

21. Effectiveness: Design a user interface, including learning data, activities and their screen presentation, capable of delivering the most effective learning strategy. For instance, do not unjustifiably highlight auxiliary features, which may create unnecessary distraction leading to a slower, shallower learning process and reduced interactive potentiality.

Links

Interactive Construct: Role / Function
Physical: Access Modes / Environment
Cognitive: Learner Group / Interactive Output
Language Learning Strategies

Design Trade-offs

· Trade-off between built-in progression and student control.
· Trade-off between a learning support and a learning resource.
· Trade-off between a unit-based and theme-based approach.

High Level Design Decisions

· Identification: Look at the content material by adopting a top down approach, identifying themes, metaphors, overriding features then broad composites and units within which modules, lessons and exercises will take place

· Match: Ensure that the content of the language material, in terms of approach, activities and themes, is on a par with the role and function adopted for the interactive construct.

Language Learning Strategies

Macro Coherence

"Non-linear hypertext is obviously a good way to package information retrieval and is useful for some forms of interactivity. However, because of its fragmented nature, it is not a suitable medium to form the core of teaching materials" (Whalley, 1993: 16).

According to Garrett (1998) "..we really have no idea a) what kind of language learning actually happens in face-to-face communication with a teacher, b) in spontaneous real-time meaningful personal communication that's network-based instead of face-to-face, with other learners or native speakers instead of teachers, c) in meaningful interpersonal communication that's not in real time and d) when students work alone, doing homework or even working in self-instructional situations".

· Language learning strategies span many different learning models from the traditional and rigid instructional approach supporting deductive structures, inductive techniques to problem solving and knowledge elicitation and construction methods. The hypermedia CALL platform, by dint of supporting a student-centred underlying concept, is more closely associated with the latter open learning activities.
· Hypermedia is generally perceived as ideally suited to a situated learning context as well as providing a tailor-made support for the constructivist approach to knowledge acquisition.
· Knowledge is constructed through interaction and not simply transmitted via the use of teaching strategies.
· Constructivist learning, by prioritizing and promoting a quintessential, individualized learning process, feeds into the design of hypermedia on the basis of a need for a user-centred approach.
· Hypermedia interactive learning generates collaborative learning by facilitating the social construction of meaning.
· Foreign language acquisition implies that learners are implicated in the real environment within which the language is spoken. Therefore, the process of acquiring the foreign language must be contextualized enabling learners to establish a useful relationship between context and use designed to facilitate and support the understanding and communication of meanings.
· Since language constructs are "embedded" into situational contexts, appropriate teaching methodologies need to ensure that the language content is "disembedded" from the situation to achieve language competence.
· Hypermedia platforms, relying on inductive modes and exploratory learning, are conceived within the communicative competence environment.
· Foreign language acquisition is perceived as providing the ideal language context for the Language for Specific Purposes (LSP) approach.
· Two distinct approaches can be broadly identified within the grammar-oriented category based on either the traditional, prescriptive, top-down deductive process or the more recent, applied, bottom-up inductive approach.
· Communicative competence and inductive approaches are not incompatible.

Refer to Chapter 6 on Hypermedia CALL for further details

Mental Models

Experienced Students

· Irrespective of the learning hypermedia platform interacted with, students failed to identify learning aims and objectives of applications. Notably, their existing model of the learning environment did not allow them to relate to the perceived unstructured and unrestricted, user interface. Additionally and interestingly, they could not sufficiently differentiate the hypermedia approach and delivery from their traditional, unappealing, text-based learning model.

Inexperienced Students

· Mental models of the learning platform as formed by the students were very much influenced by their functional and two-dimensional interaction, which was often conveniently compared to comprehension exercises performed in audio language laboratory conditions. As a result, the students' model was not so much a learning as an environmental one, conditioning their behaviour and navigational progress throughout the interaction.

Selected Student Requirements

Refer to Chapter 11 for further details.

Experienced students

· (47) State clearly the expected learning outcomes.
· (48) State clearly the target level of language proficiency.
· (49) State clearly the adopted learning strategy.
· (50) A hypermedia system must be a completely self-sufficient learning platform.
· (51) Provide optional introductory information related to the concept of the design and context.
· (56) Increase the language learning potential.

Inexperienced students

· (21) Provide clear learning objectives.
· (22) Provide clear explanations regarding the learning approach.
· (23) Provide recommended pathways.
· (25) Provide clear learning markers.

Design Guidelines

Refer to Design Guidelines for Authoring Hypermedia Language Learning Applications in Appendix 5 for further details.

8. Learning Strategy: Ascertain which learning strategy is more appropriate and suitable to potential students given the chosen or imposed learning context. For example, certain aspects of language learning, by encouraging a memorization process based on exploratory modes and generally inductive methods will tend to favour the implicit learning approach with its emphasis on student-controlled interaction. Conversely, a more traditional deductive approach, emphasizing rules and direct applications will be more appropriate for an explicit learning method.

9. Learning Goals: Clearly identify the language learning or teaching goals to be achieved by the application. These should suit the needs of the prospective students in relation to the linguistic skills to be acquired.

Links

Interactive Construct: Role / Function
Physical: Access Modes / Environment
Cognitive: Learner Group / Interactive Output
Nature of Content Material

Design Trade-offs

· Trade-off between hypermedia CALL as learning tool or as instructional platform.
· Trade-off between student control and monitoring.
· Trade-off between motivation and coercion.
· Trade-off between assimilation and production.
· Trade-off between learning goals and assignment completion.
· Trade-off between computer-based learning strategies and existing mental models.
· Trade-off between learning material and real life authenticity.
· Trade-off between on-line explanations and space.
· Trade-off between on-line information and speed.
· Trade-off between on-line explanations and intuition.

High Level Design Decisions

· Discrepancy: High level design decisions concerning language learning strategies will have to confront the blatant discrepancy between the various views and positions adopted in the CALL literature and the obvious lack of impact these seem to be having with students when interacting.
· Aims and Objectives: As a result, whichever strategy is chosen, convenient and appropriate means must be found to present it and explicate its aims and objectives for students to better appreciate what is expected of them. Too often, the lack of clear learning indicators from the platform coupled with the lack of knowledge and appropriate reference from students lead to the feeling that the interaction is not properly thought-out and meaningful within a learning context.
· Support: Explanations, guidance and contextualized support must be high on the design agenda.

Instructional

Language Learning Strategies
Macro Coherence

· Since the learning strategy is paramount, the approach and methodology is integrated into the computed programme.
· The hypermedia CALL instructional environment supports deductive and inductive learning as long as the locus of control still remains with the computer. In the latter case, the computer provides data to "reveal the pattern of the underlying rule" (Levy, 1997: 191).

Refer to Chapter 6 on Hypermedia CALL for further details

Student Requirements

Refer to Chapter 11 for further details.

See Language Learning Strategies

Design Guidelines

See Language Learning Strategies

Constructive Learning

Language Learning Strategies
Macro Coherence

· The student interaction is predicated upon student control, initiative and decision-making role. Therefore, it supports the concept of learner autonomy, student centred design and, more specifically, student oriented CALL.
· A constructivist approach means that the hypermedia learning environment must support meaningful student interaction and, therefore, help students in undertaking and performing knowledge construction tasks.
· As a learning strategy, it recognizes the cognitive potential of the computer as a learning tool such as computer-mediated communicative competence, student / teacher and student / student interactive communication and collaboration.
· Built into this approach is the notion of appeal, satisfaction and gratification within the learning process.

Refer to Chapter 6 on Hypermedia CALL for further details

Student Requirements

Refer to Chapter 11 for further details.

Experienced Students

See Language Learning Strategies

· (19) Multimedia is not by its very nature attractive. It must be made so by design.
· (22) The students must be given full control over their interaction.
· (24) Ensure that the students' motivation is maintained throughout the interaction.
· (42) Pair students together whenever possible.
· (50) A hypermedia system must be a completely self-sufficient learning platform.

Inexperienced Students

· (18) Multimedia must provide a new, attractive, interactive, environment.
· (20) Provide means to enable students to better control their actions.
· (22) Provide clear explanations regarding the learning approach.
· (23) Provide recommended pathways.

Design Guidelines

Refer to Design Guidelines for Authoring Hypermedia Language Learning Applications in Appendix 5 for further details.

See Language Learning Strategies

No Learning Strategy

Language Learning Strategies
Macro Coherence

"With the computer tool the methodology - the instructional strategies, the learning processes and the tasks - resides outside the domain of the computer and the various aspects that combine to form a methodology have to be devised by the language teacher or the student, or both together" (Levy, 1997: 194).
The 'no-learning strategy' is intricately linked to the use of hypermedia as a functional tool for language learning purposes. For example, its authoring functions can be exploited by students as presentation platforms for language material. In this particular instance, the design relates to the customization of the authoring mode and interface rather than the language learning dimension, which becomes the product of the designed functionality.

Student Requirements

Refer to Chapter 11 for further details.

Experienced Students

· (21) The students must always have access to multimedia functions.
· (22) The students must be given full control over their interaction
· (23) The students must be allowed unrestricted movement.

Inexperienced Students

· (11) Provide clear functionality.
· (17) Provide a flexible interaction.

Design Guidelines

Refer to Design Guidelines for Authoring Hypermedia Language Learning Applications in Appendix 5 for further details.

16. Organization: Consider the hypermedia shell essentially as an explicit, organizing structure designed to support a broad, albeit finite, selection of learning tasks. Plan such a structure, be it linear, hierarchical, web, tree, linked to outside component, according to its suitability to the chosen learning strategy and task requirements.

Structural Architecture / Identification of Macro Components

Macro Coherence

· Structuring the information base is intrinsically linked to learning strategies, inasmuch as an inherent reciprocity between the identified structural approach and the perceived scope of the expected user interaction exists. This is why considerations related to the interactive dimension must precede structuring as they have an overwhelming influence on the design of the structure. Therefore, within these two referential poles, a number of structural combinations can be identified depending on the varying degrees of learner control and types of learning approaches adopted.
· At this conceptual level of structural design three broad language learning approaches can be conveniently singled out to give an indication of the range of interactive possibilities and related strategies. In an attempt to focus on the strategic dimension of interaction and interface objectives, the proposed diagram highlights the purposefulness of the intended structure by separating the prescriptive / didactic artefact from the research-based design. The next compartmentalized layer essentially considers the previously mentioned interactive scenarios from the student-controlled browsable network to the teacher-controlled instructional format, through the global umbrella of mixed learning environment. Thereafter, related structures are identified followed by broad indicative types of suitable links.
· At this conceptual stage, the macro coherence of the system to be designed should be informed by some clear choices as to the context of use, the nature of the content of the information base, the adopted learning strategy and the potential structure. Therefore, the diagrams are instrumental in providing patterns of routes, which must be streamlined to take into account potential ramifications and regrouping of options. For instance, if the chosen path for coherence adopts a mixed collaborative environment with a constructive learning approach, then its construct will accommodate a tool oriented interaction, a mixed access mode with an element of direction and situated learning, a task / theme based content and, depending on the desired monitoring a root and branch or a more coercive hierarchical structure. Similarly, the conceptual design could be informed by a finite instructional, curriculum-based, teacher-controlled environment, with a rigid, formal structure relying essentially on appropriate tutor support as opposed to student control.

Mental Models

Experienced Students

· Structural mental models were never clearly elicited, or their formation was never seen as being encouraged or simply guided by the interface. As a possible consequence, all exploratory interactions were conducted at random and navigational routes seemed to be taken without obvious or clearly thought-out objectives. The students' multimedia and Internet experience meant that they understood the hypermedia platform to be more a hyperbase, providing free access to an information base, than a hyperdocument, which presented an imposed structure.

