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Influence of Culture on Learning Object Design and Evaluation

by

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Abstract

Learning objects are designed with the intention of reuse. The issues of cultural sensitivity are important in the design and development of learning objects in terms of improving reusability and adaptability in order to provide equivalent rich pedagogy to learners in culturally diverse learning contexts. The aim of this study was to develop a cultural reference model that provides designers with cross-cultural insight and perspective about influences of cultural diversity on the design of learning objects so that appropriate improvements can be achieved prior to the design completion. This study began with an empirical case study that was carried out in two universities in China and the UK to elucidate influences of culture on the reuse of learning objects, and then identified four dimensions of culturally sensitive factors that may be involved in learning objects designs through a systematic review. The cultural reference model for learning object design and evaluation was built by the four dimensions of culturally sensitive factors, a conceptual framework that maps the cultural dimensions to the design process, and a series of recommendations about dealing with the culturally sensitive factors during the process of the design and development of learning objects. Finally, the reference model was evaluated through expert review, one-to-one interviews, and practical tasks.

Designing learning objects that are culturally sound for the cross-cultural situation is a big challenge faced by learning object designers. Lack of cross-cultural awareness is a common phenomenon because the designers are normally either multimedia developers or academic tutor and not cultural experts. A popular approach to examine cultural adaptability is users' review by employing students with different cultural backgrounds. However, this approach is limited by the students' own cultural sensitivity and how many particular cultures to be addressed. The cultural reference model provides explicit guidelines and a consistent approach that allow designers to consciously address the culturally sensitive factors during the process of the design and development of learning objects to ensure the rich pedagogy of learning objects in different cultural context.

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1 Introduction

Learning objects are designed with the intention of reuse in order to meet the increasing need of high quality e-learning resources and to reduce the cost of developing such resources. Design and development of learning objects integrate technologies of computer science and instructional design theories. Learning objects currently lead a new generation of instructional design, development, and delivery due to their potential adaptability and reusability (Wiley, 2002) and have enormous potential for worldwide educational popularisation.

While standards bodies, such as AICC, IEEE and IMS, have been developing technological standards for widespread deployment and delivery, and educationists have been working on instructional design theories to support the instructional design and use of learning objects, currently cross cultural models for e-learning design do not explicitly support the design and development of learning objects. As Dunn (2006) has stated, "there is a growing need to support the designers of these (e-learning) programs in considering cultural factors" (p.256). The purpose of this study is to develop a cultural reference model that provides guidance in the design and development of learning objects to be culturally adaptable.

This chapter provides a rationale for the current study by presenting the background of the study, needs for the study, research questions, objectives of the study, and an overview of the thesis.

1.1 Background of the Study

Good e-learning materials are expensive. The effectiveness of these materials, however, has traditionally been limited. Most e-learning materials have been developed for a specific purpose (i.e. a module) or within a particular virtual learning environment (VLE) (Longmire, 2000). These materials were hardly, if

ever, transferred for use in other systems. And they were often "monolithic", and had to be taken on an all or nothing basis (Boyle, 2002). To make e-learning materials reusable and interoperable, a new structure of e-learning material was proposed – the Learning Object.

1.1.1 Concept of Learning Objects

Learning Objects as reusable units of e-learning resource have been widely used to build online learning materials in recent years. The term learning objects has been associated with a range of benefits, such as realization of systems interoperability and of resource reusability. However, the concept of learning objects and the practical meanings of it has been the subject of much debate and discussion (Wiley, 2001; Polsani, 2003; Boyle, 2002, 2003). Considerations of reuse are not only about the technological specifications, but also about the pedagogical effectiveness of learning objects, which could be reused in different learning contexts.

To facilitate the widespread adoption of the learning object approach, the Learning Technology Standards Committee (LTSC) of IEEE was formed in 1996 to develop and promote instructional technology standards. The LTSC chose the term 'Learning Object' to describe these electronic instructional contents, established a working group, and provided a working definition:

> "Learning Objects are defined as any entity, digital or non-digital, which can be used, re-used or referenced during technology-supported learning. Examples of technology-supported learning include computer-based training systems, interactive learning environments, intelligent computer-aided instruction systems, distance learning systems, and collaborative learning environments. Examples of Learning Objects include multimedia content, tools, and persons,

> organizations, or events referenced during technology supported learning". (LOM, 2002)

This definition has caused wide debates among educators, developers and other practitioners of e-learning system since it was published. Some researchers argue that the definition is obviously too broad and confusing to design learning objects effectively. Wiley (2001) proposed a definition that seems to be more specific: "any digital resource that can be reused to support learning." This definition excluded non-digital objects from the definition offered by IEEE, but was still too broad to describe the essence of learning objects. A definition that covered aspects of form, content, and reusability was given by Polsani in 2003:

> "A Learning Object is an independent and self-standing unit of learning content that is predisposed to reuse in multiple instructional contexts." (Polsani, 2003)

The fundamental idea behind learning objects is that small instructional components can be built and can be reused a number of times in different learning contexts (Wiley, 2002).

The term "learning object" juxtaposes two words that seem to be incongruous in many ways (Friesen, 2003). The word "object" is a very specific technological paradigm and originates from object-oriented programming (OOP), design, analysis and theory (Robson, 1999). OOP is a programming language model organised around "objects". Objects are essentially reusable software components that model items in real world. This programming design approach has become pervasive with the advent of C++ and Java. Thus, the "object" is a very specific technical paradigm. In contrast, the word "learning" has a completely non-technical nature. Learning is a kind of human cognitive activity, and is an inseparable aspect of social context (Lave & Wenger, 1991). Therefore,

the design of learning objects needs not only technological standards but also the support of pedagogical theories.

1.1.2 Current Research of Learning Objects

To ensure the reusability of learning objects in different e-learning environments, a lot of effort has been spent on developing international standards and specifications for learning object metadata and packaging. These included *Access for All Metadata Specification* by Instructional Management System (IMS, 2006), *Learning Object Metadata* (LOM) standard by IEEE (2002), and *Sharable Content Object Reference Model* (SCORM) by Advanced Distributed Learning (ADL, 2004). These standard packaging structures, metadata formats and interfaces enable a widespread interoperability of learning objects. These endeavours have provided technical bases for the development of repositories of reusable learning objects (e.g., Koppi, et al., 2004; JORUM, 2006) and tools supporting packaging and adding metadata (e.g., RELOAD, 2005). There are also a number of specialized learning object management systems, e.g., Intralibrary (http://www.intrallect.com) and ARIADNE (http://www.ariadne-eu.org).

Along with the development of technology and practices of online teaching and learning, the underlying pedagogical principles within learning objects have drawn the attention of learning object practitioners and researchers which seem not to be included in the technology-focused approaches. Considering the pedagogical effectiveness of learning objects, other works focus on the underlying pedagogical principles and instructional design for learning objects (Wiley, 2003; Boyle, 2003; Boyle, et al., 2006). Duval et al (2004) claim that "the use of learning objects promises to increase the effectiveness of learning ..." (p.331). To achieve this, the design of learning objects demands the involvement of a pedagogical perspective. The simple concatenation or sequencing of de-contextualized educational resources does not produce a meaningful context for

learning (Wiley, 2003). Boyle (2003) argues that learning objects can be viewed as "micro-contexts" for learning focused on the achievement of specific learning aims. The concept of "micro-contexts" provides possibilities to embed pedagogical principles into learning objects and to maintain the high reusability of the learning objects.

Current research in learning objects has turned the focus to learning design to achieve the pedagogic objectives. According to Koper (2006), a "learning design" can be defined as the description of the teaching and learning process. The key principle in learning design is that it represents learning activities and supports the activities that are performed by different learners in the context of a learning object. There have been significant efforts for embedding pedagogical principles into learning object design, such as the model of "pedagogical pattern" (Boyle, 2006) developed by the Centre for Excellence in Teaching and Learning (CETL) in Reusable Learning Objects (http://www.rlo-cetl.ac.uk/), and the Abstract Learning Object Content Model (ALOCoM) (http://ariadne.cs.kuleuven.be/alocom/).

However, reusability of learning objects has never reached its expected potential (Windle, et al., 2007). Reusability is a very typical characteristic distinguishing a learning object from other kinds of e-learning materials. While the characteristic benefits are economically and timely in terms of design and development of learning objects, it also brings with them a number of concerns and issues about cross-cultural or international delivery and reuse. In fact, the reuse of learning objects by others remains still very low, even though the issues about technology and pedagogy surrounding reusability have been addressed in many papers. Mayes (2003) explains this dilemma: "Once all of the technical, and even pedagogical, issues are out of the way, we will still be faced with cultural, social and organisational factors that will determine the extent to which learning objects are actually reused" (Mayes, 2003, p.11).

This dilemma raised a design consideration about cultural diversity that may limit the potential reuse of learning objects, particularly those that intend to fit with a local context. This consideration requires a study of cultural diversity within the design context in which a learning object is developed. Therefore, the focus of this study should be on cross-cultural issues around learning objects, and additionally on the design issues that may be influenced by the cross-cultural issues. However, recent learning object design models and specifications do not provide a design guideline that particularly addresses cross-cultural issues related to potential learning contexts.

1.2 Need for the Study

Learning does not occur in isolation. Both constructivism and behaviourism, the two main schools of pedagogical theories, consider the importance of social and cultural surroundings on human learning. Psychologists and educationists (Vygotsky, 1962, Vygotsky, 1978, Lefrancois, 1994) indicate that culture powerfully influences the human cognitive style and learning approach. What do we mean by culture? Culture can be defined as "the beliefs, value systems, norms, mores, myths, and structural elements of a given organization, tribe, or society" (Watson, et al., 1994, p.45). Individuals and groups of people carry the culture which manifests itself in how a group interprets and reacts to its environment (Collis, 1999). The behaviour of individuals "is affected by the values and attitudes that they hold and the societal norms that surround them. When values are widely shared by a group of people, they are provided with a common mechanism by which they can share understandings and interpretations of their world, and establish what is important and clarify priorities" (Wild & Henderson, 1997, p.183).

Culture has its impact on how people learn. There is abundant literature attesting to the influence of culture on both traditional learning and technology-enhanced learning (e.g., Biggs, 1998; Chen, 1999; Gunawardena, et al., 2001; Rattanapian,

2002; AFLF, 2004). Cultural diversity has become a crucial issue for successful e-learning in today's globalization of education and training (Downey, et al 2005, Dunn & Marinetti 2003, Goodear 2001). McLoughlin and Oliver (1999) argue that if pedagogical values in one culture were culturally inappropriate to another, students would doubt knowledge, or may challenge the teacher's view. The cultural inappropriateness has been one of the major reasons for the high rate of students' withdraw in online learning (AFLF, 2004).

From the sociology of technology (Pinch & Bijker, 1987), the usefulness of an information system is actively and socially constructed by users rather then merely perceived as a property of technology. This implies a broader meaning of the usefulness of e-learning resources which does not rely solely on a perception of efficiency. This view of usefulness is particularly appropriate for a globalised e-learning market, in which learning objects are produced in cultures that often differ from those of their learners. This means that, on the one hand, developers' understanding or expectation of what is useful shapes the design of learning objects, whereas, on the other hand, learners' perspectives determine how the learning objects are ultimately used and adapted. Where developers and learners belong to different cultures, it may lead to conflicting views of usefulness and may affect pedagogical effectiveness and reusability of learning objects.

Designing for the cross-cultural situation is an additional challenge faced by learning object designers, because the potential learners are much more likely to be in culturally different learning environments. Their design has to meet not only learners' needs of acquiring skills and knowledge but also culturally based needs of global learners, such as those generated by different values, norms, conventions, and even diverse levels of techno-literacy. A problem with designers for the culturally reusable design is that less practical advice is available on how to integrate cross-cultural perspectives into the design and especially how to perform the analysis phase of the design and development process for learning objects.

Wild and Henderson (1997) claim that cultural variations in interpreting and communicating information are influenced by pedagogical and instructional design decisions, and cultural issues of e-learning must be constantly problematised and not marginalised. For learning experiences to be effective in different cultural environments, the cultural values of the designers and of the learners must be taken into account when a decision is made on the design and development of learning objects.