Inexperienced Students

· Strikingly, structural models of architectures or of how systems worked were never clearly elicited. Functional models of how to use an application would always predetermine the student interaction and overshadow other considerations. In this case, the cognitive overhead triggered by the need to interact within an unfamiliar environment was clearly evident and a recognized obstacle to realize the expected interaction and fulfil satisfactory goals.
· Consequently, models of the architecture of the interface, being based on the extent of the student interaction, were systematically incomplete and inaccurate. As such, students could remain oblivious of large parts of the hypermedia environment until task-based exercises widened their focus and increased their awareness of previously unexplored, but similarly not requested, interactive areas of the structured domain.
· In addition to the above system image based on the known language laboratory, the students associated the structural dimension of the software with their own existing concept of the language course, although they never adequately identified its three-dimensional architecture and learning outcomes. From the onset, the students interacted with the interface as if it were a screen

transposition of a traditional classroom model of support material albeit two-dimensionally presented, conducted in the absence of the teacher and with full student control. As a result, students often superficially "surfed" over the learning material in the knowledge that they would not be checked or assessed. In turn, such a conditioned attitude affected the students' motivation and, ultimately, their achievements. Consequently, the students rarely attempted to seek explanations when particular elements of a knowledge base were perceived as incomprehensible further undermining their progress.

· The formation of two different mental models affecting the students' views of systems as interactive constructs was noticed. On the one hand, the students once developed a model encompassing the whole of the chosen architecture of a system, albeit not explicitly nor accurately, and naturally felt free to explore its knowledge base at random. On the other hand, navigational complications and restrictions affected students' models in such a way that they adjusted and explicitly related to the structure of the application, which, due to its limitations, had become easier to focus on.

Links

Interactive Construct: Role / Function
Language Learning Strategies

Prescriptive / Didactic

Structural Architecture / Identification of Macro Components

If the purpose of the platform is educational, its interactive structure must be adapted to the appropriate learning strategy and context of use. For the purpose of this framework, three interactive models or scenarios have been identified as representative paradigms for a limitless range of interaction and educational environments: browsable, mixed learning and instructional.

Links

Browsable / Learning Tool

Mixed: Learning Environment: Controlled / Free Interaction

Instructional

Browsable / Learning Tool

Prescriptive / Didactic
Structural Architecture / Identification of Macro Components

· If browsing is the preferred mode of user interaction, then a functional approach to structuring the content can be chosen. It follows that a browsable information base will be presented in the form of a network of discrete composite nodes or higher order units (Thüring et al., 1995) based on themes or / and tasks and best presented in an index structure (Hardman, 1995).
· The intended user interaction is predicated upon the type and style of navigation stimulated by this learning environment. The browsing mode within such a functional structure is based on the concept of learning by discovery. According to Marchionini (1995) browsing strategies are more heuristic, interactive, data-driven and opportunistic and require less cognitive overhead than a goal-driven, analytical strategy. Kommers (1996: 58) identifies inherent browsing tendencies such as "roaming, digressions and serendipity" which are both negative and positive characteristics of the exploratory mode depending on its exploitation and outcome.
· The broad distinction can be made between two types of associations. The first one is based on fixed links anchored within the content material, as in the case of hotwords for example, and tends to generate web-like ramifications supporting browsing. The second one is more structured, in the sense that the nodes are more clearly interlinked within a predetermined and graphically represented network of associations.
· In a web-like information base, the access is student controlled and the links between nodes are associative. In a more directed, navigation-oriented interaction, the links can be strengthened by allowing students access to more in-depth information with elaborative links as well as goal / strategy selection links and metalinks providing appropriate support and guidance.

Selected Student Requirements

The students did not formulate specific requirements regarding structures, per se. As previously mentioned and observed in mental models elicited by students (refer to Chapter 8) students found it difficult to relate to space or sufficiently distance themselves from their interaction to express a proper judgement. Emphasis was therefore placed on control, movement and interactive potential.

Refer to Chapter 11 for further details.

Experienced Students

· (10) Multimedia extensions are only appreciated if purposeful.
· (12) Ensure that the reference database is fully integrated and responsive.
· (23) The students must be allowed unrestricted movement.
· (25) Interactive links must be designed to facilitate access to the relevant information.
· (26) The feeling of being locked in must never occur.
· (45) The interaction must be self-sufficient.

Inexperienced Students

· (18) Multimedia must provide a new, attractive, interactive, interactive, environment.
· (20) Provide means to enable students to better control their actions.

Design Guidelines

Refer to Design Guidelines for Authoring Hypermedia Language Learning Applications in

Appendix 5 for further details.

16. Organization: Consider the hypermedia shell essentially as an explicit, organizing structure designed to support a broad, albeit finite, selection of learning tasks. Plan such a structure, be it linear, hierarchical, web, tree, linked to outside component, according to its suitability to the chosen learning strategy and task requirements.

17. Conceptualization: As an unskilled software designer, initially adopt a top-down approach to structure design as opposed to premature bottom-up thinking. An early paper-based conceptualization of the structural dimensions and considerations will stimulate and facilitate the subsequent design process of the given structure. Conversely, the bottom-up approach, by concentrating on detailed aspects of the structure, is more likely to obscure the necessary conceptual overview. It will also undermine the author's position by making it more vulnerable to design expediencies such as design shortcuts and ready-made technological facilities.

18. Mapping: Map out a clear and manageable overall structure for the application to be authored, matching the previously adopted learning strategy and conceived within the well established technological constraints imposed by the chosen system. Adopt a clear conceptual approach to the document structure highlighting its configuration. If incompatibility is discovered at this pre-design stage, go back to earlier findings of the feasibility study. This could apply in cases when structures are required for large and complex documents.

19. Navigation: Establish a clear distinction between navigational facilities. Navigation should stimulate informational, macro level controls, locating information within the whole structured data, whilst browsing should emphasize node links and attributes.

40. Consistency: When designing the application structure, refrain from being unduly influenced by technology-led solutions purposefully enhanced by the software manufacturer to the point of losing sight of stated objectives. Typical examples of design consequences such a direction might generate can be found in the predominant use of link facilities, unwarranted proliferation of nodes, confusingly wide range of displayed commands, highlighted interactive fields and colours.

41. Orientation: Limit the number of explicit outlinks from any one node. It is suggested that no more than five such links should be used so as to prevent disorientation and additional cognitive strains.

43. Information: Provide structural information and access facilities embedded into the knowledge base to enable students to relate to and appreciate the nature and extent of the available database.

Design Trade-offs

· Trade-off between degree of student control and type of guidance / support provided.
· Trade-off between exploration and demonstration.
· Trade-off between a narrowed-down, link-driven, browsing mode and a more directed or purposeful, goal-driven navigational structure.
· Trade-off between motivation linked to discovery and higher cognitive load generated by network on students.
· Trade-off between meaningfulness of interaction and degree of control.
· Trade-off between student control and disorientation.
· Trade-off between navigation support and speed.
· Trade-off between visual support and space.

High Level Design Decisions

· Conceptual Configuration: Decide on an overall conceptual configuration of the structure, matching the adopted navigational facilities, objectives and technology.
· Interactive Identification: Identify composite and discrete nodes as well as links to match above conceptual model. Incorporate navigational scenarios for early formative evaluations.
· Interactive Integration: Conceive a network of inter-related links to avoid dead-ends in parts of the information base by integrating both the language learning interactive environment with the support area.
· Support: Provide clear visual maps of the structure.

Mixed: Learning Environment: Controlled / Free Interaction

Prescriptive / Didactic
Structural Architecture / Identification of Macro Components

· In the mixed environment mode, a root and branch or network approach with nuclei of accessible discrete composites is a flexible and appealing structure in the hypermedia CALL environment. Branching routes can conveniently accommodate specific content-based units interconnected by associative links with discrete sub-networks attached for greater exploration, interactive participation, or specific task-based activities.
· Levy (1998) likens this learning environment to a "holistic-discrete approach" highlighting its adaptability to and appropriateness with World Wide Web technologies and access. At an authoring level, the clear advantage of such an approach to hypermedia CALL is strategic as well as technological. Firstly, authors are able to focus on the broad structure and overall goals of the environment whilst developing isolated interactive nuclei, separately and therefore more manageably, with appropriate and better-targeted language learning theories. At a more pragmatic and technological level, expertise and capabilities can be better spread out and adapted to a wider range of different task-based sub-components.
· Likewise, this structure can be used for an inductive approach wherein language tasks, requiring a more systematic and sequential approach, can be branched and exercises and activities bunched and attached, creating controlled loops within a more exploratory environment.
· From a different perspective, the mixed learning environment can also support a controlled structure with built-in thresholds allowing for progression through specific levels of language attainment. Within each level, task-based activities can be organized hierarchical or freely accessed and controlled by students.
· Finally, such a structural model, encompassing mixed learning strategies and activities as well as a variety of different and discrete interactive environments, is easily identifiable and applicable to students who are familiar with the real, Multi-site University. Indeed, this hypercontext (Barrett, 1994) comprises classroom teaching, but also, increasingly, self-access networked language resources as well as the more traditional but distant learning in the form of homework..

Selected Student Requirements

Refer to Chapter 11 for further details.

Experienced Students

· (20) The interactive mode must be consistent.
· (23) The students must be allowed unrestricted movement.
· (25) Interactive links must be designed to facilitate access to the relevant information.
· (26) The feeling of being locked in must never occur.

Inexperienced Students

· (17) Provide a flexible interaction.
· (20) Provide means to enable students to better control their actions.
· (23) Provide recommended pathways.
· (24) Provide recommended actions.

Design Guidelines

Refer to Design Guidelines for Authoring Hypermedia Language Learning Applications in Appendix 5 for further details.

16. Organization: Consider the hypermedia shell essentially as an explicit, organizing structure designed to support a broad, albeit finite, selection of learning tasks. Plan such a structure, be it linear, hierarchical, web, tree, linked to outside component, according to its suitability to the chosen learning strategy and task requirements.

17. Conceptualization: As an unskilled software designer, initially adopt a top-down approach to

structure design as opposed to premature bottom-up thinking. An early paper-based conceptualization of the structural dimensions and considerations will stimulate and facilitate the subsequent design process of the given structure. Conversely, the bottom-up approach, by concentrating on detailed aspects of the structure, is more likely to obscure the necessary conceptual overview. It will also undermine the author's position by making it more vulnerable to design expediencies such as design shortcuts and ready-made technological facilities.

18. Mapping: Map out a clear and manageable overall structure for the application to be authored, matching the previously adopted learning strategy and conceived within the well established technological constraints imposed by the chosen system. Adopt a clear conceptual approach to the document structure highlighting its configuration. If incompatibility is discovered at this pre-design stage, go back to earlier findings of the feasibility study. This could apply in cases when structures are required for large and complex documents.

19. Navigation: Establish a clear distinction between navigational facilities. Navigation should stimulate informational, macro level controls, locating information within the whole structured data, whilst browsing should emphasize node links and attributes.

40. Consistency: When designing the application structure, refrain from being unduly influenced by technology-led solutions purposefully enhanced by the software manufacturer to the point of losing sight of stated objectives. Typical examples of design consequences such a direction might generate can be found in the predominant use of link facilities, unwarranted proliferation of nodes, confusingly wide range of displayed commands, highlighted interactive fields and colours.

41. Orientation: Limit the number of explicit outlinks from any one node. It is suggested that no more than five such links should be used so as to prevent disorientation and additional cognitive strains.

Design Trade-offs

· Trade-off between a structurally clear approach and an unstructured network of nuclei.
· Trade-off between a cognitively predictable hierarchical structure and potentially disorienting, cyclical and web-like networks.
· Trade-off between built-in progression and student control.
· Trade-off between structural potential and technological capabilities.
· Trade-off between language theories and practical applications.
· Trade-off between exploration and demonstration.