People live in a particular social-cultural environment and build their own cultural traditions and norm in products. In fact, designers are not immune from the influence of their own cultural blinders (Rogers, et al., 2007) and often unconsciously select a learning strategy based on their own "culturally-induced worldview" (Dunn & Marinetti, 2006). Donald Norman (1996), in discussing product design, makes this point strongly: "Cultural issues are perhaps the hardest to identify and deal with. Once people are acculturated, their thoughts, beliefs, and actions are biased, without their conscious awareness. Of all the problems … cultural issues are probably the most insidious" (p.236). Designers may not be able to articulate their own cultural stances, but their beliefs will, by default, be articulated into the learning object design.

In addition, the initial motivation for creating new learning objects in many cases is for local use. The designers and their students generally belong to the same culture. Some problems can be concealed when the learning objects are used in the local cultural environment but may arise in multi-cultural situations. For example, an open-ended task that is completed successfully by students in a low uncertainty avoidance culture may cause students extra challenge or anxiety in a high uncertainty avoidance culture (Hofstede, 2001). Hence, a cross-cultural perspective is required by designers to develop learning objects in order to meet learners' culturally based needs.

However, learning object designers are academic tutors, professional trainers, and multi-media developers, and are not cross-cultural experts. Rogers and Williams (2006) claim that educators are often unaware of the implicit assumptions they bring into the situation which deeply influence how they perceive things and how they work. We cannot expect that they all have the cross-cultural understanding to be able to produce a learning object that is culturally sound.

Although there is a large body of literature on culture and online education, many efforts have been made to describe and explore cultural differences on e-learning (Downey, et al., 2005; Dunn & Marinetti, 2002, 2003; Goodear, 2001). There seems to be little research yet that systematically analyzes culture-related guidelines for the design and development of learning objects. Current cultural models or guidelines in computer-based learning design provide common overall perspectives of culture within the context of cross-culture. Some of them emphasise theoretical research. Henderson's (1996) multiple cultural pedagogic model of interactive multimedia instructional design, for example, analyses 14 aspects of cultural educational context, such as cognitive, epistemological, and philosophical aspects. Some researchers consider the flexible design of an e-learning system as a whole. Collis, Vingerhoets, and Moonen (1997), for example, identified 19 critical dimensions that relate to aspects of content of a course, prerequisites, instructional approach, delivery and logistics, etc. of an e-learning system. Some models are developed for adapting e-learning resources from one culture to another (e.g., Dunn & Marinetti, 2002; Edmundson, 2006); and others focus on one particular aspect of e-learning design, such as online learning communnity (e.g., McLoughlin, 1999; Seufert, et al., 2002), web or software design for international use (e.g., Zahedi, et al., 2001; Marcus & Gould, 2000b), and accessibility (e.g., IMS 2006). However, these models or guidelines are inadequate to provide a pragmatic approach that considers cross-cultural issues extensively and appropriately around the design and development of learning objects.

Learning object design and the designers are inevitably tied to their societal context; and they are "infused with" (Herderson, 1996) the cultural influences resulting from the subtle and intricate interplay of culture-related factors. Because the design of learning objects involves instructional design approaches and computer software engineering paradigms, research is needed to support learning object design and development with cross-cultural perspectives from both pedagogy and programming.

In addition, I am personally interested in this study as I was a lecturer teaching computer science in a university in China. Online education has been developed rapidly in China since last two decades. The main reasons of that can be seen from three aspects. Firstly China has huge population, and traditionally parents want their children to get better education. There is a great demand for the resource of education. Secondly along with the dramatic growth of economy much of knowledge-based workforce is required to sustain its growth. Finally China has a bimodal distribution of wealth (Levy 2003). The Eastern provinces tend to be very wealthy whilst those in the West remain relatively poor. Good educational resources are located in the Eastern area (e.g., majority of universities are located in the Eastern provinces). This vast gap causes a flow of educational resources from the East to the West. Online education provides the opportunity to supply the deficit of educational resources.

However, developing good online learning materials is time consuming and costly. My desire is that the good online learning materials designed in developed countries can be used for learners in China and other developing countries where there is a lack of good learning resources. The concept of learning object brings the possibility of reuse of the learning resources in other countries. However, there are cultural differences in teaching and learning between countries. I hope this study could enhance the reusability of learning objects to facilitate learners from different cultures.

1.3 Research Questions

This study focuses on the intersection of learning object design and development and cultural influences on them. The assumption that culture influences the use of learning objects and that it is necessary to design learning objects which are culturally inclusive and accommodate culturally diverse needs of learners is the thinking behind the push for this study which pursues adaptability and flexibility of the design of learning objects.

Various questions arise when considering the interaction between pedagogical design, implementation of software, and their culture-related aspects in learning object design, as follows:

- How effective and reusable are learning objects in culturally diverse learning contexts?
- What are the impacts of culture on reuse of learning objects?
- What design factors are culturally sensitive that may differ in culturally diverse learning environments?
- Can they be identified effectively and fully?
- How do designers recognize the culturally sensitive factors during the process of the design and development of learning objects?
- What makes the design of learning objects culturally adaptable and flexible?

Addressing these research questions sums up the aim of this study.

1.4 Aim of the Study

Given the importance of cultural diversity to the reusability of learning objects and cross-cultural problem and challenges faced by designers during the process of design and development, the need of explicit support for the design of learning objects that are culturally adaptable and reusable is clear. Therefore, the aim of this study is to develop a cultural reference model that provides designers with cross-cultural insight and perspective about influences of cultural diversity

on the design of learning objects so that appropriate improvements can be achieved prior to the design completion.

For the aim of the study to be achieved, the cultural reference model intends to

(1) clarify cultural dimensions in contexts of learning object design,
(2) identify culturally sensitive factors that may exist in learning objects in each of the cultural dimensions,
(3) propose principles for dealing with culturally sensitive factors,
(4) provide a practical framework for mapping the cultural dimensions to the process of design and development of learning objects, and
(5) provide recommendations to support making design decisions that are culturally sound.

Since there is a variety of cultural phenomena and the complexity of their influences on learning object design, the cultural reference model does not intend to create "cultural experts" or to create culturally perfect learning objects. Instead, it intends to generate a consistent approach by which learning object designers consciously address the influences of cultural diversity on their products to enhance the reusability and ensure an equivalently rich pedagogy of learning objects in culturally different learning contexts.

The cultural reference model is developed through a process that involves multiple research methods that include (1) a review of literature focusing on cultural theories and their application in instructional design and e-learning design, (2) a case study to investigate and illustrate the influence of culture on reuse of learning objects in two particular cultural contexts, (3) a systematic review to identify culturally sensitive factors, (4) the development of the cultural reference model, and (5) evaluation of the cultural reference model.

1.5 Overview of the Thesis

This thesis is composed of seven chapters. Chapter 1 presents an overview of the background and the purposes for this study. Chapter 2 presents related research that provides scope and theoretical basis of the study. The chapter addresses issues of culture and learning technologies, cross-cultural instructional design, and learning object design and its culturally diverse contexts. Chapter 3 discusses the research methodology that is employed to accomplish the objectives of the study. Chapter 4 presents an empirical case study of examining the use of learning objects in two universities in China and the UK. Chapter 5 analyses the dimensions of culture-related differences in learning objects and identifies culturally sensitive factors for each of the cultural dimensions through a systematic review. Chapter 6 presents the proposed cultural reference model that begins with principles for dealing with cultural issues of learning object design, follows with a conceptual framework for mapping the cultural dimensions to the design of learning objects, and ends with adaptation strategies for reuse of learning objects. Chapter 7 presents the evaluation of the cultural reference model that is completed through expert review, questionnaire survey, and one-to-one interview. Chapter 8 presents the conclusion of the study and further work.

2 Literature Review

In order to study influences of culture on learning object design, which involved multiple disciplines, it is necessary to have a big picture of recent research about culture, pedagogical design, learning technology, and their impact on learning object design. Hence, this chapter starts by reviewing concepts of culture and cultural diversity in teaching and learning. Then, pedagogical theories and instructional design strategies for e-learning are discussed. The last section reviews the design and development of learning objects from both technological and pedagogical approaches.

2.1 Culture and its Influence on Education

This section promotes cross-cultural understanding in an online learning environment. Before talking about how culture influences learning object design, it is important to first discuss what culture is about.

2.1.1 Concepts of Culture

Culture is a popular word and as a concept has many different perceptions. The word *culture* comes from the Latin root *colere*. In general it refers to human activity. The first anthropological definition of culture was given by E. B. Tylor in 1871:

> "Culture or civilization, taken in its wide, ethnographic sense, is that complex whole which includes knowledge, belief, morals, law, custom and any other habits and capabilities acquired by man as a member of society." (Tylor, 1871, p1)

Since then, extensive attempts have been made by anthropologists to answer the thorny question of what culture is. Subsequent scholars Kroeber and Kluckhohn (1952) completed a list of over 150 different definitions of culture in their book, *Culture: A Critical Review of concepts and definitions*, which largely views

culture as the properties of an average citizen or modal personality (Inkeles & Levinson, 1969). In fact, different definitions of culture reflect different theories for understanding, or criteria for valuing human activity. A common way of understanding culture is to see it as consisting of three elements: values, norms, and artifacts (Parsons & Bales, 1955). According to Parsons and Bales, values are ideas about what in life is important, desirable, worthwhile, meaningful, and worth striving or even dying for. Values guide the other forms of culture. Norms are rules or standards of how people will behave in different situations in a social group, such as law. Artifacts that derive from the culture's values and norms compose the material culture.

Anthropologists categorise the phenomena of culture into two groups: material culture and symbolic culture (Kroeber & Kluckhohn, 1952). The material culture denotes something taking concrete form in a variety of artifacts such as tools and the design of buildings. Material culture is the physical evidence of human experience. It includes the vast number of objects that people use in every aspect of their lives. The symbolic culture refers to all non-material forms of culture, such as language, myths, beliefs, values, and all the rules for communicating, understanding, and behaving common to a particular society or group. The view of culture as a symbolic system means that culture can be learned and taught in one group of people or from one group to another. To distinguish material culture and symbolic culture is not only because each reflects different kinds of human activity, but also because they constitute different kind of data that require different methodologies.

Hofstede (1984) argues that "there is no commonly accepted language to describe a complex thing such as a culture" (p.77) and admits that his is not a complete definition of culture, but simply includes what he has been able to measure. Instead of synthesising the different definitions of culture, this study prefers to focus more on how culture is viewed in societies and the everyday practices of members of a society. Bodley (2000) suggests that culture can be

observed from three aspects: What people think? What people do? And what people produce? He classifies these aspects as mental, behavioural, and material. Verhelst (1990) argues that culture infiltrates "very aspect of life: know-how, technical knowledge, customs of food and dress, religion, mentality, values, language, symbols, socio-political and economic behaviour, indigenous methods of taking decisions and exercising power, methods of production and economic relations, and so on" (Verhelst, 1990, p.17).

Culture can be learned, acquired, and reflects the patterns of thinking, feeling, and acting (Harris, 2002); reacting (Kluckhohn, 1951); values, ideas and other symbolic meaningful systems (Kroeber & Parsons, 1958). Lustig and Koester view culture as "a learned set of shared interpretations about beliefs, values, and norms, which affect the behaviours of a relatively large group of people" (Lustig & Koester, 1996, p30). The underlying theme is that culture is an abstraction from concrete behaviour but is not the behaviours itself. Culture is transmitted mainly by symbols, constituting distinctive achievement of human groups, including the embodiments in artefacts (Kluckhohn, 1951).

"Cultures are not static; they are always evolving as people respond to new conditions and influences. The relationships between ethnic groups and the dominant culture also change and vary over time and place" (Ramsey, Williams, & Vold, 2003, p.68). In an attempt to understand cultural difference, nations and organisations are two levels to be analysed and measured diversity of culture.

2.1.1.1 National Culture

People living apart from one another develop unique culture. Hofstede (1994) defined culture as the collective programming of the mind that distinguishes the members of one group or category of people from another. In this definition, the "mind" represents thinking, feeling, and acting, with consequences for beliefs, attitudes, and skills. This definition emphasises that culture is a product of "mind" which is fostered by learning within social contexts. Culture is a

collection of characteristics possessed by people who have been conditioned by similar socialisation practices, educational procedures and life experiences. In this sense, countries possess a distinct and relatively stable culture, which is widely accepted. Therefore comparing the national cultures is usually adopted as the way to research issues of cross culture.

2.1.1.2 Organisational Culture

Organisational culture is the personality of the organisation and comprised of the assumptions, values, norms and tangible signs (artefacts) of organisation members. It is essentially "the way we do things round here" (Deal & Kennedy, 1988, p4). Schein (1985) stated that organisational culture is the key to organisational excellence. Organisational culture is mainly created and maintained in existing frameworks by the founders and the leaders of an organisation through their value system (Gagliardi, 1986; Schein, 1983). Organisational culture is often reflected as the result of management activity (Lessem, 1989) or is looked at through levels of practices, like symbols, heroes and rituals (Joynt & Warner, 1996; Mullins, 1989). It is also greatly affected by organisational structure and the distribution of power (Dopson & McNay, 1996). These characteristics enable the differentiation among organisations.

Lomas (1999) uses the models of organisational culture (Schein, 1992; Dopson & McNay, 1996) to examine the cultural differences between higher education institutions and suggests that organisational cultures vary greatly in them. The variance of culture emanates from differing mission statements, aims and objectives, size and nature of student intake, range of courses and emphasis on research. These cultural factors consequently affect performance of the organisational members – teachers and students.

2.1.2 Cultural Dimensions

Cultural related research requires robust frameworks for analysis and application of complex phenomena. Anthropologists, such as Cattell (1949), Sawyer (1967), and Hofstede (1980), have developed such frameworks that consist of various cultural variables by which groups of people can be evaluated and classified. Hofstede's cultural dimensions are the most well-known classification and widely cited in researches of cross culture.

With access to people working for the same organization in over 40 countries of the world, Hofstede collected cultural data and analyzed his findings. Using this unprecedented quantity of data, Hofstede (1984) identified the four dimensional model of cultural differences among societies, based on his research on work-related values in over 50 countries. These four dimensions are Power Distance, Uncertainty Avoidance, Individualism versus Collectivism, and Masculinity versus Femininity.

- Power Distance as a characteristic of culture defines the extent to which hierarchy and inequality exist and is considered as normal. Hierarchy exists within any social formation, but the degree of acceptance is quite different between one culture and another.
- Uncertainty Avoidance as a characteristic of culture defines the extent to which people within a culture are made nervous by situations which they perceive as unstructured, unclear, or unpredictable; situations which they therefore try to avoid by maintaining strict codes of behaviour and a belief in absolute truths. Cultures with strong uncertainty avoidance are active, aggressive, emotional, compulsive, security-seeking, and intolerant; cultures with weak uncertainty avoidance are contemplative, less aggressive, unemotional, relaxed, accepting personal risks, and relatively tolerant.
- Individualism as a characteristic of a culture opposes Collectivism. Individualist cultures assume that any person looks primarily after his/her own interest and the interest of his/her immediate family (husband, wife and

children). Collectivist cultures assume that any person through birth and possible later events belongs to one or more tight "in-groups," from which he/she cannot detach him/herself. The "in-group" protects the interest of its members, but in turn expects their permanent loyalty. A collectivist society is tightly integrated; an individualist society is loosely integrated.

- Masculinity as a characteristic of a culture opposes Femininity. The two differ in the social roles associated with the biological fact of the existence of two sexes, and in particular in the social roles attributed to men. Masculinity indicates the extent to which the dominant values in a society tend toward assertiveness and the acquisition of things. In masculine cultures importance is placed on assertiveness, competitiveness and materialism in the form of earnings and advancement, promotions and bonuses. Femininity indicates the concern for people and the quality of life. In feminine cultures the dominant concern is for quality of life, nurturing and social well-being.

These dimensions of national cultures have frequently been applied by other scholars and practitioners in cross-cultural research, including nominal quotations, reviews and criticisms, empirical usages and citations that take his work for granted, according to Søndergaard's early analysis (1994).

However, Hofstede's work is also criticized by some other researchers. For example, Baskerville (2003) argues that nations are not the best units for studying culture, because any one nation often includes multiple cultures. McSweeney (2009) also argues that the national cultural model "over-privilege(s) continuity and uniformity" and "lack(s) the capacity to explain" (p933) variety and variation within countries. He criticises that the model of national culture relies on fundamentally flawed assumptions and makes "problematic moves" by

> I: denying agency. This is achieved by assuming that national culture is: (a) coherent; (b) stable; (c) pure; (d) by excluding any independent role of other cultural influences; and (e) excluding any independent role of non-cultural influences.

> II: unwarranted depictions. This is done by: (a) conflating nation and state; (b) making unwarranted generalizations from singular instances and/or treating unrepresentative averages as nationally representative; and (c) confusing statistical averages with causal forces. And,
>
> III: ignoring prior and pertinent intellectual developments elsewhere, it fails to engage with the peripheralization in anthropology and cultural geography (and in other disciplines) of the assumptions of national and other spatial cultural uniformity (McSweeney, 2009, p934).

He further argues that "the model's notion of culture — unrealistically — excludes the influence of other cultural and non-cultural factors; conflates the unit of data (the 'nation') with the unit of explanation (the sources of action *within a* 'nation'); erases intra-national diversity; and debars it from engaging with endogenous change" (McSweeney, 2009, p945).

Variety and variation of culture exists for sure. Cross-cultural research is not an easy task (Cavusgil & Das 1997). Many additional factors not inherent in typical research tasks have to be overcome. For example, identification of culture firstly is a problem in the research. Terms used in research instruments; particularly the word 'culture' itself is open to interpretation (Nasif, et. al., 1991). As has been discussed in last section there are more than 150 definitions for this one word alone. Then when one considers the term of culture in cross-cultural research, it becomes subject to interpretation.

In fact, we are living in a global age. Technology has brought the world much closer together. People in different cultures find themselves working together and communicating more and more. They need generalised guidelines to follow. If variety and variation of culture within countries are over-stressed, a question is arising, how can I come to understand these cultural differences? Advocates of Hofstede's cultural dimensions assert that his observations and analysis provide scholars and practitioners with a highly valuable insight into the dynamics of cross-cultural relationships (Johes, 2007).

While the criticisms may be sound, Hofstede's research is one of the most widely used pieces of research among scholars and practitioners. Søndergaard (1994) found that Hofstede's 1980 study received 1,036 citations, while another highly regarded study on strategy by Miles and Snow received only 200 citations (Jones, 2007). Based on Jones (2007), Arguments in support of Hofstede's work focus on the following points which reinforce the value of the study.

- Relevance

  During the time of international business there was very little work on culture, and at this time many businesses were just entering the international arena and were experiencing difficulties; they were crying out for credible advice. Hofstede's work met and exceeded this demand for guidance. Scholarly attention was also turning toward culture during this period, and Hofstede was considered a pioneer and pathfinder (Søndergaard 1994, 448-449).

- Rigour

  The research framework used by Hofstede was based on rigorous design with systematic data collection and coherent theory. This is just what scholars and the marketplace had been asking for (Søndergaard 1994, 448-449). However, many critics claim the sampling was flawed, being sparse and unevenly distributed (McSweeney 2000).

- Relative Accuracy

  In Søndergaard's bibliographical analysis (1994) he compared the replications (research similar to Hofstede's IBM study, originated to compare his findings) of Hofstede's research. 61 replications were analysed. The majority of the replications confirmed Hofstede's predictions. Four of the replications concurred in their entirety, and 15 showed partial confirmation. The only dimension of Hofstede's that could not be validly confirmed was 'Individualism'. However, Hofstede addressed this issue by predicting that cultures will shift over time (Søndergaard 1994, 450-453). Several studies were developed not as replications, but along similar lines, to test the relevancy of Hofstede's

> questions. These have also confirmed the accuracy of Hofstede's four dimensions (Søndergaard 1994, 453).

Despite existing debates about Hofstede's work, Edmundson (2006) suggests that "this model provides one example of a way of looking at culture through various dimensions" (p.6). Hofstede (2003) responds to criticism as "true, but they (nations) are usually the only kind of units available for comparison and better than nothing" (p.812). Even McSweeney (2009) admits that the use of existing cultural models will no doubt go on.

There are, of course, other ways of looking at culture in terms of multiple dimensions. For example, Trompenaars (1993) views culture as a way in which a group of people solve problems, which is based directly on Schein's (1985) definition of organizational culture. He has studied how people in specific countries resolve dilemmas. From the solutions to three types of problems (relationship with others, time, and the environment), he identifies seven linear binary oppositional dimensions of culture. Hall (1976) organises cultures by the amount of information implied by the context of the communication itself, regardless of the specific words that are spoken. The context is defined in terms of place, space, communication, relationships and how individuals and society seek information and knowledge. He made distinctions between high-context and low-context cultures with regards to the different demands for contextual information among cultures.

These studies provide different ways of looking at culture and comparing cultural differences. In this study the term "culture" refers to the values, norms, behaviours, and habits that are related to teaching and learning. In addition, educational systems and technological development that may vary in different nations are also considered as aspects of culture in this study. Hofstede's dimensions for national culture are adapted in this study to compare and analyse the diversity of behavious and attitudes toward teaching and learning between

learners with different cultural background. The next section reviews the studies related to cultural issues in teaching and learning.

2.1.3 Cultural Issues in Teaching and Learning

Vygotsky (1962) stated that human culture was created as a result of using tools and symbols. Development of the memory from children to adults consists precisely of the transition from natural to cultural forms of memory (Luria, 1992). An educational context refers to "the physical and social setting, including the instruction and support provided by the teacher, the behaviour of others, and the norms and expectations inherent in the setting" (Marini & Genereux 1995). These contexts also affect learners' cognitive styles, and teaching and learning methods.

2.1.3.1 Cultural Difference and Cognitive Style

Cognitive style is defined as the form of cognitive activity such as thinking, perceiving, problem solving. Cognitive style is an individual's preferred and habitual approach to organizing and representing information (Riding & Raynor, 1998). Ford, et. al., (1994) define that "A tendency for an individual consistently to adopt a particular type of strategy is known as a cognitive style" (p.79-86). Anthropological studies of general cognitive processes suggest that cognitive styles are connected to culture (Chen & Ford, 1998; Nisbett & Norezayan, 2002; Peng, Choi, & Norenzayan, 2001; Riding & Rayner, 1998).

Nisbett (2003) declares that "Human cognition is not everywhere the same" (p. xvii), and exposited the hypothesis that "Western people", referring to white European, differ from Asian (e.g. Chinese, Koreans, and Japanese) in cognitive style in his book *The Geography of Thought: How Asians and Westerners Think Differently ... and Why*. Nisbett presentes experiments he performed for the discovery of the differences of cognitive style in two groups, such as showing people pictures with several objects, one of them obviously the "main" object,

then asking them to describe the scene. For example, one of the experiments is that of a large moving fish in a tank with other objects, then asking two groups of American and Asian students to describe it. American students immediately talked about the big fish, while Asians tended to mention first that it was a fish tank, and then include other details about the background that were not mentioned by Americans. This study thus revealed differences between East Asians and Westerners. East Asians are more focused on the field and on relationships, whereas Westerners are more focused on objects and tend to detach objects from the field. These different styles thoughts are categorized as holistic vs. analytic thought.

Nisbett and Norezayan (2002) propose that cognitive processes differ according to holistic and analytic perspectives. According to Nisbett and Norezayan (2002), holistic reasoning includes:

- Orientation to the context or field as a whole, including attention to the relationship between a focal object and the field;
- A preference for explaining/predicting events on the basis of such relationships;
- An approach that relies on experience-based knowledge rather than abstract logic and the dialectical;
- An emphasis on change, recognition of contradiction, and the need for multiple perspectives.

Analytic thought includes:

- A detachment of the object from its context;
- A tendency to focus on the attributes of the object in order to assign it to categories;
- A preference for using rules about categories to explain and predict an object's behaviour;
- Inferences that rest in part on the decontextualization of structure from content, use of formal logic, and avoidance of contradiction.

Recently, Cultural differences in cognitive style are studied by many researchers in web design in terms of cultural adaptability (Faiola & Matei, 2005; Marcus & Gould, 2000a; Singh & Pereira, 2005). These studies are important for the design of e-learning resources regards to interface design and navigation design.