High Level Design Decisions

· Conceptual Model: Design a clear conceptual model of the structure.
· Interactive Nuclei: Design interactive nuclei separately, based on their relevant theories.
· Network: Design a fully navigational network of interactive links.
· Pathways: Provide recommended pathways.
· Optional Interaction: Make structured interaction optional.
· Support: Provide full navigational support with appropriate functions and visual maps.
· Orientation: Provide structural and index-based maps as well as trailing and tracking devices.

Instructional

Prescriptive / Didactic
Structural Architecture / Identification of Macro Components

· The hypermedia contextual material may be modelled on the curriculum structure, invoking a rigid, sequential interaction based on a controlled, hierarchical, systematic 'reading' of instructions and practice (Boyle, 1997: 102) best envisaged in a stricter language learning context than that proposed and generated by a hypermedia environment.

· Interestingly, experienced and inexperienced students reacted noticeably differently to instructional structuring. Whereas the former made a point of dismissing the coercive and linear features of the method, opting to disregard its instructions and functions, the latter were often pleased to follow rather conscientiously the given path.

Selected Student Requirements

Refer to Chapter 11 for further details.

In view of the fact that experienced student requirements were strongly oriented towards the need for greater student control over their interaction, the instructional structure became an impossibility within the confines of the identified usability field. In this case, elicited mental models identifying instructional problems were selected for a greater appreciation of student attitudes and interactive difficulty.

Inexperienced Students

· (15) Instructions must clearly indicate what actions are required.
· (21) Provide clear learning objectives.
· (25) Provide clear learning markers.
· (26) Provide supervision.
· (27) Provide a greater sense of purpose.

Mental Models

Experienced Students

· Whilst the pedagogical potentiality of hypermedia applications was dismissed, students often took systems to task to ascertain their authoritative strength and test the true capacity of an application. Students resorted to techniques ranging from making deliberate mistakes to insubordinate reactions to command and error messages. The students' mental model elicited in this case was that of the deeply rooted and crucial relationship between master and learner, although somewhat exacerbated by the knowledge that the would-be master was a mere machine with a flawed and inadequately designed user interface.

Inexperienced Students

· Overall, students interacted with applications in a methodical and systematic fashion. The overwhelming model, which they projected, suggested that they primarily relied on and responded to instructions.

Design Guidelines

Refer to Design Guidelines for Authoring Hypermedia Language Learning Applications in Appendix 5 for further details.

16. Organization: Consider the hypermedia shell essentially as an explicit, organizing structure designed to support a broad, albeit finite, selection of learning tasks. Plan such a structure, be it linear, hierarchical, web, tree, linked to outside component, according to its suitability to the

chosen learning strategy and task requirements.

17. Conceptualization: As an unskilled software designer, initially adopt a top-down approach to structure design as opposed to premature bottom-up thinking. An early paper-based conceptualization of the structural dimensions and considerations will stimulate and facilitate the subsequent design process of the given structure. Conversely, the bottom-up approach, by concentrating on detailed aspects of the structure, is more likely to obscure the necessary conceptual overview. It will also undermine the author's position by making it more vulnerable to design expediencies such as design shortcuts and ready-made technological facilities.

18. Mapping: Map out a clear and manageable overall structure for the application to be authored, matching the previously adopted learning strategy and conceived within the well established technological constraints imposed by the chosen system. Adopt a clear conceptual approach to the document structure highlighting its configuration. If incompatibility is discovered at this pre-design stage, go back to earlier findings of the feasibility study. This could apply in cases when structures are required for large and complex documents.

Design Trade-offs

· Trade-off between student control and structured interaction.
· Trade-off between motivation and coercion.
· Trade-off between learning goals and task-completion.

High Level Design Decisions

· Learning Environment: If a tutor mode is required, regarding progression, instructions and assessment, exploit the full potentiality of hypermedia CALL by integrating the instructional approach within a mixed learning environment.

Research-Dependent Macro Components

Structural Architecture / Identification of Macro Components

· In the case when the interface is designed for testing a particular language learning theory or a design in terms of expected interaction or features, the relevant research areas must be clearly identified so as to avoid any misapprehensions or misleading attitudes vis a vis the aims and objectives of the artefact, the specificity of its usability and functionality within the expected context. See Jacobson (1994) and Levy (1997).
· A tracking device can be built in to record and evaluate the student interaction.

Design Trade-offs

· Trade-off between a custom-made, research-based interface and context of use.
· Trade-off between use of tracking device and complexity of implementation.
· Trade-off between design of tracking device and processing time.

Links:

Research / testing artefact

High Level Design Decisions

· Research Targets: Design decisions will be influenced by the targeted area of research, be it learning strategies, structurally-based features, student characteristics and needs, student interaction, support mechanisms, task-oriented functions, screen display amongst others.

Micro Coherence

If, at a high level, macro coherence refers to notions such as usability and achievability within an identified context of use, micro coherence, on the other hand, is particularly concerned with the relevant provision and appropriate representation of the information base. Intricately linked with structural considerations, micro coherence must be perceived from three different angles at the node level. Firstly, the presentation of the information base will fluctuate depending on its macro representation. Hence, a curriculum-based approach will lend itself to a discrete knowledge unit fragmentation, which could be represented by definable composite nodes, operating as gateways to specific task-based nodes and intrinsic links. Similarly, different presentations will be required for theme-based or task-based approaches.

Secondly, to be coherent the node must provide presentational fluidity of the information base. This is an important consideration as the contextual potential of the situated hypermedia environment will depend on the successful segmentation of the information base into relevant nodes, allowing for a projected learner interaction process capable of 'disembedding' the acquired knowledge.

Thirdly, micro coherence will be predicated upon the degree of explicitness of its links and node-based functionality supporting the expected user interaction, be it browsing or structured navigation.

Links

Provision for Supporting Macro Structure

Flow of Information Base

Links, Functionality

Provision / Support of Context: Components / Nodes /Links / Flow of Information

Micro Coherence

Attention must be paid to the multiplicity of medium-based contexts, their implicit relationship amongst themselves, in terms of interactive potential and their explicit transitional relationships, in terms of sequence, links and functionality. At the level of the information base, micro coherence stems from the process of media segmentation towards the full, satisfactory integration and subsequent display of all its information elements. In so doing, considerations will focus on the identification of the segmentation of the information base, its physical as well as temporal display at node and system levels, the flow of information between and within nodes and, finally, the necessary links in terms of display and functionality.

Links

Provision for Supporting Macro Structure

Flow of Information Base: between nodes / within nodes

Links - Functionality

Provision for Supporting Macro Structure

Provision / Support of Context

Micro Coherence

An important aspect of micro coherence focuses on the visual contextualization of the conceptualized macro structure. Boyle (1997: 86) compares this design consideration with information composition and visual composition in film analysis. However, since the learner plays an active part in the hypermedia environment, the context must provide both information and interactivity. Therefore, micro coherence is media-based insofar as it is dependent on the type of media used, the hierarchical choice operated, maximizing a dominant medium and minimizing a peripheral, task-based one.

Links

Identification of Segmentation of the Information Base

Display of Information at Composite / Discrete Node Level

On-Line Support Help / References

Identification of Segmentation of the Information Base

Provision for Supporting Macro Structure
Provision / Support of Context: Components / Flow of Information / Links
Micro Coherence

"What does multimedia do for the learning of language? We have never before been able to investigate how these abilities support each other, because we have never before had the capability of selectively manipulating our materials to emphasize one or the other source of input and measure the effect" (Garrett, 1998).
· To support macro coherence and enhance micro coherence at node level, the author needs to identify the types, appearance and broad behaviour the media components are likely to have within the application and how this impacts on the screen display.
· Aside from media recognition, an important aspect of micro coherence is to consider the degree of interrelation or combination between media types. Decisions have to be made at the conceptual level with a view to giving valuable information to the graphic designers. For instance, the display can be primarily text-based, giving metaphorical prominence to the text field with peripheral media attachments. Conversely, a fully-fledged multimedia presentation might be adopted, and if so, a conceptual position and design indicators on how the various media components must hierarchically behave are required. Some will have to be designed in parallel over several or all the nodes for a media metaphor, multimedia references and on-line interactive help, others will be sequential or synchronized depending on their functions, be it presentational or task-based. In any case, what needs to be conceptually thought-out are both the decomposition of the multimedia functionality as well as its overall integration so as to facilitate the transition between its various elements.

Mental Models

Experienced Students

· Mental models of hypermedia systems were established by default and based on criteria essentially pertaining to a multimedia environment. As a result, these mental models of hypermedia, and by extrapolation of all hypermedia systems, emphasized the nature and quality of the knowledge base overshadowing all structural considerations and concerns. Thus, hypermedia was noticeably visualized and described as a multimedia database qualified on the basis of criteria such as rigour, consistency, authenticity, veracity, reliability but also breadth and depth within an identifiable and attractive language environment.
· Only once was this structural differentiation between hypermedia and multimedia made when the design of an hypermedia platform was felt to be too restrictive and, therefore, incompatible with a multimedia-based learning environment. However, such a structural model was only developed on the perceived navigational limitations of a particular system.

Selected Student Requirements

Refer to Chapter 11 for further details.

Experienced Students

· (1) Produce a good, professionally designed screen display.
· (6) The screen must only display relevant and useful features.
· (8) Multimedia presentations must be adequately displayed
· (9) In a multimedia environment, limit textual representations as much as possible.
· (10) Multimedia extensions are only appreciated if purposeful.
· (12) Ensure that the reference database is fully integrated and responsive.
· (16) On-line information must not be systematically provided in a written form.

Inexperienced Students

· (1) The screen display must be easy to understand.

· (19) Increase the visual quality of multimedia presentations.

Design Guidelines

Segmentation:
22. Optimization: Plan the visual display of information so that students scanning the screen make the most of the display as quickly and as usefully as possible. Wagner (1988) suggests that the scanning sequential order is predicated upon the eye movement, often conditioned to go from top to bottom and from left to right, which, additionally "naturally moves from a larger image to a smaller; a saturated colour to an unsaturated colour; a bright colour to a dull colour; from colour to black and white; from a non-symmetrical to a symmetrical form; from moving object to a stationary object". Therefore, the screen display fulfils two important functions: it triggers the visual behaviour of users whilst providing important visual interactive cues.

23. Presentation: Establish appropriate screen divisions and design clear and consistently-positioned functional areas on screen according to the content they display, text, graphics, image, video. The larger informational areas should ideally occupy a central position.

24. Customization: Group functions and design customized screens for main and peripheral interactive modes linked to specific task requirements. Functional modes should be labelled and clearly identifiable, on the basis of their own specific layout and display features, for easy recognition and ease of use. For instance, such modes could include text-based activities, interactive dialogue and recording facilities, video displays and ICALL language-based exercises .

Identification: Text:
30. Characters: Rely on small characters. Do not subscribe to the well established view that big is beautiful when it comes to inputing text on screen. Evidence indicates that the greater eye fixation required to read large characters is not rewarded by increased cognition and comprehension.

31. Presentation: Optimize the readibility and comprehension of the textual material by appropriately chosing the most suitable typeface, fontsize, line spacing and linebreaks. Specific design guidelines related to typeface, size, lines, lines spacing, margins, linebreaks case and colours are proposed by Clarke (1992), Horton (1990), Wagner (1988) a selection of which is presented below:

* 80 character text, using a slab-serif or a sans-serif font, is best suited to continuous reading

* Lines should be reasonably short - between 8 and 10 words. It is recommended to use columns to break down a high-density text, although the content matter or the student screen-reading ability might influence such an approach.

* Line spacing should be 1.5 or double line, depending the length of the displayed text

* Break down the information to be displayed into chunks, such as short meaningful statements or recognizeable paragraphs, within reason

* Use lower and upper cases but avoid full capitalization of text.