There is another reason to discuss cognitive style in this review, that is cognitive style is often used interchangeably with learning style in most situations. Generally, cognitive styles are more related to theoretical or academic research, while learning styles are more related to practical applications (Liu & Ginther, 1999). A major difference between cognitive style and learning style is that learning styles comprise not only cognition, but emotion and physiology as well (Keefe, 1988). Riding & Rayner (1998) describes learning style as "an individual's preferred approach to organising and presenting information", which emphasized the individualisation of learning style. Griggs (1991) describes learning style as characteristics of cognitive, effective, and psychological behaviours that serve as relatively stable indicators of how learners perceive, interact with, and respond to the learning environment. Gregorc (1979) suggested "distinctive behaviours which serve as indicators of how a person learns from, and adapts to his/her environment, and provide clues as to how a person's mind operates".

An understanding of learning styles is a part of the basis of designing for quality teaching. Observing and analysing cultural difference in learners' behaviours lead to definitions of learning style. Many researches have identified the differences of learning style among students (Entwistle, 1981; Ford, 1995; Jonassen & Grabowski, 1993; Schmeck, 1988), while others also have reported the relevance between the differences and students' cultural backgrounds (Dunn, et al, 1990; Dunn, R., & Griggs, S. A. 1995).

There is empirical research evidence which suggests that learning in matched conditions, in which instructional strategy is matched with students' learning

styles, may in certain contexts be significantly more effective than learning in mismatched conditions (Entwistle, 1981; Ford, 1995; Pask, 1976; Jonassen & Grabowski, 1993; Schmeck, 1988). Further, Guild (1994) suggests that educators should be reminded of the connection between national culture and the learning styles of their students, i.e., some learning styles are more or less likely to be found among individuals from a particular culture.

E-learning environments have provided flexible opportunities for various groups of learners that have no barriers of time and place. How to enhance the quality of e-learning has further been the objective that educators and researchers have paid attention to. Researchers have suggested that learners' personal characteristics and preferred cognitive styles are influential on their studies in an e-learning environment (Coggins, 1988; Sampson & Karagiannidis, 2002; Graff, 2003). Compared to campus-based learning, self-directed learning is the main learning approach in the e-learning community. Learners' personal characteristics, therefore, may particularly impact on their achievements (Coggins, 1988; Ackerman & Woltz, 1994).

2.1.3.2 Cultural Difference in Teaching and Learning

Cultural difference in teaching and learning is about the roles and relations of teachers and learners, about appropriate teaching and learning styles and methods, about the use of textbooks and materials, and about what constitutes good work in classrooms (Jin & Cortazzi, 1995).

The cultural differences can be traced to educational thought and goals between the culture of the East and the West. Confucian philosophical thought and educational thought have been deeply rooted in the community in China for two thousands years. In China, success is evaluated by the principle of collectively as standard, attaching importance to collectivity, and seeking introjections between individuals and the collective. One's personal interests should be subordinated to the interests of the collective and country. These characteristics of culture

evolved obvious differences in many aspects of education between Western culture and Chinese culture.

The attitudes towards education and learning relate to both personal development and societal development in East Asian countries (Lee, 1996). Some researches also revealed that in Confucian Heritage Culture, which mainly refer from mainland China, Hong Kong, Singapore, students score higher than Western students on measures of deep motives for learning, task value, intrinsic as well as self, social and economic aspects of extrinsic goal orientation (Volet, Renshaw & Tietzel, 1994; Volet, 1999). Education was exclusive. The aim was to create successors for the ruling class. Although it has changed in many aspects in the current educational system in China, for the individual, to be educated is still a route to higher status in society and a good economic income. On the other hand, success in individual situations such as academic work and career for Chinese students is not only an achievement for themselves but related closely to their families.

Different attributions for success and failure exist between Oriental students and Western students. Chinese children are taught to be obedient, to conform, and to persist even before they arrive at school. Therefore, in Chinese students' opinion, success is the result of effort, and failure caused by lack of effort, but ability does not play a very important role. Westerners consider ability as more important than effort in accounting for success and failure (Hess & Azuma, 1998; Holloway, 1988). Hua and Salili (1991) reported that Hong Kong secondary students arranged the attributions of academic success in order as effort, interest in study, study skill, mood, and lastly, ability. The Chinese students work hard, generating multiple approaches to a solution, explaining the rationale behind their methods, and making good use of wrong answers (Stevenson & Stigler, 1992).

Teachers and students play roles at the two sides during the process of teaching and learning. However, people from various cultures may not share similar expectations of teacher and student role (Hofstede, 1986; Mccargar, 1993). As an example, Jin and Cortazzi (1998) compared the responses of 129 Chinese students and 205 British secondary school students on a variety of attitudinal items relating to their perceptions of a good teacher and a good student as well as to reasons for different types of student behaviours. Chinese students were significantly more likely than British students to define a good teacher as: someone with knowledge, someone who sets a good example, and someone who teaches students about life. British students were significantly more likely than Chinese students to define a good teacher as: someone who arouses the students' interests, helpful, explains clearly, is sympathetic to individual students, and organises a variety of classroom activities. In terms of what characterises a good student, Chinese respondents were significantly more impressed than British students by students who respect the teacher, study independently, develop a good character, answer the teacher's question, ask questions during and after class, and prepare for the class in advance. British student in contrast saw a good student as someone who learns from others and pays attention to the teacher. In terms of interpreting why some students do not ask questions in the classroom, Chinese student suggested that it might be that the students can find the answer themselves. British students in contrast felt that this was a reluctance based on fear of peer disapproval (afraid others may laugh, afraid of making mistakes) or just not being interested enough to bother. Clearly these differences profoundly affect the decisions made in a online course-support site in terms of types of student activities, the role of the instructor, and what sorts of communication to expect from students.

There may be preference for teaching methods in different cultures. Stigler and Hiebert (1999) reported the differences of teaching methods in three countries (Germany, Japan, and the US) in the book "The Teaching Gaps". The authors propose three "mottos" for describing the main characteristics of a lesson in each

country. For a German lesson, the motto is "developing advanced procedures"; for a Japanese lesson it is "structured problem solving"; and for a US lesson it is "learning terms and practising procedures". Adding flesh to these descriptions, the main aim of Japanese mathematics lessons appears to be conceptual understanding through problem solving with the students having much of the "control". Conceptual understanding is also a major aim for German lessons, but the "control" remains very much with the teacher. In contrast, the major aim in the US lessons appears to be acquiring techniques and algorithms. The lesson illustrations given in the book strongly substantiate these characterisations, and the authors claim that they are highly typical. Indeed, the authors describe the mental picture of the teaching pattern within each culture as a kind of "teaching script".

Learning is essentially a social activity. Social relations among learners and between learners and instructors are tremendous influences on forming learning behaviours. According to Hofstede's (1984) four-dimensional model of cultural differences, there is usually a strict hierarchy between teacher and students in high Power Distance society. Students were reluctant to ask questions, raise objections, criticize existing knowledge, or argue with their teachers (Ballard & Clanchy, 1984, 1991, 1997). The high Power Distance exists in the social life of China and impacts deeply on teaching methodology. Chinese teachers are seen as guides who direct the correct way to students not only in schoolwork but also in their outlook on life. As a contrast, Western teachers identify whole class teaching with lecturing. The interaction of teacher-student is based on students having respect for their teacher in China. This happens in a classroom, where there is usually strict order. The students speak up only when invited to do so and the teachers are not contradicted. Teachers have absolute authority and cannot be challenged in the classroom. The results of a survey, which involved around 20,000 students in all of China in 1999, showed that there were 65% of Chinese students who thought that it was unacceptable to argue with their teachers in the classroom (He, 2001). Following the guidance of the teacher and

syllabus is encouraged, and teachers always arrange everything for students. Students tend to rely on their teachers and learn dependently. In contrast, teachers in a lower Power Distance society treat their students as equals and encourage critical thinking by them. Independent learning is much more respected.

Dunn and Griggs (1995) indicated that cultural values influences the socialization practices of all ethnic groups, which in turn will affect the preferences of students learning. One very distinctive difference between westerners and non-westerners is the approach towards individual competition vs. group cooperation. Tang (1993) described that Chinese students tend to work collaboratively, to seek each other's cue-perceptions and views on how to handle their learning tasks. Spontaneous collaboration is not cheating, but a collectivist attempt to share knowledge and do the best job possible. Interestingly, when Westerners collaborate, individuals put in less effort than when working individually, whereas Chinese work harder in groups (Gabrenya et. al., 1985). It is possibly a reason that public opinion for a person in his/her group is extremely important for the Chinese. The acceptance of peers is a sign of success in many situations and it might cause a stimulation for working better. Consequently, these spontaneous collaborative learning practices positively impact on students' academic achievements.

Each specific learning context has its own unique culture of learning with some explicit but also tacit rules and expectations. These actually provide subjective criteria for evaluating what are appropriate learning behaviours in the context (Volet 1999). In Germany, which is a strong Uncertainty Avoidance society, students used to learn in structural situations, such as precise objectives and a strict timetable. They may prefer one correct answer during studying, according to Hofstede (2001). Enigmatic academic language is preferred as the sign of knowledge. German students even believe that "anything which is easy enough for them to understand is dubious and probably unscientific" (Stroebe, 1996). In

contrast, students from a weak Uncertainty Avoidance society prefer open-ended learning situations and believe that any question has more than one answer. Originality is the characteristic they respect (Hofstede, 1984).

2.1.3.3 Cultural Difference in E-learning

For two decades, there are and have been many changes in situations of education, especially using computers to enhance or aid learning. Cross-cultural learning situations have emerged, and some perplexities or confusions have appeared. E-learning has been applied in the global educational and training market. Online learning materials are often offered to international learners who may hold different cultural backgrounds. It has become crucially important to acknowledge cultural diversity and different perspectives in e-learning. If the pedagogical values of online learning material are culturally inappropriate to one culture, students might question the knowledge (McLoughlin & Oliver 2000). Students may doubt the merit in participation, or worse, feel disenfranchised if the resources do not fit their world view (ANTA, 2002).

Collis (1999) argues that culture as an affecting factor of the acceptance, use, and impact of online learning system appears at different levels: society, organization, group, individual, and the discipline as the subject area. Table 2.1 shows the different levels and descriptions.

There have been some studies done, which have supported the assumption that students from different cultural backgrounds think and use computer-based technologies differently. Owens (1998) in his study found that there were significant differences in computer technology used by students due to their ethnicity and gender. He focused on gender and ethnic related differences in technology use amongst students in secondary schools science and mathematics classrooms. A large number of tenth grade students (15,577) completed surveys. The students came from African American, White American and Hispanic backgrounds. The findings showed that male students reported they used the

computer more than females in science and maths classes. The female students reported they used the calculator more than males in maths classes. African American students reported using computers more often than Hispanic and White American students in science and science classrooms, because they received more help from teachers to raise their academic levels. Also White American students reported using calculators more often than Hispanic and African American students. Brosnan and Lee (1998) also reported their findings of gender differences in computer attitudes and anxieties between students in the United Kingdom and Hong Kong.

Table 2.1 Cultural levels for e-learning system (adapted from Seufert, 2002)

Cultural Level	**Descriptions**
Society	General culture of the society, formative societal culture as an ethnic group (e.g. religion, language, values, norms, attitude). Educational system
Organization	The culture of a organization in which learning takes place (e.g. formal educational institution, informal learning at workplace) Learning culture includes rules in the organization, circumstance in school, classrooms, etc.
Group	Group culture: group norms, values and attitudes, which affect learners' behaviours in the group work Type of group task: decision-making, role play (Watson, et al 1994) Group size and member proximity
Individual	Individuals: instructors, learners, and designers of online learning materials who carry the culture influenced by society, organization, and group they are in Personal characteristics, attitudes towards information technology, online communication, one's preferred learning style
Discipline/Domain	Subject related culture: differences in acceptance of computer-media communication within course, e.g., more appropriate for social sciences and less for technical sciences (Sheddick & woolgar, 1994)

Branden and Lambert (1999) who researched the influence of culture on open and distance learning, found that people form culture based attitudes towards the use of technology. From their research on the framework of the European Open University network project, they noted cultural differences between larger European regions regarding technology use in education. For example, those

from northern and western European countries preferred studying with computers whereas those from South and Central Eastern European countries felt a high competence was needed for studying with computers and preferred to study in small groups.

Chen et al (1999) focused on cultural considerations in the design of online learning environments in Singapore and found some interesting cultural patterns amongst Singaporean tertiary students. With use of data collected from field notes of project group activities, interviews with students, on-line conversation logs, minutes of meetings and student journals, they noted that in online collaboration students valued trust building with the mentor. They found that dialogue was facilitated well due to the design taking into account the local cultural context. They also found the practice of anonymous identities in online communication was not a help but a hindrance to communication in the Singaporean culture. This led them to emphasise that "social and cultural understandings need to be explicit and up-front, before participants are able to build the online networks of trust upon which effective communication and learning is based" (Chen 1999, pp.228).

Chin, et al. (2000) investigated the effects of cultural background of tertiary learners and their perceptions of web based learning with the use of a survey type of questionnaire. They found that Anglo Saxon students felt more confident and had lesser difficulties than Asian students. Such differences they suggest call for a more differentiated approach in web based learning in culturally diverse learning contexts.

Liang & McQueen (1999) investigated the experiences of 18 adult learners from different cultural backgrounds when learning with the Internet through the use of surveys, interviews and observations. Regarding student expectations about the teachers they found that most of the Asian students believed that the teacher should offer more information instead of waiting for students to request this and

preferred more teacher direction. Western students on the other hand preferred more interaction amongst students.

The above studies which used quantitative methodologies like surveys (Branden & Lambert, 1999; Chin, et al., 2000; Owens, 1999), bring forward the issue that diversity of attitudes and behaviours regarding learning with computers exist between learners with different cultural backgrounds. It has also happened that some e-learning systems encountered rejection by learners as failing to meet their special needs in different cultures (Russo & Boor 1993). It also has been noticed that there are high-drop out rates in online courses. One of the major reasons for unsuccessful completions is the lack of cultural adaptation (ANTA, 2002).

Russo & Boor (1993) narrated an example. A French company (LYRE) developed learning software that allowed students to analyze a poem from given different viewpoints. The software did not enable students to add their own viewpoint, only use the viewpoints that the teacher had previously added. This learning software was successfully used by French students but was complained of by Scandinavian students. In the Scandinavian countries, independent discovery is greatly valued. The software was unacceptable during application, because it did not allow them to add their own viewpoints to the application.

In e-learning systems, cultural effects exist not only between learners and teachers, learners and peers, but also learners and developers who develop the online learning materials. The design of online learning materials is not culturally neutral, but instead is always based on a particular cultural context and developers' perspective towards the education. Disregarding cultural diversity may cause a failure of the production of learning.

2.2 *Pedagogical Theory in E-Learning Design*

2.2.1 Pedagogical Theories and Social Context

"Learning is an integral and inseparable aspect of social practice" (Lave & Wenger, 1991). Pedagogical theories have explained the importance of social and cultural surroundings on human learning, both Constructivism and Behaviourism, which are two main schools of pedagogic theories.

Constructivism is derived from the ideas of cognitive theory, e.g. Piaget (1970), Blumer (1969) and Vygotsky (1978). They suggest that children actively construct knowledge and this construction of knowledge happens in a social context. The most fundamental assumption of constructivism is that knowledge does not exist independent of the learners; knowledge is constructed. Learning is a process in which the learner actively constructs or builds new ideas or concepts based on current and past knowledge. Knowledge is constructed through social interaction and re-organized in the learners' mind. Vygotsky's (1978) concept of the Zone of Proximal Development (ZPD) explained the importance of social interaction for psychological development. ZPD is "the distance between the actual developmental level as determined by independent problem solving and the level of potential development as determined through problem solving under adult guidance or in collaboration with more capable peers". According to the approach of constructivism, the teacher acts as a facilitator who encourages students to discover principles for themselves and to construct knowledge by working to solve realistic problems, usually in collaboration with others. A learner's knowledge is grounded in the perception of their physical and social experiences, which are comprehended by the mind (Jonasson, 1991). Constructivism emphasizes the learner's cognitive processes, self-reflective skills, and the learning process itself (Vrasidas, 2000).

Behaviourist learning theory emphasizes the relationship between observable stimuli and responses, and the changes in behaviour. The theory of behaviourism

focuses on the study of overt behaviours that can be observed and measured. Behaviourists, e.g. Skinner and Pavlov, believed that the environment directly shapes behaviour, and complex learning requires a series of small, progressive steps. Behaviourism views learning as a sequence of stimulus and response actions in the learner. They reasoned that teachers could link together responses involving lower-level skills and create a "chain" of learning to teach higher-level skills. The teacher would determine all of the skills needed to lead up to the desired behaviour and make sure students learned them all in a step-by-step manner (Roblyer et al., 1997).

Both of the two pedagogical theories emphasize the influence of environment on learning and the importance of interaction between learners and environment during the learning process.

There are three types of interaction between learners and the environment of education: learner and teacher, learner and peers, and learner and content (Moore, 1989). Learning occurs when learners interact with some learning content whether learning is defined as change in behaviour, creation or modification of cognitive structures, or the construction of shared meaning and whatever media that present learning content is, e.g. books, videotapes, or computer programs (Vrasidas 2000). "Cyberspace itself has a culture and is not a neutral or value-free platform for exchange" (Chase, Macfadyen, Reeder, & Roche, 2002). In e-learning environments, this interaction especially includes computer-mediated communication and accessing digital learning resources, which is a more primary form of interaction.

2.2.2 Instructional Design Strategies

There is a difference between learning in the natural world and learning in the constructed situation of formal education. Learning from everyday experience is serendipitous and situated by context. In an academic environment, learning is

intentional activities. What is to be learned is prescribed and how it is to be learned is carefully structured. Laurillard (1993) describes formal education as that: "academics want more to be learned than that which is already available from experiencing the world. The whole point about articulated knowledge is that being articulated it is known through exposition, argument, interpretation; it is known through reflection on experience and represents therefore a second order experience of the world". The question is how this intention can be achieved through well organised processes or systems.

2.2.2.1 Constructivist View of Learning

In the view of constructivism, learning is an active process in which learners use sensory input and construct meaning out of it (Piaget, 1970 and Vigotsky, 1978, among others). Constructivism theory currently focuses on all the components in the system, in particular on what a student does in a learning process, and how that relates to teaching. Constructive alignment is designed by Biggs (2003) with the notion that a learner constructs his or her own learning through relevant learning activities. Biggs argues that the teacher's job is to create a learning environment that supports the learning activities appropriate to achieving the desired learning outcomes. The key is that all components in the teaching system – the curriculum and its intended outcomes, the teaching methods used, the assessment tasks – are aligned to each other. All are tuned to learning activities addressed in the desired learning outcomes.

Based on Biggs (2003), there are two aspects in the constructive alignment. The 'constructive' aspect refers to the idea that students construct meaning through relevant learning activities. 'If students are to learn desired outcomes in a reasonably effective manner, then the teacher's fundamental task is to get students to engage in learning activities that are likely to result in their achieving those outcomes' (Shuell 1986). The 'alignment' aspect refers to what the teacher does, which is to set up a learning environment that supports the learning activities appropriate to achieving the desired learning outcomes.

The basic premise of the alignment system is that the curriculum is designed so that the learning activities and assessment tasks are aligned with the learning outcomes that are intended in the course. This means that the system is consistent.

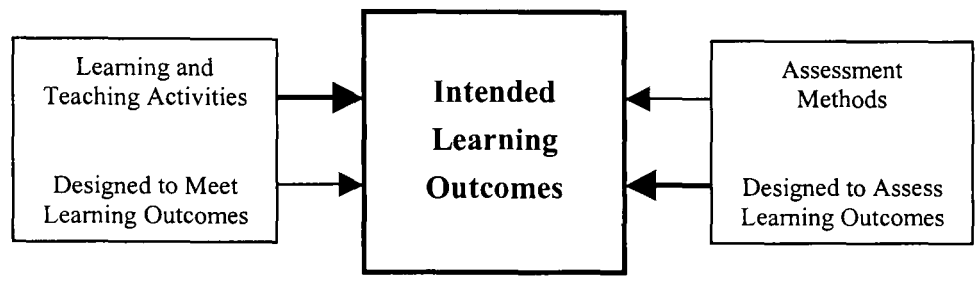


Figure 2.1 Aligning learning outcomes, learning and teaching activities and the assessment (adapted from Biggs, 2003)

In setting up an aligned learning system, Biggs concludes a process with four major steps:

1. Defining the intended learning outcomes (ILOs);
2. Choosing teaching/learning activities likely to lead to the ILOs;
3. Assessing students' actual learning outcomes to see how well they match what as intended;
4. Arriving at a final grade.

Within the constructivist paradigm, the accent is on the learner rather than the teacher. Tyler (1949) has described it clearly 60 years ago.

> "*Learning takes place through the active behaviour of the student: it is what he does that he learns, not what the teacher does.*" (Tyler, 1949, p.63)

Therefore, the question turns to what learning activities might best be appropriate for achieving the intended learning outcomes.

2.2.2.2 Laurillard's Conversational Framework for Learning Activities

Diana Laurillard develops the conversational framework (Figure 1) in her book *Rethinking University Teaching: A Framework for the Effective Use of Learning Technologies* (1993, 2002), and redraws it in the chapter 'Pedagogical forms for mobile learning: framing research questions' in the book *Mobile Learning: towards a research agenda* (2007). The form of Laurillard's framework defines a dialogic process between 'teacher' and 'student' at two levels, the discursive level and the experiential level. Both levels are interactive. At the discursive level, the focus is on theory, concepts, and description-building. The interaction takes a communicative form – the teacher describes, the student asks questions, the teacher elaborates, and the student states their own idea or articulation of the concept. At the experiential level, the focus is on practice, activity, and procedure-building. The interaction is adaptive, where the student is acting within some practical environment to achieve a goal, and experiences the results of their action as changes in that environment, enabling them to see how to improve their action. This teaching-learning process is an iterative 'conversation'. The student adapts their actions in the light of the theoretical discussion and enhances their understanding of the concept by reflection on their experiences. Similarly, the teacher constructs a suitable learning environment and modifies it as feedback for the student's performance and reflection. There are also conversations that link students with each other through the learning process in the framework.

The conversational framework supports a complete learning process and therefore provides a way of analysing what learning activities the learning process involves in an e-learning environment and further examining cultural diversity on these activities in a systematic way.

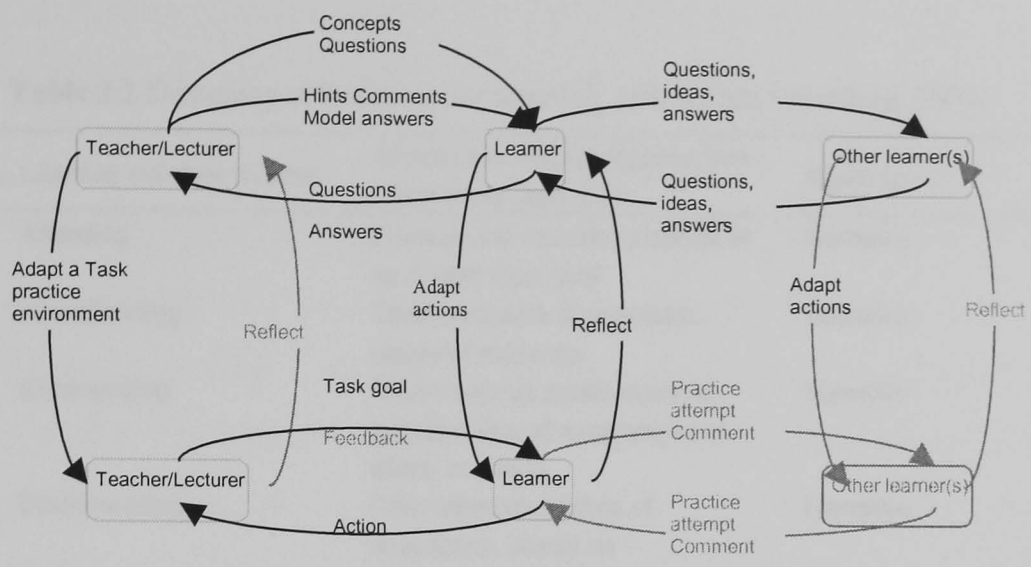


Figure 2.2 The conversational framework adapted from Laurillard (2002)

Based on the conversational framework, Laurillard identifies five media forms: narrative, interactive, communicative, adaptive and productive. According to Conole and Fill (2005), "Narrative media tell or show the learner something (e.g. using text or image). Interactive media respond in a limited way to what the learner does (e.g. search engine, multiple choice test, and simple models). Communicative media facilitate exchanges between people (e.g. email, discussion forum). Adaptive media are changed by what the learner does (e.g. some simulations, virtual worlds). Productive media allow the learner to produce something (e.g. word processor, spreadsheet)." Laurillard argues that each form of educational medium has its "essential pedagogical characteristics" (2002, p89) and best supports different kinds of learning activities in terms of the conversational framework. Table 2.2 summarizes the learning activities and affordances of the media forms.