32. Length: Provide authentic textual material. Texts do not have to be necessarily rewritten or simplified for the screen with shorter and simpler sentences. Even if, as claimed by Krull and Ruben (1984), longer sentences slightly reduce reading speed, they do not have an adverse effect on the more relevant comprehension and memory retention. However, note that high text density on screen may alter perception.

33. Scrolling: Long texts can be scrolled. Ensure that the scrolling facility is used appropriately, under student's control, for the display of informational databases and search devices. For instance, avoid scrolling a text which is the basis of specific interactive activities. Use a frame-based approach instead.

34. Emphasis: Emphasize text moderately using familiar conventions such as bold, underline and italics. Alternatively, colour can be used. Horton (1990) suggests that not more than three should

be used per display and not more than four should be used per document.

35. Contrasts: Restrict and justify the need for colours. Use them economically to create contrasts and emphasis. According to Clarke (1992) comprehension of continuous texts is enhanced by "keeping a high contrast between text colour and background". Too great a concentration of colours will only blur the display and confuse the students

Images

36. Images, illustrations, graphics should not be used for decorative purposes. Horton describes their need as a means: "to explain and describe; to express visual and spatial concepts; to help learners imagine complex processes; to highlight important points; to attract and focus attention; to show complex relationships; to motivate and attract users; NOT for decoration...". For a further study of effects and display presentation of pictures see Clarke (1992).

Animation

37. Use animation recording facilities to highlight learning. Functions such as zooming in and out to present specific and general information: animated displays of learning processes like substitutions, language alternatives, progressions; provision of animated display commands like play, replay, recording etc.

Sound

38. Good sound facilities are crucial to hypermedia applications for foreign language learning. Use sound for integrated interactive dialogues and general aural and oral exercises. Provide a customized and recognizable display with its relevant, dedicated functions replicating, for example, a conventional audiocassette recorder.

Video

39. Being the latest multimedia resource to be made available in recent hypermedia shells, a good video facility is still very much predicated upon technological and professional considerations in terms of equipment, storage, quality and additional skills. However, and in lieu of guidelines, Horton (1990) makes the following recommendations:

* Use moving pictures for subjects that teach psychomotor skills or demonstrate three-dimensional devices in motion. Do not use them to discuss abstract concepts and philosophies.

* Show things moving, not just people talking.

* Keep segments short.

Design Trade-offs

· Trade-off between textual and multimedia presentations.
· Trade-off between multimedia links and processing speed.
· Trade-off between multimedia and hypermedia.

Design Solutions

· Screen Display: Clearly partition the screen display into functional areas: interactive language learning, task-related support, navigational support, on-line help and commands.
· Media Identification: Define a central interactive medium.
· Media Relationship: Define interactive role and place of peripheral media.
· Support Provision: Provide default and on-request displays of navigational supports such as structural maps, indexes, search facilities and trailing and / or tracking devices.
· Media Decomposition: Decompose multimedia nature of student interaction.
· Media Synchronization: Synchronize the multimedia interaction between video and audio,

between video and text, between audio and text.

Display of Information at Composite / Discrete Node Level

Provision for Supporting Macro Structure
Provision / Support of Context: Components / Flow of Information / Links
Micro Coherence

· The display of information needs to include and differentiate macro level and micro level components, which are reflected in terms of functions and interactive areas.
· Functions need to be clearly identified and classified according to their discrete, task-based role or structural relevance, such as navigational support, visual cues and on-line help functions.
· Similarly, interactive areas need to be compartmentalized for easier orientation and exploration. Resources, references and the help database should be separated from the main interactive language learning screen.
· Finally the micro level display needs to look at screen design features considering the visual impact of the displayed media in terms of legibility, visibility, recognizability, and styles; the display of functional commands, as well as the space management including identification of functional areas, headings, but also features such as balance, harmony, styles, and appeal.
· However, it ought to be pointed out that this micro level of attention and related design skills should, ideally, be the responsibility of the relevant members of the design team as this task falls well within their design implementation remit.

Mental Models

Experienced Students

· Overwhelmingly, the students were brought to make negative comments on the physical interface when its design or functionality was considered responsible for reminding them of its flawed, limited or simply two dimensional reality. In this respect, hypermedia, as they experienced it, did not match their functional model of multimedia.
· Design shortcomings, perceived as obstacles to free, interactive movement, were clearly and unequivocally identified. These included the use of inadequate colour schemes, inappropriate metaphors, simplistic graphics, authenticity and veracity of audio-visual material, non-standard designs when conventions existed, such as recording functions, inconsistency of required interactive modes switching from keyboard to mouse, and the imbalance between media extensions favouring the visual element at the expense of others such as audio links. Students felt particularly strongly about design decisions which undermined their expected interaction or which jeopardized the formation of an authentic language environment.
· The students were, generally, well equipped, in terms of expertise and experience with a variety of system designs and multimedia platforms in particular to fully relate to the expected spatial, language-based, contextualized environment. In many respects, they felt noticeably frustrated in their attempt to transcend the physical barrier as their mental model of multimedia was often reduced to a man-machine interaction due to what was perceived as a limited and unsatisfactory functionality and interface design.

Selected Student Requirements

Refer to Chapter 11 for further details.

Experienced Students

· (2) The screen display must be consistent.
· (3) The screen display must be clear and uncluttered.
· (4) The screen display must be stable and reliable.
· (5) Colour schemes must be carefully chosen.
· (6) The screen must only display relevant and useful features.
· (7) Icons, symbols and graphical representations must be compatible and standardized.
· (8) Multimedia presentations must be adequately displayed.
· (9) In a multimedia environment, limit textual representations as much as possible.
· (16) On-line information must not be systematically provided in a written form.

· (19) Multimedia is not by its very nature attractive. It must be made by design.
· (29) Provide visual maps of the structure.

Inexperienced Students

· (1) The screen display must be easy to understand.
· (2) The screen display must be simple.
· (3) The screen display must be clear and uncluttered.
· (4) The screen display must facilitate learning.
· (7) Design a map to be displayed on request.
· (8) Design recognizable commands.

Design Guidelines

Refer to Design Guidelines for Authoring Hypermedia Language Learning Applications in Appendix 5 for further details.

Macro Level:

24. Customization: Group functions and design customized screens for main and peripheral interactive modes linked to specific task requirements. Functional modes should be labelled and clearly identifiable, on the basis of their own specific layout and display features, for easy recognition and ease of use. For instance, such modes could include text-based activities, interactive dialogue and recording facilities, video displays and ICALL language-based exercises .

25. Standardization: Standardize all permanent screen information, such as interactive fields, menus, command buttons and recurrent features like help notes, references and error messages, within each of the identified interactive modes.

26. Consistency: Consistently display all permanent screen information, such as interactive fields, menus, command buttons and recurrent features like help notes, references and error messages, within each of the identified interactive modes.

Microlevel:

27. Clarity: Ensure that the display is clear and uncluttered. Do not provide too much information at any one time. Avoid cramming too many commands and unnecessary items onto the screen.

28. Colour: Colour should be used sparingly and only when it is justified. Clarke (1992) proposes a number of guidelines related to the use and functions of colour in a learning environment, derived from individual pieces of research. The selection below was felt to be particularly relevant:

* Avoid incompatible colour combinations such as:
red/green
blue/yellow
green/blue
red/blue

* Short term memory limits of five to nine colours

* More than seven colours may cause learners to access less material

* Use shape as well as colour to overcome colour blindness

* Learners prefer a dark foreground on a light background

* Increasing density of display will make the identification of information more difficult.

29. Design Process: Sketch out the screen layout or create an early prototype of it. Get a feel for the selected layout, consider potential alternatives and seek reactions, impressions and

recommendations from colleagues and students alike. If available, seek and heed professional advice as you progress. Proceed iteratively: keep going back to the drawing board until you are reasonably satisfied with the layout

· For more specific screen design guidelines related to typeface, size, lines, lines spacing, margins, linebreaks case, colours refer to Clarke (1992), Horton (1990), Kahn and Lenk (1993), Kommers et al. (1996), Rivlin et al. (1990), Wagner (1988).

Design Trade-offs

· Trade-off between size of informative support and screen space.
· Trade-off between presentation of support and type of information.
· Trade-off between display of multimedia information and technological capacities.

Design Solutions

· Conventions: Adhere to existing design conventions when using textual anchors such as hypertext links, audio and video controls and recognized navigational commands. Originality does not pay when it comes to designing well known functions, it can only confuse and infuriate. Similarly, introducing personalized design styles as in an odd range of colours or textbook cartoon characters can be counterproductive and detrimental to the expected interaction as the acceptability and credibility of the interface will be intricately linked to the perceived quality and style of its graphics display.
· Expectations: Ironically, whilst many screen design guidelines exist and are readily available, none can seriously pretend to turn an academic author into a graphic designer. Therefore, authors should concentrate on students' expectations and tastes and convey this valuable information to graphic designers.
· Visual Quality: The visual pixel quality of the multimedia presentation has become an issue again, in the wake of the digital revolution. Students have shown to be affected by it when felt to be lacking or simply when the interface was seen as old technology.

On-Line Support / Help / References

Provision for Supporting Macro Structure
Provision / Support of Context: Components / Flow of Information / Links
Micro Coherence

· Three on-line resources need to be considered at the level of micro coherence: generic and problem specific operational / system-based help; contextualized, task-related support, including guidance, feedback, advice and recommendations; referential resources in the form of glossaries, grammars, cultural background etc.
· The design of the help database and its search mechanism need to follow existing design protocols and conventions.
· The design of the language task support needs to focus on the nature and qualitative impact of the message, such as being reassuring, supportive, and rewarding, as well as its display, which must follow standard design conventions currently used within the Windows environment.
· Finally, the design of the referential resource needs to be as interactively integrated and as exhaustive as possible.

Selected Student Requirements

Refer to Chapter 11 for further details.

Experienced Students

· (12) Ensure that the reference database is fully integrated and responsive.
· (15) Display contextualized on-line help.
· (16) On-line information must not be systematically provided in a written form.
· (17) Provide relevant and helpful task-based feedback instead of warnings and locking mechanism.
· (29) Provide visual maps of the structure.
· (39) Provide an overview of progress on request.
· (40) Provide a tracking device.
· (41) Provide an adequate and relevant context for the designed environment.
· (52) Provide task-specific guidance.
· (53) Feedback for language tasks must be relevant and accurate.

Inexperienced Students

· (5) Display a help facility at all times.
· (6) Instructions must be succinct
· (7) Design a map to be displayed on request.
· (12) Provide appropriate feedback.
· (13) Provide a versatile Help facility.
· (14) Provide understandable, jargon-free, explanations.
· (15) Instruction must clearly indicate what actions are required.
· (16) Provide clear orientation.
· (25) Provide clear learning markers.

Design Guidelines

43. Information: Provide structural information and access facilities embedded into the knowledge base to enable students to relate to and appreciate the nature and extent of the available database.

44. On-line Help: Provide clear overviews, guiding mechanisms and tutoring facilities such as maps, indexes as well as suggested tours and learning approaches. Make access to such structure-based devices always available and applicable. A consistent and systematic display of orientational cues and navigational information will increase the usability and potentiality of the designed hypermedia application. Maps or browsers are particularly suited to provide necessary navigation information. Indexes are more likely to be required in directed learning situations.

Alternatively, 'soft tutoring' such as tours are particularly designed to cater for beginners or near-beginners, more easily prepared to trade off control in exchange for speedier and easier language acquisition.

Design Trade-offs

· Trade-off between size of the information support and speed of the processing.
· Trade-off between role of support and degree of transparency.
· Trade-off between nature of support and student control.