From the viewpoint of instructional design, the conversational framework provides a systematic way to observe the cultural influences for learning design.

Table 2.2 Designing affordances for learning, (cited from Laurillard, 2002)

Learning activities needed	Affordances (design features that afford those activities)	Media forms
Attending	Describe the narrative in terms of an overall topic goal	Narrative
Apprehending	Clarify structure of argument, nature of evidence	Narrative
Experiencing	Offer vicarious experiences or supplantation of experiences of ideas, concepts	Narrative
Discriminating	Offer alternative forms of description, based on misconceptions and misrepresentations identified in learning needs	Narrative
Articulating	Encourage student's articulation of conceptions and perspective	Communicative Productive
Challenging conceptions	Generate the questions and exercise that will elicit likely misconceptions, or representational difficulties	Communicative
Clarifying internal relations	Create environment for actions with intrinsic feedback	Adaptive
Experimenting	Define the goals against which students can compare the intrinsic feedback to modify their next action	Adaptive
Relating experience to theory	Refer to prior experiences of interacting with the world that students should reflect on to appreciate the points being made	Narrative
Investigating, analysing	Offer student the means to select or negotiate their own task goal	Interactive
Reflecting on experience	Generate questions on topic goal that require students to use their experience at the interactive task level	Communicative Productive
Relating theory to practice	Develop goals and activities at interactive level that require students to use their knowledge of the theory	Interactive Adaptive
Synthesising	Ask students to reflect on the comparison between theirs and the teacher's conceptions, and on goal-action-feedback cycle	Productive

2.2.3 Models and Guidelines for Learning Design to Accommodate Cultural Differences

Biggs (2003) describes that task of good pedagogical design as one of ensuring that there are absolutely no inconsistencies between the curriculum we teach, the teaching methods we use, the learning environment we choose, and the assessment procedures we adopt. It has also led to the belief that in designing learning with the use of computer-based technologies, cultural differences of learners and its influence on learning need to be taken into account. Consequently various guidelines and models have been proposed for the design of learning for students from different cultural groups for both learning in general and learning with computer based technologies.

One research stream is to concentrate on cultural design approaches which are based on a pedagogic model of interactive learning systems extended by cultural dimensions. Reeves (1993) identifies 14 pedagogic dimensions of interactive learning. It proposes a multidimensional approach which reflects the contrast between objectivism and constructivism for the positioning and judgement of interactive learning systems. The dimensions do not provide an inventory of things to do and not to do; rather, they give a valuable framework for judging the pedagogic worth of the instructional design of e-learning materials.

Based on Reeves' 14 pedagogical dimensions of computer-based education, Henderson (1996) presents a cultural pedagogical model through adding a multiple cultural contextuality dimension (Figure 2.3). The multiple cultural contextuality affects all dimensions and all points along the continuum of each dimension and ranges from 'not incorporated' to 'actioned'. All the dimensions and continuums are social constructs and have meaning because of the selective and academic traditions in which they are situated. Therefore, various cultures preserve their identities and can adapt the system to their cultural environment. For different cultural groups contrary endpoints of the dimensions could be appropriate. Henderson's multiple cultural pedagogical model of interactive

multimedia instructional design makes the 'centrality of multiple cultural context obvious' (Henderson, 1996). In this model, the multiple cultural perspectives is added into an eclectic paradigm, so that different cultures maintain their identities and can adapt the system to their culture's environment of learning.

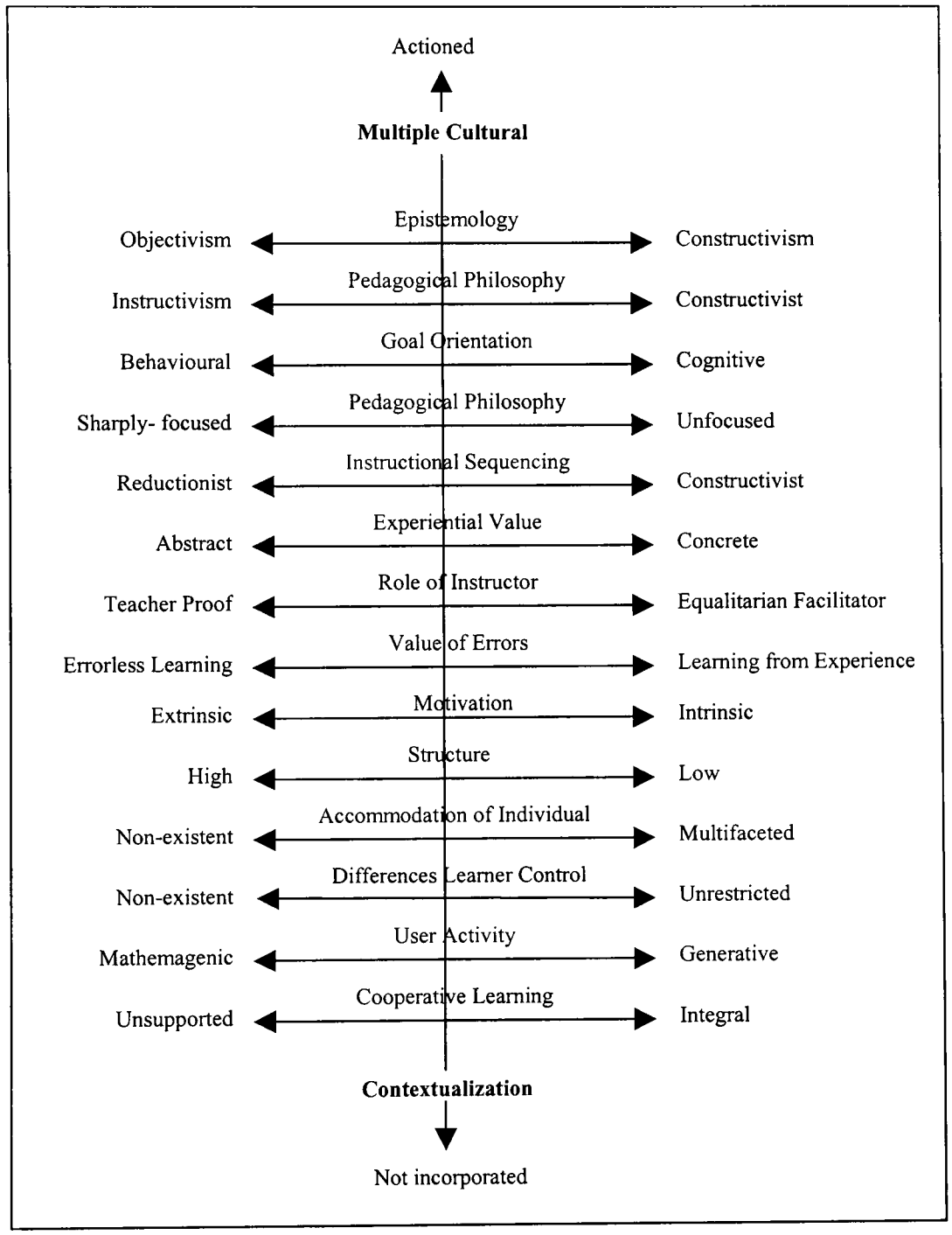


Figure 2.3 multiple cultural pedagogical model of interactive multimedia instructional design (adapted from Henderson, 1996)

The other work of designing for cultural differences is Collis' (1999) dimensions which are sensitive to cultural-related differences in terms of the acceptance, use

and impact of computer-related learning resources. The dimensions set the cultural-related variables at the instructional, instructor, and student levels as show in Table 2.3. Collis points out that a web-based course-support system must be designed to anticipate user choices about a large number of variables, each of which have different optimal values in different cultural settings.

Table 2.3 Dimensions sensitive to culture-related differences in terms of the acceptance, use and impact of computer-related learning resources (adapted from Collis, 1999)

Dimensions	Cultural Sensitivity
Group size, member proximity, task type, in relation to softer system to support group collaboration	Egalitarianism, non-critical acceptance of ideas, decoupling thoughts and their provider, and levelling of status guide Western designers of group-support systems; such assumptions are different for Asian cultures (Watson et al., 1994)
Pedagogic philosophy subject-area disciplines, deep and surface learning, horizontal and vertical communication	A deficit model (ie, the learner begins with a deficiency in terms of lack of pre-defined knowledge) vs a social-participative model (ie, the learner learns through communicative interaction with others) vary by national and institutional culture and are also discipline-related; "Surface" learning relates to a deficit model while "deep" learning to a social-participative model; Horizontal (communication between students) vs Vertical communication (between instructor and students) vary in appropriateness in different cultures (Jin and Cortazzi, 1998; Sheddick and Woolgar, 1994)
Language, visual aspects of the user interface	Language involves also differences in acceptable tone and style of communication, and in understanding of interfaces and neologism; Icon recognition and response to the design and layout of the user interface varies among cultural groups (Griffiths et al., 1994; Mirshafiei, 1994)
Infrastructure differences, access differences, technology-skill differences	Groups of potential users differ in terms of the network and support infrastructure available to them and also in the amount of competence and comfort they have with technology use (NODE, 1998)
Responsibilities of learners, instructors; teaching-styles, student behaviours	Cultural differences in perception of appropriate allocation of responsibilities between students and instructors; in appropriate teaching styles and forms of student behaviour (Collis and Remmers, 1997; Ikuta et al., 1998; Jin and Cortazzi, 1998)
Human-computer interaction	Cultures differ on willingness to accommodate new technologies, acceptance of trail-and-error in terms of computer use, differences in expectations for technical support, preferences for precision vs

	browsing, preferences for internal vs system instructor control, differences for tolerance of communication overlaps and interrupts (Nakakoji, 1993)
Institutional aspects such as requirements for examinations, timetables for course participation, prerequisites for course, accreditation requirements, locations for course participation	Operational practices become associated with institutional culture, "doing things differently" becomesnot acceptable or suspect in terms of quality (Borremans, 1996; Collois, 1998a)

Other guidelines and models, which have been seen in literature, include how to create WWW based course support sites for cultural inclusivity (McLoughlin and Oliver, 2000); how to design sites for use in local cultures (Chen, Mashadi et al, 1999); how to design culturally inclusive online learning environments which can be culturally inclusive in accordance with constructivist principles (Holzl, 1999); and how to evaluate computer based learning resources for cultural sensitivity (Reeves, 1997).

With these guidelines and models it would be hoped that the needs of learners from different cultural backgrounds would have been accommodated in the design of online learning environments and educational software. The fact is that this does not seem to the case (Henderson, 1986). Henderson (1986) outlines a number of reasons for this. Firstly, designers often have a status of unintentional cultural blindness or adopt a culturally homogeneous approach to design. This leads to exclusion and silencing of issues of cultural contextualization and the universalization of a dominant groups knowledge and culture. Secondly, the issues of multiculturalism, cultural diversity, and cultural pluralism cause feelings of general controversy. This leads designers to adopt avoidance strategies which result in deracialization. Thirdly, there is not much significance provided to cultural context in learning theories that direct instructional design. This leads to e-learning systems in which a user has no identity other than that of 'the learners'. The other reasons might come from perceptions of multiculturalism in e-learning systems. Certain disciplines, for example, are culturally neutral like mathematics. Designers who hold this perception would

ignore in their design the different educational attitudes and learning styles in other cultures.

This section reviewed studies regards to e-learning design guidelines for cross-cultural situations. However, it seems that they cannot be used directly to support learning object design because of its unique characteristics, such as granularity and reusability. The design and development of learning objects is discussed in next section to clarify the extent to which cross-cultural issues are addressed.

2.3 Learning Object Design

Learning object design combines technical approach and pedagogical approach. Each of them focuses on one important aspect of learning objects. The cultural reference model developed in this study needs to address cross-cultural issues in both aspects.

2.3.1 The Technical Approach of Learning Objects

Learning technology interoperability standards and specifications are designed to facilitate the description, packaging, sequencing and delivery of educational content, learning activities and learning information (Campbell, 2003). Reusable learning objects need standards to "facilitate search, evaluation, acquisition, and use of learning objects" (LOM, 2002) between various e-learning environments. The work of standardization has attracted a number of major organizations, and some standards and specifications have been provided, e.g. Learning Object Metadata from IEEE (2002), IMS Learning Resource Metadata Information Model from IMS (2001), and Shareable Courseware Object Reference Model (SCORM) from ADL. These organizations have created technology standards that have been widely used in the packaging and delivery of reusable learning objects.

The technology standardizations offer a technical basis that enable interoperability across different e-learning systems. With standardized

descriptions, the learning objects that are stored in a repository can be located and retrieved. The basic principle of the standards is to attach a package of extra information to learning objects. It consists of the data to describe the attributes and structure of the learning object and provide a possibility to "understand" the purpose of the learning object and to search for or invoke them automatically in a repository by software agents. The facilities of standards was described as: "The association of standardized descriptive metadata with network objects has the potential for substantially improving resource discovery capabilities by enabling field-based (e.g., author, title) searches, permitting indexing of non-textual objects, and allowing access to the surrogate content that is distinct from access to the content of the resource itself" (Weibel & Lagoze, 1997, p.176).

To facilitate search, evaluation, acquisition, and use of learning objects by learners or instructors or automated software processes, the IEEE Learning Technology Standards Committee (LTSC) authorized the IEEE Standard for Learning object Metadata (LOM) in 2002. The other purpose of LOM is also to facilitate the sharing and exchange of learning objects, by enabling the development of catalogs and inventories while taking into account the diversity of cultural and lingual contexts in which the learning objects and their metadata are reused (LTSC, 2002).

LOM defines basic metadata structure into nine categories, each of which is grouped by data elements to describe a learning object:

- General: consist of context-independent features of the learning object, like Identifier, Title or Language (human language).
- LifeCycle: consist of features related to the life cycle of the learning object, like Version, Status, or Evolution.
- Meta-MetaData: indicate the origin and edition of the metadata rather than the learning object.
- Technical: indicate technical features of the learning object, like Format, Size, Location, or Requirement.

- Educational: indicate educational or pedagogic features of the learning object:

    - Pedagogical Type: the pedagogical type of the resource (Active, Expositive, Undefined);
    - Pedagogical Classification: classification according to a pedagogical theory;
    - Courseware Genre: the specific kind of the resource (Hypertext, Video Clip, Exercise, etc.);
    - Approach: pedagogical approach used in the resource (Inductive, Deductive, Exploratory);
    - Granularity: the relative size of the resource (Course, Unit, Lesson, Fragment);
    - InteractivityLevel: level of interactivity between an end user and the resource;
    - SemanticDensity: ratio of content over size or usage time;
    - EducationalUse:
        - Role : normal user of the resource;
        - Description: comments on how the resource is to be used;
        - Prerequisite: course or capabilities required from the end use;
        - EducationalObjective: intended learning result;
        - Level: target audience in terms of academic grade;
        - Difficulty: how hard it is to work through the resource relative to level;
        - Duration: approximate or typical time it takes to work with the resource;
- Rights: describes the intellectual property rights and conditions of use the learning object.
- Relation: consist of features of the learning object in relationship to other learning objects.

- Annotation: provides comments on the educational use of the learning object.
- Classification: indicate where the learning object belongs to a particular classification system.

This technical approach ensures the reusability of learning objects from the angle of technology. However its pedagogical attributes are limited in providing guidelines for the pedagogical design of learning objects. Dalziel (2002) argues that learning objects should represent "an educationally meaningful stand-alone unit" with metadata attached. This description, in turn, draws attention to the pedagogical attribute of learning objects.

2.3.2 The Pedagogical Approach of Learning Objects

From the viewpoint of pedagogy, the learning objects approach aims to support high quality learning by means of providing an effective e-learning resource. Duval et al (2004) claim "the use of learning objects promises to increase the effectiveness of learning ...". To achieve this, design of learning objects demands involving a pedagogical perspective. Pedagogical effectiveness of learning objects would diminish if only reusability was considered. The simple concatenation or sequencing of de-contextualized educational resources does not produce a meaningful context for learning (Wiley, 2003).

An effective instructional design is not driven by the advancement of technology. It has to be rooted in the sound pedagogical theories and appropriate instructional strategies. Constructivist theory relies on active learning, oriented to the acquisition of important knowledge and skills, to the solution of complex problems, to the focus on constructing knowledge rather than transmitting it, and to the development self-regulation abilities (Ausubel, 1963; Bruner, 1966a; Piaget, 1976). In this view, new knowledge is built up, based on the previously acquired knowledge, by means of personal reflection and social interaction, by analysing and combining experiences, by abstracting concepts and consciously

applying them to the solution of new problems (Dillenbourgh, 1999; Vygotsky, 1978). From this perspective a learning context should be involved in learning objects to provide meaningful learning activities.

However, the technical standardization approach does not tackle the pedagogical issue. There is not clear pedagogical concept of what a learning object is. This approach is also described as being "pedagogical neutral". Researchers (Allert, et al 2002; Wiley, 2003) have indicated the deficiency of pedagogical design in the approach of learning objects. Allert (2004) criticizes the notion of "being pedagogical neutral":

> "Note that these standards and specification failed in being pedagogical neutral. But there is no chance of being neutral as referring to an epistemological and ontological position is unavoidable. Defining the structure of metadata and specifying a conceptual data schema inevitably reflects a specific concept of knowledge and meaning." (Allert, 2004, p12-13)

This argument has attracted a lot of attention in the efforts of pedagogical design of learning objects for the provision of effective learning in recent years (Busetti, et al, 2005; Allert, H., Dhraief, H., Nejdl, W., 2002; Boyle, 2003, 2006; Koohang & Harman, 2007).

2.3.3 Design and Development of Learning Objects

Polsani (2003) proposed standards and specifications for developing learning objects, which includes three parts. (1) Technical Standards describing how selecting the technology of development should address the interoperability of learning objects and the physical structure to facilitate easy operation and delivery. He suggested that XML is the ideal developing language for achieving both purposes because it has such fundamental logic: separation of structure, content and presentation. (2) Editorial Requirements explaining that a common

terminology should be used for referring to concepts. (3) Stylistic Considerations emphasizing that appearance and style, such as colour, fonts, and layout of images and text, are extremely important for effective presentation of learning objects. This approach emphasizes the technical standards and physical implementation but fails in pedagogical design of learning objects.

Boyle and his colleagues report a learning object design approach that pays attention to both aspects of technology and pedagogy (Boyle & Cook, 2001; Boyle et al. 2003; Boyle, 2003; Boyle, 2006). The reusability is an essential characteristic of the concept of learning objects. A learning object must be constructed to support and enhance reusability. Fulfilling the reusability of learning objects in various e-learning environments requires a structure that is stand-alone. The object-oriented paradigm provides design principles that have direct relevance to create self-contained learning objects. These principles, called "cohension" and "decoupling", affect the selection of the educational goal, the structuring of the learning content, and activities to achieve that goal of a learning object.

The first step in the design of learning objects is to select a clear and distinct learning goal. The principle of *cohesion* – each unit should do one thing and one thing only (Sommerville, 2000; Pressman & Ince, 2000). This learning goal must minimize the learning object as a pedagogically meaningful unit. The cohesion emphasizes that the selection and organization of the learning content and activities should be focused on the learning goal. The principle of *decoupling* states that the unit (learning object) should have minimal bindings to other units. The content of one learning object should not refer to the content in another source to keep its self-contained structure.

Enhancing effective learning is the aim of learning objects. The pedagogical design that enables learners to achieve the desired learning goal is thus a central feature of learning objects design. The pedagogical approach in generative

learning objects (GLOs) developed by the Centre for Excellence in Teaching and Learning (CETL) in Reusable Learning Objects, is to use "pedagogical pattern" as a conceptual structure (Boyle, 2006). The pedagogical pattern is about an instructional approach that provides an explicit structure to assemble learning activities and tasks. Pedagogical patterns come from pedagogical theories and instructional strategies. One pedagogical pattern explicitly provides a base structure for one class (type) of objects.

According to Biggs' constructive alignment (see Figure 2.1), instructional design should align learning activities and assessment with intended learning goals; and the goals have to target learners' needs. Therefore, analysing learners' needs to set up a learning goal is the first step of the design of learning objects. The second step is to create learning content based on learning object paradigm (i.e., the principle of cohesion and decoupling). The next steps should be instructional design following a pedagogical pattern and implementation that technically and physically creates the learning object (Figure 2.4).

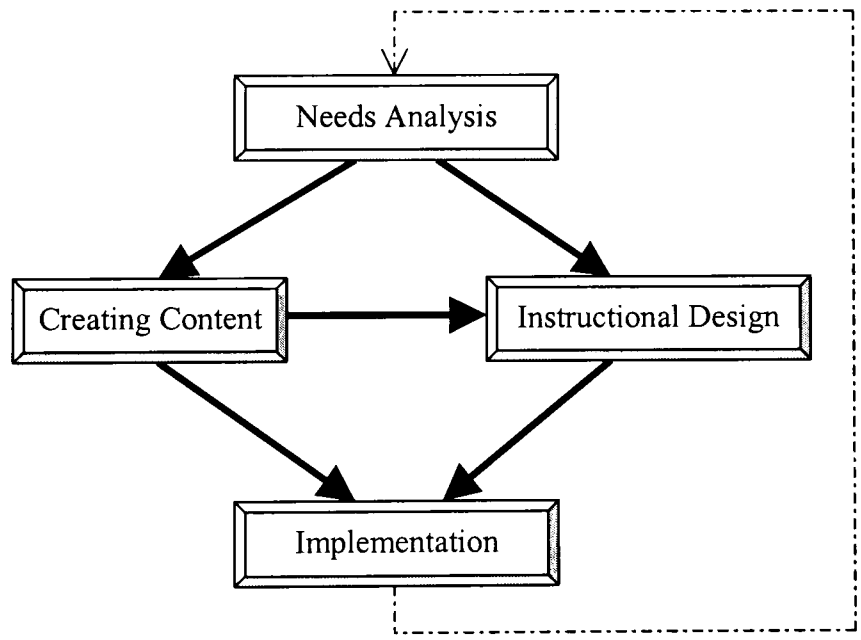


Figure 2.4 A conceptual structure of the design and development of learning objects

Figure 2.4 shows a conceptual structure of the design and development of learning objects. It describes the basic design stages. Each stage has its focus of attention. For example, the stage of creating content relates to knowledge domain

of learning content. The stage of instructional design focuses on the design of learning activities to meet the pedagogical requirement. The stage of implementation focuses on creating an effective interaction between learners and the learning objects based on available technology. These design stages provide a platform to which cross-cultural issue that affect the design and development of learning objects can be addressed.

2.4 Summary

This chapter reviewed literatures with regards to the issues that relate to the aim of this study. The influences of cross-cultural issues on e-learning design are complex, because there are many aspects of culture involved and they are often complex and subtle. These cultural issues, at social level, relate to social values, norms, and conventions that form learners' attitude towards teaching and learning. At organisational level, learners' learning style and behaviours are shaped by different learning environments. From the point of view of pedagogical design, fourteen dimensions are all culture-related (Henderson, 1996). From the point of view of e-learning design, the culture-related issues extend to the development and usage of the technology. A culturally sound instructional design needs to consider not only the designers' cultural background, but also that of the learners. Theoretical debates about cultural difference in learning behaviours (e.g., cognitive style, preferred learning approaches) between cultures still remain. Therefore, challenges of this study may arise under this situation.

Despite the difficulties, a lot of efforts have been made by educators and researchers to explore the influences of culture on e-learning design, which provide significant information for this study. The studies about pedagogical theory and the researches and practices of learning object design also provide foundation for this study to build the cultural reference model.

To cope with the challenge of this study, the next chapter will seek appropriate research methodology to build the cultural reference model.