Design Solutions

· Integration: Design the reference section as a fully-fledged multimedia interactive support and not like an after-thought or a mere extension to the main language learning interactive area.
· Comprehensiveness: Ensure that the referential resource covers all aspects of the main language learning interactive area. For instance, if a glossary is provided, ensure that at least all the terms used within the hypermedia CALL environment are included in it.
· Exploration: Introduce a search mechanism for contextualized on-line help but also for task-based information support such as glossaries etc.
· Protocols and Conventions: Adhere to existing design Windows protocol and conventions to design the on-line support with generic, task-based support and history facility.

Node Content Inter-Linking

Flow of Information Base: between nodes / within nodes
Provision / Support of Context: Components / Flow of Information / Links
Micro Coherence

· Node content interlinking can be identified at two different levels involving the node transition of content and media types. Conceptually, the author must be aware of the design problems and consequences related to the need to secure a strong element of continuity and consistency to promote both coherence and comprehension.
· The "given-new strategy" in psycholinguistics refers to the semantic relation between two sources or nodes (Thüring et al., 1995). One way of supporting this strategy is by integrating into the design a media-based reminder of what the previous screen display or action was. Therefore, the student can see the "given" information of the initial node as well as the "new" information base displayed by the new node. Generally, this reminder takes a visual form but it can equally take an audio form.

Selected Student Requirements

Refer to Chapter 11 for further details

Experienced Students

· (4) The screen display must be stable and reliable.
· (20) The interactive mode must be consistent.
· (21) The students must always have access to multimedia functions.
· (33) The functionality must support a more intuitive interaction.
· (35) Ensure that the support material provided in references, grammars etc. is also interactive.

Inexperienced Students

· (1) The screen display must be easy to understand.
· (4) The screen display must facilitate learning.
· (9) Make the design adaptable to the different levels of student needs and expertise.

Design Guidelines

42. Data Recognition: Ensure that the knowledge base is sufficiently recognizable and manageable for the range of targeted students and their required tasks. A large database with a seemingly wide choice of links may confuse and disorientate them.

43. Information: Provide structural information and access facilities embedded into the knowledge base to enable students to relate to and appreciate the nature and extent of the available database.

Design Trade-offs

· Trade-off between provision of added explanations and capacity of database.
· Trade-off between display of 'repeat' commands and screen clutter.

Design Solutions

· Explanations: Make provision for audio and visual introductory explanations between nodes or when accessing a new node. A greater exploitation of both multimedia potential and authentic language use can solve local node-based disorientation when students are confronted with a new display.
· Repeat Commands: Provide repeat commands of all above mentioned multimedia functions.
· Shortcuts: Provide bypass mechanisms and key strokes shortcuts for easier and faster interaction for experienced students.
· Recognition: Adhere to a single recognizable display per composite. A multi-node language learning task requires the same overall display for easier identification, comprehension and

orientation.

Relationship Task / Content / References

Flow of Information Base: between nodes / within nodes
Provision / Support of Context: Components / Flow of Information / Links
Micro Coherence

· Media relations and transitions also take place within nodes at two conceptual levels: at the interactive language learning level where different types and degrees of student interactiveness need to be designed, depending on the nature of the media used, the content of the information and the relevant activity.
· Secondly, at the level of the relation between content and references where hypermedia links must allow students to freely navigate from one space into another and establish relevant correspondence and new interactive transitions to avoid dead ends.

Mental Models

Experienced Students

· Multimedia was seen to provide immediacy, which facilitated and encouraged information exposure. Last but not least, the mental model of multimedia led to believe that multimedia interaction was passive as opposed to hypermedia considered pro-active and involving. For example, multimedia was clearly associated with interactions such as controlling a video or seeking information in a referential database. Conversely, hypermedia was more clearly identified through its interactions, such as language exercises and live recordings, which, as a result, were reluctantly or partly attempted.

Selected Student Requirements

Experienced Students

· (8) Multimedia presentations must be adequately displayed.
· (12) Ensure that the reference database is fully integrated and responsive.
· (21) The students must always have access to multimedia functions.

Inexperienced Students

· (19) Increase the visual quality of multimedia presentations.

Design Guidelines

42. Data Recognition: Ensure that the knowledge base is sufficiently recognizable and manageable for the range of targeted students and their required tasks. A large database with a seemingly wide choice of links may confuse and disorientate them.

43. Information: Provide structural information and access facilities embedded into the knowledge base to enable students to relate to and appreciate the nature and extent of the available database.

45. Data accessing: Ensure that the selected interaction, expected of and controlled by students, to access specific information according to their level of proficiency is predictable and unambiguous. Whilst allowing for potential structural and informational shortcuts, remember that too many alternative choices make a structure artificially complex and inevitably lead to confusion, demoralization and error-prone responses.

Design Solutions

· Media Balance: Avoid any interactive discrepancy between the multimedia-based information support and the hypermedia-based language learning information base as it creates a confusing imbalance.
· Meaningful Interaction: Ensure that the relationship task / content is not task or technology driven but is based on a clear language learning strategy or approach or progression that can be

succinctly displayed on request in a pop-up window for example. Students often had the impression that the tasks were convoluted and predictable for lack of know-how.

· Contextualization: Ensure that references are sufficiently contextualized to be seen to be actively supporting the task in hand or the content of the interactive language learning domain.

Links - Functionality

Provision / Support of Context: Components / Flow of Information / Links
Micro Coherence

Interactive elements of the information base must be visually represented to generate the appropriate user interaction. This design consideration involves the recognition and identification of link types, decisions regarding the visual encoding (Hardman, 1995: 21) for link-ends as well as the display of commands and functions forming part of the interactive structure of the system to be designed.

Links

Identification of Link Types

Display of Link ends - Identity / interactivity

Function / Display of Interactive Command Types

Identification of Link Types

(Links / Functionality
(Provision / Support of Context: Components / Flow of Information / Links
Micro Coherence

· If access is paramount in hypermedia inasmuch as it is required to support and satisfy students' interactive needs, then underlying links must be conceived for its provision. Two clear taxonomies of links have been established, identifying their micro, task-based role or their macro, navigational as well as support meta-functions. Additionally, a third classification helps focus on the specificity of media links, be they task-based sequential and synchronized links or node independent, parallel, on-line links.
· Therefore, at the conceptual level of link identification, the author must be in a position to relate the necessary links to the interface both within and between nodes, in terms of broad anchorage points, screen location and availability.

Selected Student Requirements

Refer to Chapter 11 for further details.

Experienced Students

· (7) Icons, symbols and graphic representations must be compatible and standardized.
· (15) Display contextualized on-line help.
· (25) Interactive links must be designed to facilitate access to the relevant information.

Inexperienced Students

· (4) The screen display must facilitate learning.
· (5) Display a help facility at all times.

Design Guidelines

41. Orientation: Limit the number of explicit outlinks from any one node. It is suggested that no more than five such links should be used so as to prevent disorientation and additional cognitive strains.

43. Information: Provide structural information and access facilities embedded into the knowledge base to enable students to relate to and appreciate the nature and extent of the available database.

44. On-line Help: Provide clear overviews, guiding mechanisms and tutoring facilities such as maps, indexes as well as suggested tours and learning approaches. Make access to such structure-based devices always available and applicable. A consistent and systematic display of orientational cues and navigational information will increase the usability and potentiality of the designed hypermedia application. Maps or browsers are particularly suited to provide necessary navigation information. Indexes are more likely to be required in directed learning situations. Alternatively, 'soft tutoring' such as tours are particularly designed to cater for beginners or near-beginners, more easily prepared to trade off control in exchange for speedier and easier language acquisition.

Design Trade-offs

· Trade-off between proliferation of links and orientation.
· Trade-off between links and transparency.
· Trade-off between information and intuition.

Design Solutions

· Identification: A well conceptually thought-out identification of types and levels of links will help streamline their use and improve transparency.

· Classification: Classify for easy identification links by their media type, macro or micro level functions as well as location and anchors.
· Rationalization: Limit the number of task-based links whenever possible. A media link-based approach to designing complex interactive situations, such as simulations, can help authors understand and therefore reduce the multiplicity and ramifications of links towards greater intuitiveness at users' level.

Display of Link Ends / Identity / Interactivity

Links / Functionality
Provision / Support of Context: Components / Flow of Information / Links
Micro Coherence

· It is important to ensure that different links have recognizable visual representations for easier identification. These include the type, size and label of the link display as well as its anchor visibility, if applicable.
· Visual impact and identification may be facilitated by the use of icons, although their natural intuitiveness when authored might be misleading or misinterpreted by students.
· It is important to note that, beyond this notion of universality underpinned by conventions and standards, screen design specifications and implementation falls within the remit of graphic design expertise.
· Many on-screen design guidelines exist to guide the author and facilitate the development of a broad visualization of the screen display. See in particular Grabinger and Dunlap, (1996); Kahn and Lenk, (1993).

Selected Student Requirements

Refer to Chapter 11 for further details.

Experienced Students

· (7) Icons, symbols and graphical representations must be compatible and standardized.

Inexperienced Students

· (8) Design recognizable commands.

Design Guidelines

25. Standardization: Standardize all permanent screen information, such as interactive fields, menus, command buttons and recurrent features like help notes, references and error messages, within each of the identified interactive modes.

26. Consistency: Consistently display all permanent screen information, such as interactive fields, menus, command buttons and recurrent features like help notes, references and error messages, within each of the identified interactive modes.

Design Trade-offs

· Trade-off between the use of icons and greater screen space.
· Trade-off between icons and degree of screen clutter.
· Trade-off between unpredictable impact of iconic message and predictable intelligibility of words.

Design Solutions

· Conventions: Conform to conventions
· Personalization: Refrain from relying solely on one' own notion of intuition. Intuitiveness is individualized.
· Information: If in doubt, provide textual information with the use of icons.

Function / Display of Interactive Command Types

Links / Functionality
Provision / Support of Context: Components / Flow of Information / Links
Micro Coherence

· The design and display of the functionality is crucial to the satisfactory understanding of the student when interacting and the usability of the hypermedia platform in general.
· Links and commands are facilitators in the process of performing tasks, navigating through the information base and access learning supports.
· Links should be intuitive and adopt typical behavioural patterns associated with their types.

Selected Student Requirements

Refer to Chapter 11 for further details.

Experienced Students

· (2) The screen display must be consistent.
· (4) The screen display must be stable and reliable.
· (32) The functionality must be reliable and consistent.
· (33) The functionality must support a more intuitive interaction.
· (37) Well known functions such as cut, copy and paste must not be taken for granted.

Inexperienced Students

· (8) Design recognizable commands.
· (9) Make the design adaptable to the different levels of student needs and expertise.

Design Guidelines

Refer to Design Guidelines for Authoring Hypermedia Language Learning Applications in Appendix 5 for further details.

22. Optimization: Plan the visual display of information so that students scanning the screen make the most of the display as quickly and as usefully as possible. Wagner (1988) suggests that the scanning sequential order is predicated upon the eye movement, often conditioned to go from top to bottom and from left to right, which, additionally "naturally moves from a larger image to a smaller; a saturated colour to an unsaturated colour; a bright colour to a dull colour; from colour to black and white; from a non-symmetrical to a symmetrical form; from moving object to a stationary object". Therefore, the screen display fulfils two important functions: it triggers the visual behaviour of users whilst providing important visual interactive cues.

24. Customization: Group functions and design customized screens for main and peripheral interactive modes linked to specific task requirements. Functional modes should be labelled and clearly identifiable, on the basis of their own specific layout and display features, for easy recognition and ease of use. For instance, such modes could include text-based activities, interactive dialogue and recording facilities, video displays and ICALL language-based exercises .

Design Trade-offs

· Trade-off between level of functionality and clarity of screen display.
· Trade-off between display of functionality and student understanding.
· Trade-off between level of functionality and accessibility.
· Trade-off between level of options and level of production.
· Trade-off between accessibility and speed.
· Trade-off between accessibility and screen space.

Design Solutions

· Rationalization: Rationalize the display of functions, in terms of type, position, size and style of display.
· Exploitation: Exploit all recognizable design features of the Windows environment known to students.

Cognitive Issues

Whilst greater coherence is designed to increase the overall readability factor of the hypermedia CALL environment, cognitive issues focus on reducing the cognitive overheads generated by the triggered student interaction. These cognitive overheads can be recognized at the micro level of the user interface, emphasizing its usability features, the unobtrusiveness and stability of its functionality as well as the clarity and meaningfulness of its screen display. Similarly, this high level approach must include macro considerations regarding the student interaction in terms of navigation, exploration and assimilation. Ultimately, comprehension is predicated upon maximum use of mental resources unhindered by undue concentration on the interactive task presented by the interface. At a further level, concerns with the student interaction include the need to establish a match between tasks, learning objectives, student competence and ICT expertise. In this respect, the cognitive load is intrinsically determined by the nature and degree of approximation of that match.

Mental Models

Experienced Students

· Students were quick to establish a working reciprocity with the interface with which they needed to identify in order to be seen to be interacting with it. Unexpectedly though, students often reacted personally to the interface and could not easily contemplate being associated with an interface which was perceived as hurting their established design tastes and conventions as well as, more importantly, their self-esteem and position. Therefore, the interface design became to be regarded as primordial in sustaining both motivation and interaction suggesting a strong duality between identification and stimulation. As a result, a weakness in the design, an omission in the database, an information perceived as being condescending or erroneous, unrealistically expressed or artificially displayed invariably undermined the following student computer interaction and involvement.
· If the conceptual model of the learning process, as conceived by authors, essentially relied upon sustained information exposure and student interaction, it failed to generate a mental model commensurate with this original system image. Indeed, students' critical stance showed the strength of their disenchantment and distant involvement when left to their own device, in the absence of an explicit learning framework in a supposedly new environment relying on a traditional delivery. In such a learning context, which brought the worst of both worlds, students only felt disenfranchized. Indeed, their mental model suggested the need for a clearly established student input and interface output towards achievable and quantifiable goals through an interactive mode which would have done away with traditional, therefore "boring" means of delivery such as the ubiquitous textual material.

Inexperienced Students

· The concentration required to interact with the visual interface coupled with the need to absorb simultaneous audio explanations potentially highlighted students' vulnerability when linguistic abilities and proficiency were called upon. Therefore, beyond the audio laboratory model generating uni-dimensional sensory interaction, the combination of synchronized multimedia presentations, computer skills and levels of language proficiency could be a major, if largely unaccounted, factor in creating temporal information overloads limiting and slowing the expected interaction.
· The novelty and attraction of the multimedia presentation, supported by the authenticity of the audio-visual material whenever this was relevant, helped students construct context-based language environments, exploring the knowledge base whilst, subconsciously, exploiting the hypermedia potentiality. Nevertheless, there was a fine line between its output and necessary input. In order to justify the need for additional cognitive overheads resulting from the complexity of the interface, the gains to be made from such a novel approach had to be seen as worthy of it or arguably superior to those produced by more conventional methods.
· Generally, inexperienced students adopted a more assiduous attitude than their experienced counterparts. However, this assiduity concealed a latent vulnerability and unassertiveness which, when over-exposed, quickly and damagingly translated into despondency, resignation and

disaffection.

Links

User Interface
Usability Features
Functionality
Screen Display

Student Interaction
Navigation
Exploration
Assimilation

User Interface

Cognitive Issues

If at author level, the user interface is frame-based or node-driven (refer to Section 5.2.1 for further details) and is fundamentally concerned with the design of links and interactive artifacts and commands, its main prerogatives, in terms of cognitive issues at student level, are to provide and enhance usability features, such as appeal, flexibility and learnability, a stable and transparent functionality and, finally, a clear, consistent and meaningful screen display.

Links

Usability Features

Functionality

Screen Display

Usability Features

User Interface
Cognitive Issues

· The usability of a hypermedia CALL platform can first be measured by the degree of intuitiveness linked to the smoothness of the transition between content nodes but also between the different media constituting the interface. Similarly, it is related to the general appeal of the functional and compositional display necessary for generating and sustaining motivation and pleasure. The application must also be flexible, to cater for varying levels of attainment, as well as be efficient for producing a satisfactory productivity, and be easy to learn thus reducing cognitive overheads.

Selected Mental Models

Experienced Students

· Students were always in a position to form functional mental models of the Windows-based interface and its intrinsic icon-based command mechanisms. Therefore, they easily identified and interacted with interface features, such as those related to the manipulation of windows. Furthermore, the concept of the node and links was clearly understood at local level at least if not always at the more global, net level. The students' comprehension of the mechanistic functions of the interface, based on their accurate recall of known multimedia interfaces, facilitated the construction of all relevant, albeit idiosyncratic, functional mental models.

Inexperienced Students

· The Windows environment was recognized and taken for granted. However, the students' knowledge and understanding of its functionality were noticeably limited. This often required longer deciphering periods when confronted with new icons or when interacting with the interface.
· The model of the interaction changed drastically depending on whether on-line explanations and clarifications were seen as being a necessary and, as such, an integral part of it or if these electronic adjuncts were considered a mere support rarely called upon.

Selected Student Requirements

Refer to Chapter 11 for further details.

Experienced Students

· (17) Provide relevant and helpful task-based feedback instead of warnings and locking mechanism.
· (19) Multimedia is not by its very nature attractive. It must be made so by design.
· (30) Provide optional introductory information related to the concept of the design and context.
· (31) The functionality must be both adequate and appropriate but not overwhelmingly complex.
· (34) Ensure that multimedia material is interactive.
· (38) Ensure that the students' motivation is maintained throughout the interaction.
· (51) Provide introductory suggestions of language learning approaches with their recommended access modes.
· (53) Feedback for language tasks must be relevant and accurate.

Inexperienced Students

· (9) Make the design adaptable to the different levels of student needs and expertise.
· (17) Provide a flexible interaction.

Design Guidelines

Refer to Design Guidelines for Authoring Hypermedia Language Learning Applications in Appendix 5 for further details.

11. Learning Environment: Consider the most suitable learning or teaching environment that can be provided, both feasibly and realistically, by hypermedia in conjunction with the clear presentation of stated aims and objectives.

12. Usability Study: Define the projected usability of the application to be designed with a view to optimizing the expected language learning process within the above mentioned learning goals. Remember that such a process cannot be sustained by simply providing students with navigation facilities and information retrieval mechanisms. The discrepancy which may arise out of a tendency to offer a multiplicity of choice or, indeed, too much peripheral user control to customize the interface, whilst paying too little attention to the necessary supporting guiding mechanisms might undermine the expected learning process.

13. Student Requirements: Ensure that the information, tasks and interaction meet the needs of prospective students in terms of acquired language skills and levels of language attainments.

14. Student Support: Provide an acceptable level of support tailored to the available range of in-built learning strategies offered to students. For instance, authors should pay particular attention to the provision of adequate support, such as on-help facilities, tutorials and error messages, for all students with a view to reducing the front-loaded cognitive load likely to be experienced by such learners.

15. Task Metaphor: Consider the need to provide students with an easily and readily recognizable metaphor encapsulating the nature of the tasks offered with a view to increasing usability and learnability.

20. Compatibility: Ensure that the design of the user interface is specifically tailored to match and reciprocate the expected context of use and the chosen learning modes. For instance, students must be given appropriate means to control the expected interaction in relation to the chosen learning approach and context, be it self-directed, laboratory-based etc.

21. Effectiveness: Design a user interface, including learning data, activities and their screen presentation, capable of delivering the most effective learning strategy. For instance, do not unjustifiably highlight auxiliary features which may create unnecessary distraction leading to a slower, shallower learning process and reduced interactive potentiality.

40. Consistency: When designing the application structure, refrain from being unduly influenced by technology-led solutions purposefully enhanced by the software manufacturer to the point of losing sight of stated objectives. Typical examples of design consequences such a direction might generate can be found in the predominant use of link facilities, unwarranted proliferation of nodes, confusingly wide range of displayed commands, highlighted interactive fields and colours.

Design Trade-offs

· Trade-off between information and intuition.
· Trade-off between flexibility and orientation.
· Trade-off between motivation and control.

Design Solutions

· Exploitation: Exploit the Windows environment as it is easily identified.
· Recognition: Design operational features of the interface so that they do not undermine or restrict the learning or reading process they are designed to support and deliver.
· Direction: Increase directness of approach by facilitating goal-oriented interaction and, therefore, increasing a sense of purpose with built-in aims and objectives.
· Capacity: Increase the scope of the interface by comfortably encapsulating the expected student interaction in order not to provide physical reminders of its limitations and inadequacies.

· Match: Ensure that levels, tasks and learning environment match.
· Support: Learning supports should be commensurate with required performance, student needs and characteristics.

Functionality

User Interface
Cognitive Issues

· Cognitive issues related to functionality stem from the degree of stability of the operational base, and therefore its reliability, as well as the transparency of its representation, stressing its instrumental role as a invisible means to a goal oriented end.
· Improved usability features require tried and tested technological capabilities to support the functionality to be designed as well as an intuitive user interface design to facilitate the student interaction.

Mental Models

Experienced Students

· The students were, generally, well equipped, in terms of expertise and experience with a variety of system designs and multimedia platforms in particular to fully relate to the expected spatial, language-based, contextualized environment. In many respects, they felt noticeably frustrated in their attempt to transcend the physical barrier as their mental model of multimedia was often reduced to a man-machine interaction due to what was perceived as a limited and unsatisfactory functionality and interface design.

Inexperienced Students

· The overwhelming model formed by students was of a two-dimensional interface, which provided the necessary, although largely unfathomed, functionality.
· Inexperienced students rarely went beyond the straightforward man-machine functionality and the two-dimensional screen display so absorbed were they by the cognitive load created by the interface. Only once, was the interactive dimension of an hypermedia system integrated into the mental model of an application as a result of perceived navigational difficulties and limitations.
· The mental model of the computer being that of a machine, students often felt the need to secure the involvement of the experimenter within their interaction. In so doing, they tried to establish a triangular relationship involving the experimenter and the computer suggesting that a straight one-to-one contest between the student and the computer was bound to be unfair or, simply, not plausible.

Selected Student Requirements

Refer to Chapter 11 for further details.

Experienced Students

· (31) The functionality must be both adequate and appropriate but not overwhelmingly complex.
· (32) The functionality must be reliable and consistent.
· (33) The functionality must support a more intuitive interaction.
· (34) Ensure that multimedia material is interactive.
· (36) Multimedia is not about typing in text.
· (37) Well known functions such as cut, copy and paste must not be taken for granted.
· (43) There must be complete compatibility between the design of the expected functionality and its technological delivery.

Inexperienced Students

· (11) Provide clear functionality.

Design Guidelines

Refer to Design Guidelines for Authoring Hypermedia Language Learning Applications in Appendix 5 for further details.

10. Task Support: Clearly ascertain that the range of tasks to be undertaken by the targeted learners are adequately supported by the chosen hypermedia system. For instance, will the authored hypermedia courseware be able to promote a language-based exploratory environment if a conducive approach is chosen?

20. Compatibility: Ensure that the design of the user interface is specifically tailored to match and reciprocate the expected context of use and the chosen learning modes. For instance, students must be given appropriate means to control the expected interaction in relation to the chosen learning approach and context, be it self-directed, laboratory-based etc.

21. Effectiveness: Design a user interface, including learning data, activities and their screen presentation, capable of delivering the most effective learning strategy. For instance, do not unjustifiably highlight auxiliary features, which may create unnecessary distraction leading to a slower, shallower learning process and reduced interactive potentiality.

45. Data accessing: Ensure that the selected interaction, expected of and controlled by students, to access specific information according to their level of proficiency is predictable and unambiguous. Whilst allowing for potential structural and informational shortcuts, remember that too many alternative choices make a structure artificially complex and inevitably lead to confusion, demoralization and error-prone responses.

46. Linguistic Interaction: Optimize the level of linguistic interaction by ensuring that students can control their own appropriate progression through customized nodes and learning tasks. These can take the form of reading textual material in the target language, playing a participatory role in structured and fully interactive dialogues, preparing language-based exercises and drills and taking tests.

47. Interactive Match: Tailor the nature of the interaction and instructional control to the level of language proficiency of targeted students. The more knowledgeable, the more likely students will benefit from self-directed learning approaches.

Design Trade-offs

· Trade-off between increased functionality, in terms of alternative actions, shortcuts and routes, and flexibility / learnability.
· Trade-off between amount of feedback and transparency of interface.

Design Solutions

· Interaction: Ensure tasks are fully supported by the hypermedia platform.
· Support and Explanations: Provide support and explanations for all the functionality.
· Intuition: Make functionality intuitive with the use of icons, inter-node transition links, media synchronization and a minimum number of mouse-clicks for any given goal-driven interaction.
· Operation: If the functionality is mouse-activated, retain the mode of operation throughout the interaction. Do not use or resort to keyboard functions unless a warning is given or shortcuts provided as a result.

Screen Display

User Interface

Cognitive Issues

Conceptually, cognitive issues at the level of the screen display focus on the degree of consistency, clarity and meaningfulness of the multimedia presentation within and across nodes as well as important considerations regarding the heuristic and discrete presentation of the content material in terms of style to adopt and suitability of the display for the targeted students.

Links

Screen Display: Consistency / Clarity / Meaningfulness

Screen Display: Content Presentation

Screen Display: Consistency / Clarity / Meaningfulness

Screen Display
User Interface
Cognitive Issues

· In order to reduce cognitive overheads related to the user interface, the screen display must be as clear, consistent and meaningful as possible. This involves focusing on the appropriate presentation of and interrelations between the relevant media used. Additionally, it requires the design of a recognizable or identifiable, Windows-based environment promoted by the use of appropriate metaphors, if any, or informed by existing mental models.
· "Metaphor-based interfaces acquire their popularity from the belief that they promote effective mental models" (Kommers, 1996: 55).

Student Requirements

Experienced Students

· (1) Produce a good, professionally designed screen display.
· (2) The screen display must be consistent.
· (3) The screen display must be clear and uncluttered.
· (4) The screen display must be stable and reliable.
· (6) The screen must only display relevant and useful features.
· (7) Icons, symbols and graphical representations must be compatible and standardized.
· (10) Multimedia extensions are only appreciated if purposeful.
· (14) The material used must be attractive and identifiable.
· (44) Make exercises relevant and realistic.

Inexperienced Students

· (1) The screen display must be easy to understand.
· (2) The screen display must be simple.
· (3) The screen display must be clear and uncluttered.
· (4) The screen display must facilitate learning.

Design Guidelines

Refer to Design Guidelines for Authoring Hypermedia Language Learning Applications in Appendix 5 for further details.

20. Compatibility: Ensure that the design of the user interface is specifically tailored to match and reciprocate the expected context of use and the chosen learning modes. For instance, students must be given appropriate means to control the expected interaction in relation to the chosen learning approach and context, be it self-directed, laboratory-based etc.

21. Effectiveness: Design a user interface, including learning data, activities and their screen presentation, capable of delivering the most effective learning strategy. For instance, do not unjustifiably highlight auxiliary features which may create unnecessary distraction leading to a slower, shallower learning process and reduced interactive potentiality.

24. Customization: Group functions and design customized screens for main and peripheral interactive modes linked to specific task requirements. Functional modes should be labelled and clearly identifiable, on the basis of their own specific layout and display features, for easy recognition and ease of use. For instance, such modes could include text-based activities, interactive dialogue and recording facilities, video displays and ICALL language-based exercises .

25. Standardization: Standardize all permanent screen information, such as interactive fields, menus, command buttons and recurrent features like help notes, references and error messages, within each of the identified interactive modes.

26. Consistency: Consistently display all permanent screen information, such as interactive fields, menus, command buttons and recurrent features like help notes, references and error messages, within each of the identified interactive modes.

27. Clarity: Ensure that the display is clear and uncluttered. Do not provide too much information at any one time. Avoid cramming too many commands and unnecessary items onto the screen.

28. Colour: Colour should be used sparingly and only when it is justified. Clarke (1992) proposes a number of guidelines related to the use and functions of colour in a learning environment, derived from individual pieces of research.

29. Design Process: Sketch out the screen layout or create an early prototype of it. Get a feel for the selected layout, consider potential alternatives and seek reactions, impressions and recommendations from colleagues and students alike. If available, seek and heed professional advice as you progress. Proceed iteratively: keep going back to the drawing board until you are reasonably satisfied with the layout

Design Solutions

· Screen Identification: Clearly identify interactive areas on screen, types and relevant display of links and commands as well as micro design features such as node titles, information support links and multimedia presentations.
· Colour Styles: Use colours parsimoniously. Acquire enough expertise to establish the formative basis of the interface to be designed and collaborate with graphic designers when it comes to implementation.

Screen Display: Content Presentation

Screen Display
User Interface
Cognitive Issues

· Strikingly, experienced students strongly felt that there was little point in reproducing text-based, language learning material on screen, since textbooks already existed. Furthermore, they often deplored the artificial, poorly adapted and inadequately designed delivery, whilst thinking such an approach was ultimately counterproductive.
· Students felt that authors' stylistic approaches and choices left a lot to be desired. Whilst, admittedly, the students' adopted critical stance was not conducive to complimentary remarks, it must be said that never did they openly and whole-heartedly approve of the displayed end product.
· Finally, the now common use of digital technology with its potential for virtual reality and complex graphics has greatly influenced the way students look at and appreciate screen design. As previously mooted, the quality of the display is now, more than ever, a serious issue best left to experts in the field.

Selected Student Requirements

Refer to Chapter 11 for further details.

Experienced Students

· (1) Produce a good, professionally designed screen display.
· (4) Colour schemes must be carefully chosen.
· (9) In a multimedia environment, limit textual representations as much as possible.
· (14) The material used must be attractive and identifiable.
· (19) Multimedia is not by its very nature attractive. It must be made so by design.
· (44) Make exercises relevant and realistic.

Inexperienced Students

· (18) Multimedia must provide a new, attractive, interactive, environment.
· (19) Increase the visual quality of multimedia presentations.

Design Guidelines

28. Colour: Colour should be used sparingly and only when it is justified. Clarke (1992) proposes a number of guidelines related to the use and functions of colour in a learning environment, derived from individual pieces of research.

29. Design Process: Sketch out the screen layout or create an early prototype of it. Get a feel for the selected layout, consider potential alternatives and seek reactions, impressions and recommendations from colleagues and students alike. If available, seek and heed professional advice as you progress. Proceed iteratively: keep going back to the drawing board until you are reasonably satisfied with the layout

35. Contrasts: Restrict and justify the need for colours. Use them economically to create contrasts and emphasis. According to Clarke (1992) comprehension of continuous texts is enhanced by "keeping a high contrast between text colour and background". Too great a concentration of colours will only blur the display and confuse the students

36. Images, illustrations, graphics should not be used for decorative purposes. Horton describes their need as a means: "to explain and describe; to express visual and spatial concepts; to help learners imagine complex processes; to highlight important points; to attract and focus attention; to show complex relationships; to motivate and attract users; NOT for decoration...". For a further study of effects and display presentation of pictures see Clarke (1992).

37. Use animation recording facilities to highlight learning. Functions such as zooming in and out to present specific and general information: animated displays of learning processes like substitutions, language alternatives, progressions; provision of animated display commands like play, replay, recording etc.

38. Good sound facilities are crucial to hypermedia applications for foreign language learning. Use sound for integrated interactive dialogues and general aural and oral exercises. Provide a customized and recognizable display with its relevant, dedicated functions replicating, for example, a conventional audiocassette recorder.

39. Being the latest multimedia resource to be made available in recent hypermedia shells, a good video facility is still very much predicated upon technological and professional considerations in terms of equipment, storage, quality and additional skills. However, and in lieu of guidelines, Horton (1990) makes the following recommendations:

49. Add-Ons: Avoid unnecessary and overtly distractive displayed attractions which, as a result of being too easily construed as potential cues or attention-seekers, might mislead learners. Make wise and restricted use of peripheral devices, such as the wide range of 'live' activated objects and customizable animations chosen for their convenient availability and potential to 'liven up' the screen, as they will invariably distract attention away from required goal if used artificially.

Design Solutions

· Implementation: Although screen design guidelines are numerous and easily obtainable, use them essentially to inform the conceptual model of the display. The best solution is to leave its implementation to the appropriate expertise.
· Presentation: In any case, ensure that the presentation of the interactive content material is attractive, realistic, authentic, identifiable, and motivating. The impact of a good screen display onto the expected student interaction is completely underestimated.

Student Interaction

Cognitive Issues

Once informed by the context, content and strategies to be adopted, the projected student movements and potential interaction must be facilitated at the levels of mechanistic navigational support, strategic exploratory means and provision for highest rate of targeted assimilation.

Links

Navigation

Exploration

Assimilation

Navigation

Student Interaction
Cognitive Issues

· The navigational issue is concerned with the creation of paths through the information base, providing and generating both direction and movement. Navigation is intricately linked with space and access. To this end, it depends upon directional tools providing forward and backward movements and clear parameters defining the boundaries of the different spaces, be they interactive, informational or referential.
· In a nutshell, navigation involves knowing where to go, how to get there and remembering how to come back.

Selected Mental Models

Experienced Students

· The students' mental model of a multimedia platform was spatial, inasmuch as they easily and willingly related to the concept of travelling or navigating in space and between pre-defined spaces. If the three-dimensional navigational potential of hypermedia might be overstated in this case, the students, quite unequivocally, could not accept that it conformed to the same conventions and rules as the two-dimensional textual presentations. As such they rarely related to screens as frames or nodes in the way some authors seemed to within the design process.

Selected Student Requirements

Refer to Chapter 11 for further details.

Experienced Students

· (20) The interactive mode must be consistent.
· (21) The students must always have access to multimedia functions.
· (22) The students must be given full control over their interaction.
· (23) The students must be allowed unrestricted movement.
· (26) The feeling of being locked in must never occur.
· (29) Provide visual maps of the structure.
· (32) The functionality must be reliable and consistent.
· (34) Ensure that multimedia material is interactive.

Inexperienced Students

· (7) Design a map to be displayed on request.
· (16) Provide clear orientation.
· (20) Provide means to enable students to better control their actions.

Design Guidelines

Refer to Design Guidelines for Authoring Hypermedia Language Learning Applications in Appendix 5 for further details.

19. Navigation: Establish a clear distinction between navigational facilities. Navigation should stimulate informational, macro level controls, locating information within the whole structured data, whilst browsing should emphasize node links and attributes.

44. On-line Help: Provide clear overviews, guiding mechanisms and tutoring facilities such as maps, indexes as well as suggested tours and learning approaches. Make access to such structure-based devices always available and applicable. A consistent and systematic display of orientational cues and navigational information will increase the usability and potentiality of the designed hypermedia application. Maps or browsers are particularly suited to provide necessary navigation information. Indexes are more likely to be required in directed learning situations.

Alternatively, 'soft tutoring' such as tours are particularly designed to cater for beginners or near-beginners, more easily prepared to trade off control in exchange for speedier and easier language acquisition.

Design Solutions

· Movement: Design navigational tools, which allow students to move back and forth between nodes but also across nodes to specific destinations.
· Interaction: Make provision for navigation within content nodes but also between content and information support nodes.
· Support: Make provision for navigational supports such as maps and trailing devices. Such tools include backtrack and forward facilities, dynamic overviews in the form of indexes, graphics, web-like maps, clearly displayed link types and live links and a search mechanism.

Exploration

Student Interaction
Cognitive issues

"Exploration should essentially motivate the student to reflect on the problem approach" (Kommers, 1996: 48).

· The exploratory dimension suggests meaningful penetration towards the appropriate construction of the desired knowledge. The hypermedia exploration is a goal-oriented interaction requiring initiation such as a hypothesis to be tested, a question to be answered, a query to be searched or a simulation to be performed. Therefore, the learner must be provided with strategic orientation, generating appropriate learning objectives, and structural orientation, facilitating and stimulating the exploratory mode.
· Meaningful exploration requires strong semantic links to avoid ambiguity and disorientation.

Selected Student Requirements

Refer to Chapter 11 for further details.

Experienced Students

· (10) Multimedia extensions are only appreciated if purposeful.
· (12) Ensure that the reference database is fully integrated and responsive.
· (27) Interactive aims and objectives must be clearly stated.
· (29) Provide visual maps of the structure.
· (33) The functionality must support a more intuitive interaction.
· (35) Ensure that the support material provided in references, grammars etc. is also interactive.
· (39) Provide an overview of progress on request.
· (40) Provide a tracking device.
· (46) Learning objectives must be clearly delimited and explained.

Inexperienced Students

· (7) Design a map to be displayed on request.
· (16) Provide clear orientation.
· (21) Provide learning objectives.
· (23) Provide recommended pathways.
· (27) Provide a greater sense of purpose.

Design Guidelines

Refer to Design Guidelines for Authoring Hypermedia Language Learning Applications in Appendix 5 for further details.

18. Mapping: Map out a clear and manageable overall structure for the application to be authored, matching the previously adopted learning strategy and conceived within the well established technological constraints imposed by the chosen system. Adopt a clear conceptual approach to the document structure highlighting its configuration. If incompatibility is discovered at this pre-design stage, go back to earlier findings of the feasibility study. This could apply in cases when structures are required for large and complex documents.

43. Information: Provide structural information and access facilities embedded into the knowledge base to enable students to relate to and appreciate the nature and extent of the available database.

44. On-line Help: Provide clear overviews, guiding mechanisms and tutoring facilities such as maps, indexes as well as suggested tours and learning approaches. Make access to such structure-based devices always available and applicable. A consistent and systematic display of orientational cues and navigational informations will increase the usability and potentiality of the designed hypermedia application. Maps or browsers are particularly suited to provide necessary

navigation information. Indexes are more likely to be required in directed learning situations. Alternatively, 'soft tutoring' such as tours are particularly designed to cater for beginners or near-beginners, more easily prepared to trade off control in exchange for speedier and easier language acquisition.

45. Data accessing: Ensure that the selected interaction, expected of and controlled by students, to access specific information according to their level of proficiency is predictable and unambiguous. Whilst allowing for potential structural and informational shortcuts, remember that too many alternative choices make a structure artificially complex and inevitably lead to confusion, demoralization and error-prone responses.

46. Linguistic Interaction: Optimize the level of linguistic interaction by ensuring that students can control their own appropriate progression through customized nodes and learning tasks. These can take the form of reading textual material in the target language, playing a participatory role in structured and fully interactive dialogues, preparing language-based exercises and drills and taking tests.

47. Interactive Match: Tailor the nature of the interaction and instructional control to the level of language proficiency of targeted students. The more knowledgeable, the more likely students will benefit from self-directed learning approaches.

48. Quality: Ensure that students are actively engaged in the process of understanding and learning and not just passive recipients of a large quantity of informational data. Introduce a wide range of additional interactive activities such as quizzes, gap-filling exercises, text and phrase jumbling facilities and audio-visual interactive exchanges.

Design Trade-offs

· Trade-off between providing a broad, all embracing, search mechanism or a more in-depth but more finely tuned and limited search tool.
· Trade-off between depth of exploration and higher cognitive overheads.

Design Solutions

· Orientation: Support strategic and structural orientation by introducing path trailing, thus avoiding disorientation, by providing a physical position within the information space as well as evidence of the interactive area covered, achievement and undiscovered space.
· Support: Design useful orientation devices, which include overviews, structural maps of the global information space, interaction history or trailing, footprints and time-stamping facilities (Nielsen, 1989).

Assimilation

Student Interaction
Cognitive issues

· Assimilation is related to the ability to explore the hypermedia environment meaningfully, allowing the learner to anticipate, recognize, identify and acquire the relevant information. Therefore, it is linked to the usability factor of the application, and cognitive overheads it generates when interacting with it both at operational and informational levels.
· Assimilation can become problematic when learners are given full interactive control potentially leading to poor motivation and, passive or negative interaction.
· Assimilation can be facilitated on the strength of existing mental models. Pre-conceived ideas and idiosyncratic tendencies can be exploited positively, as in the case of the multimedia environment and the WWW, or can generate negative reactions and apprehensions as in the case of the language laboratory.

Selected Mental Models

Experienced Students

· Attitudes and reactions vis à vis the hypermedia interface essentially triggered the formation of functional models for the most part linked to the students' prior understanding, vision and pre-conceived ideas of multimedia software based on past experience. In this respect, students generally found it difficult to relate to both hypermedia and multimedia interactions simultaneously when such a combination was encouraged or simply made available. Interestingly, students would not easily mix these two modes either by subconsciously circumscribing their interaction within the hypermedia interactive domain of an application or by concentrating on the multimedia dimension of a referential database.

Inexperienced Students

· The students' main referential criteria were drawn from their language laboratory experience. Although generally apprehensive of the new multimedia interface, its novelty acted as a stimulant and generated sustained motivation. Such systematic comparisons with previously experienced and better known audio-based language exercises led the students to develop mental models reminiscent of the artificially established man-machine relationship. Therefore, it reduced the interface to a colour monitor and a mouse, seen as its necessary, albeit painfully operated, interactive extension and go-between. It also confirmed the supremacy of the image and the impact of the visual display over its audio counterpart This last point was particularly obvious when the students interacted with video material, which was, systematically, absorbing their concentration for protracted periods of time, whilst encouraging, or justifying, passivity.

Selected Student Requirements

Refer to Chapter 11 for further details.

Experienced Students

· (11) Treat students like normal human beings.
· (13) Ensure that errors or bugs do not creep in if you want to retain teaching status, credibility and students' trust.

· (14) The material used must be attractive and identifiable.
· (18) Do not attempt to design an interface with a view to making the computer look and respond more like a human.
· (24) Ensure that the students' motivation is maintained throughout the interaction.
· (41) Provide an adequate and relevant context for the designed environment.
· (44) Make exercises relevant and realistic.
· (49) State clearly the adopted learning strategy.
· (50) A hypermedia system must be a completely self-sufficient learning platform.
· (53) Feedback for language tasks must be relevant and accurate.

Inexperienced Students

· (9) Make the design adaptable to the different levels of student needs and expertise.
· (10) Provide clear objectives.
· (14) Provide understandable, jargon-free explanations.
· (21) Provide clear learning objectives.
· (22) Provide clear explanations regarding the learning approach.
· (27) Provide a greater sense of purpose.

Design Guidelines

42. Data Recognition: Ensure that the knowledge base is sufficiently recognizable and manageable for the range of targeted students and their required tasks. A large database with a seemingly wide choice of links may confuse and disorientate them.

45. Data accessing: Ensure that the selected interaction, expected of and controlled by students, to access specific information according to their level of proficiency is predictable and unambiguous. Whilst allowing for potential structural and informational shortcuts, remember that too many alternative choices make a structure artificially complex and inevitably lead to confusion, demoralization and error-prone responses.

46. Linguistic Interaction: Optimize the level of linguistic interaction by ensuring that students can control their own appropriate progression through customized nodes and learning tasks. These can take the form of reading textual material in the target language, playing a participatory role in structured and fully interactive dialogues, preparing language-based exercises and drills and taking tests.

47. Interactive Match: Tailor the nature of the interaction and instructional control to the level of language proficiency of targeted students. The more knowledgeable, the more likely students will benefit from self-directed learning approaches.

48. Quality: Ensure that students are actively engaged in the process of understanding and learning and not just passive recipients of a large quantity of informational data. Introduce a wide range of additional interactive activities such as quizzes, gap-filling exercises, text and phrase jumbling facilities and audio-visual interactive exchanges.

49. Add-Ons: Avoid unnecessary and overtly distractive displayed attractions which, as a result of being too easily construed as potential cues or attention-seekers, might mislead learners. Make wise and restricted use of peripheral devices, such as the wide range of 'live' activated objects and customizable animations chosen for their convenient availability and potential to 'liven up' the screen, as they will invariably distract attention away from required goal if used artificially.

Design Trade-offs

· Trade-off between assimilation of information and flexibility.

Design Solutions

· Meaningfulness: By dint of being intricately linked to the meaningful exploration of the hypermedia CALL environment, consider design solutions maximizing usability features, functionality and screen display for increased assimilation.

Technological Capabilities

· Technological capabilities must be appreciated and determined at two different levels. On the one hand, the specificity of the hardware configuration must be considered to ensure compatibility and viability with the selected authoring platform, in terms of the adequacy of processing speed, memory capacity and range of desired authoring features.
· On the other, design approaches and guidance provided by the platform must be identified for better exploitation or to avoid undue design interference with the hypermedia to be authored. Professional advice, provided by software companies, often proposes a bottom-up, step-by-step design approach presenting pragmatic solutions to specific design difficulties. Furthermore, these authoring shells provide design scenarios, themselves, built on the strength of adopted, overriding metaphors, such as the book, the page, the stack of cards or the flow line.

Selected Student Requirements

Refer to Chapter 11 for further details

Experienced Students

· (1) Produce a good professionally designed display.
· (32) The functionality must be reliable and consistent.

Design Trade-offs

· Trade-off between functionality and learnability.
· Trade-off between functionality and affordability.
· Trade-off between functionality and compatibility.
· Trade-off between functionality and applicability.

Design Guidelines

Refer to Appendix 5 for further details

1. Market: Survey the existing market: Clearly ascertain the availability and potential suitability of similar commercial packages specifically authored to be used in language learning or teaching environments. Warning: although at first glance, such applications might appear to be attractive and suitable, they might not necessarily provide an authoring mode.

2. Approach: Choose an appropriate hypermedia approach: The range of features and versatility of the shell will vary according to the chosen hypermedia approach. For instance, do not confuse frame-based platforms supporting hierarchical structures, data abstraction and orientation with relational databases and sophisticated Windows-based applications such as desktop publishing.

3. Specifications: Ensure that the existing hardware specifications match that of the desired software: The full functionality and expected performance of the chosen technology are predicated upon the right combination of processing power to provide adequate speed, random access memory to manipulate large amounts of data and finally, important memory saving capacity to store sizeable data.

4. Potential: As language specialists, ensure that you fully appreciate the potential and the limitations of the selected hypermedia authoring software before considering it as a suitable design tool: Match its functionality with the desired usability of the application to be authored within a learning environment.

5. Planning: Ensure that the planned design and development process of the application to be authored is adequately and realistically timed and affordable: Do not underestimate the value of a

feasibility study even if it is initially seen as counter-productive.

6. Expertise: Establish the existing level and range of expertise that can be called upon as well as the technical and design support that can be made available when considering the validity and feasibility of the design project: Whilst the design tools are tailored to the adopted learning strategies by the language specialist, as subject expert author and course design specialist, the ultimate success of the project lies in the adequate combination of specialist knowledge to reflect areas of expertise such as: software engineering, graphic design and user interface design. Although hypermedia development is best achieved by a design team comprising professional developers, it is feasible for one author to combine the necessary knowledge to conceive and build appropriate and satisfactory educational applications.