3 Research Methodology

This chapter discusses research methods employed to develop a cultural reference model for the design and development of learning objects.

3.1 Research Design

In order to develop a cultural reference model, the emphasis of this study is on the process of design and development of learning objects seen from a cultural diversity point of view. A central issue that needs to be addressed is to identify culture-related elements that impact on design and development of learning objects. From this point of view, this study needs to elucidate what design factors are culturally sensitive, and which would influence the pedagogical effectiveness of the learning objects if they were reused in different cultural contexts. Once the culturally sensitive factors are identified, they need to be integrated with the process of the design and development of learning objects. Therefore, this study does not only focus on cross-cultural issues, but also deals with issues of instructional design and the software engineering paradigm. The characteristic of multi-discipline research causes the complexity of this study and, hence, demands multiple research methods in different research stages.

The first aim of the study is to identify culturally sensitive factors that may affect the design and development of learning objects. What social survey methods are available to the study for data collection? Questionnaire survey is the most common research method used by many researchers to investigate various aspects of cross-cultural situations in teaching and learning. Their popularity is founded on first-hand information and the speed with which results can be obtained without significant capital investment. However, the influences of culture on learning objects are complex. Because of the limit on length, one questionnaire cannot contain too many questions and not cover all aspects of the possible influences of culture on learning objects. For the feasible reason as well,

it is difficult to investigate personally the cultural differences over different countries, different educational institutions during the PhD study period.

For the complexity of the study, "cumulative" rather than "piecemeal" results (Evans & Benefield, 2001) of educational and cross-cultural researches need to be represented. Systematic review of researches, which has been developed in the health sector, provides a viable research method to effectively and efficiently collect useful data about cultural differences in teaching and learning for the aim of the study. The details about the systematic review are discussed in Section 3.3.

For reusable learning objects particularly, no literature had been found in the beginning of the study that reported researches of reusing learning objects in different countries and investigated cultural influences on the reuse. It is necessary for the study to undertake an initial empirical study to obtain a first-hand evidence of influences of culture on reuse of learning objects. The empirical study will strengthen the findings of this study by reinforcing the bedrock of data.

By the concern of the research methods, the process of developing the cultural reference model contains the following research stages:

- **Stage 1:** Elucidating influence of culture on reuse of learning object through a empirical case study

  In this empirical case study, a set of learning objects of Java programming were provided to Chinese students. Their feedback about the learning objects were collected and compared with ones from students in the UK. The case study provided empirical evidence about influences of culture on reuse of learning objects. Section 3.1 discusses more about the case study.

- **Stage 2:** Identifying culturally sensitive factors by means of systematic review

  This stage was the process of information gathering. Through a systematic literature review factors that may be culturally sensitive to learners with

different cultural backgrounds were identified. The systematic review is different with the literature review in Chapter 2. It is a qualitative research technique for gathering results of prior researches in a particular research area. The detailed method of the systematic review was discussed in the section 3.2.

- **Stage 3:** Building the cultural reference model

  The cultural reference model is grounded by the information gathering which provides a set of data that explicitly represented the culturally sensitive factors that may influence the design and development of learning objects. Based on these data, principles for dealing with the culturally sensitive factors are proposed. It starts with observing the dimensions of culturally sensitive factors and looking for a relation that can establish a set of common principles. Then, a framework that maps the culturally sensitive factors onto the process of design and development of learning objects is built. Finally, recommendations for each culturally sensitive factor are proposed.

- **Stage 4:** Evaluation of the cultural reference model

  The last stage is to evaluate the cultural reference model. In this study, multiple evaluation methods were employed. They are experts review with questionnaire data collection, one-to-one interview, and practical tasks. The detailed evaluation methods and results were reported in Chapter 7.

3.2 Empirical Case Study

The starting point of this study is national concern about the pedagogical effectiveness of learning objects as reusable learning resource to learners with different cultural background. Many cultural differences in the practice of e-learning have been observed and reported in literatures by educational practitioners and researchers. However, there was no practical research about cross-cultural reuse of learning objects to be found in literature up to now. Whether learning objects, as a "granulated" learning unit, contain cultural issues

that may affect the pedagogical effectiveness, or different cultural contexts have an impact on the reuse of learning objects, is not clear; perhaps both occur. Therefore, an empirical study is needed to answer the question.

According to Yin (1989, p23) a case study is an empirical inquiry that

- investigates a contemporary phenomenon within a real-life context, when
- the boundaries between phenomenon and context are not clearly evident.

Case study is defined by Robson (2002) as "a strategy for doing research which involves an empirical investigation of a particular contemporary phenomenon within its real life context using multiple sources of evidence". Benbasat, et al., (1987) argue that the case study method allows researchers to understand the nature and complexity of the process taking place; and valuable insights can be gained into new topics emerging in the rapidly changing information systems field.

Therefore, in order to gain an insight about how and what cultural factors influence the reuse of learning objects in different cultural contexts, an empirical case study was employed to examine aspects of cultural influences on reuse of learning objects in two countries, China and the UK. Detailed process and results of the case study will be discussed in Chapter 4.

Limitation of a case study method

The case study method focuses on a small number of organizations and seeks to understand the problem being investigated (Yin, 1989). It provides the opportunity to ask penetrating questions and to capture the richness of organizational behavior, but the conclusions drawn may be specific to the particular organizations studied and may not be generalisable (Gable, 1994). Lee (1989) identifies four corresponding problems with case study research, a lack of controllability, deductibility, repeatability and generalisability, where the latter two limitations stem largely from the lack of power to randomize (Kerlinger,

1986). While Lee goes on to defend the case study method suggesting that these problems are not endemic or insurmountable, they nonetheless remain relative to other research methods. Yin (1988) also suggests single case studies are appropriate if the objective of the research is to explore a previously un-researched subject, whereas multiple-case designs are desirable when the intent of the research is description, theory building, or theory testing.

To build a cultural reference model that intends to provide designers a cross-cultural perspective to design culturally adaptable learning objects, a single case study cannot offer a sufficient amount of cultural factors to measure the cultural diversity in reuse of learning objects in different cultural contexts. For example, only a few learning objects, which are usually of the same type and relevant topic, can be involved in one case study. The culturally sensitive factors examined through out the case study would be limited. However, there are many cross-culture researches on pedagogical design and e-learning design reported in literature. These findings should be combined in a way that could contribute valuable fundamental data to building the cultural reference model with a cross-cultural perspective.

Therefore, a systematic literature review as an important research method was employed in this study to identify culturally sensitive factors comprehensively.

3.3 Systematic Review

In the past decade, qualitative researchers have explored methods for synthesizing qualitative research findings conducted by different researchers in disparate contexts and using a variety of methods. These approaches were used to amalgamate, combine, or reinterpret qualitative research findings in the light of other qualitative work (e.g., Estabrooks, et al., 1994; Jensen & Allen, 1994; Paterson, et al., 2001; Schreiber, et al., 1997; McCormick, et al., 2003).

Much of the groundwork in developing methods for synthesizing the findings of qualitative studies has been conducted in the health and education fields. Within health care, the field in which the idea of the systematic review was first developed, these developments have been led by the growth of systematic reviewing as a tool for synthesizing evidence on the effectiveness of health care interventions (Khan, et al., 2001; Mays, et al., 2005; Atkins, et al., 2008). The NHS Centre for Reviews and Dissemination (CRD) published *Undertaking Systematic Review of Research on Effectiveness, CRD's Guidance for those Carrying Out or Commissioning Reviews* (Khan, et al., 2001) for the growing use of systematic reviews in health care. The qualitative research approach has been adopted in educational research (Evans & Benefield, 2001) and more recently in software engineering research (Beecham, et al., 2008; Dyba and Dingsøyr, 2008).

The CRD's Guidance defines a systematic review as a review of the evidence on a clearly formulated question that uses systematic and explicit methods to identify, select and critically appraise relevant primary research, and to extract and analyse data from the studies that are included in the review (Khan, et al., 2001). MacDonald (2000) suggests that systematic reviews of research:

> "*entail a series of techniques for minimising bias and error, primarily through the use of protocols which state, prior to the review being undertaken, what the criteria are which will guide the review, search strategies, inclusion and exclusion criteria, standards of methodological adequacy, the precise definition of the intervention in question, unbiased estimation of aggregate effect, and so on.*" (MacDonald, 2000, p.131)

Based on Evans and Benefield (2001), the key features of systematic reviews include

- an explicit research question to be addressed;
- transparency of methods used for searching for studies;

- exhaustive searches which look for unpublished and published studies;
- clear criteria for assessing the quality of studies (both qualitative and quantitative);
- clear criteria for including or excluding studies based on the scope of the review and quality assessment;
- joint reviewing to reduce bias;
- a clear statement of the findings of the review.

Systematic literature reviews locate, appraise and synthesise evidence from primary studies and provide a valuable source of information for decision-making. They provide empirical answers to focused questions about health care, education, criminal justice, social care, welfare policy, housing, transport and related issues (Davies, et al., 2000). Thomas and his colleagues (2004) suggest that assembling the findings of multiple primary qualitative studies using a systematic process may help generate more comprehensive and generalisable theory, or may add greater breadth and depth to existing systematic reviews of effectiveness by focusing on the views of those towards whom the interventions are directed. Harden and her colleagues (2004) also suggest that systematic reviews may provide insights into the reasons why interventions succeed or fail. Therefore, the approach of systematic reviews is employed in this study for gathering evidence about cultural issues that should be taken into account during the design and development of learning objects.

Systematic reviews differ from traditional reviews and commentaries produced by 'content experts' in that they adhere to a scientific methodology which seeks to minimise bias and errors (Khan, et al., 2001). The key difference between systematic reviews and the more common narrative or academic reviews is, as Slavin (1995) stressed, to be explicit about each aspect of a review. In the other words, systematic reviews tend to be more focused in their scope (Hart & Nolan, 1999), much clearer in reporting their search strategies or their criteria for including or excluding studies (Gillborn & Gipps, 1996), have more explicit

criteria for assessing the quality of the studies included (Hallam & Cowan, 1998) and generally make explicit their methodology for reviewing the studies included.

For example, Bassey (2000) has distinguished between 'academic' and 'user' reviews on the basis of the audience for their findings. However, it is not so much the audience, but the purpose of the review which is the key feature. That is, what question is the review asking? If it is, as in Hart & Nolan (1999), 'What research was carried out on environmental education between 1993 and 1999?', then the broad scope and general conclusions are to be expected and the audience is likely to be academics and researchers. However, if the question is more focused, for example, 'Is homework important for increasing educational attainment?' (Hallam & Cowan, 1998) or 'Can school improvement overcome the effects of disadvantage?' (Mortimore & Whitty, 1997), then one would expect a more explicit statement of the types of evidence used to inform the review and of the criteria used to evaluate the evidence upon which the narrow conclusions are based. The audience for such a review is likely to be policy-makers and practitioners (and maybe parents), as well as researchers and academics. However, the style of many of these more focused reviews is narrative and does not give the reader sufficient information upon which to form a view about the reliability of the conclusions. The key distinction, then, between narrative (or 'academic') and systematic (or 'user') reviews lies in the ways in which evidence is selected and evaluated and the explicitness with which this is reported (Slavin, 1995).

The systematic review of qualitative research is initially developed in health care. The NHS Centre for Reviews and Dissemination (CRD) produces practical guidance for undertaking systematic reviews (Khan, et al., 2001). The guidance provides a framework for carrying out systematic reviews of effectiveness and is used extensively to ensure a high standard in conducting reviews both by CRD and by other research groups. The framework for carrying out systematic reviews is described in three stages: planning, reviewing and disseminating (table 3.1).

Table 3.1 The framework for carrying out systematic reviews (adapted from Khan, et al., 2001)

Stage I Planning the review	Phase 0 – identification of the need for a review
	Phase 1 – Preparation of a proposal for a review
	Phase 2 – Development of a review protocol
Stage II Conducting a review	Phase 3 – Identification of research
	Phase 4 – Selection of Studies
	Phase 5 – Study quality assessment
	Phase 6 – Data extraction and monitoring progress
	Phase 7 – Data synthesis
Stage III Reporting and dissemination	Phase 8 – The report and recommendations
	Phase 9 – Getting evidence into practice

Informed by the established methods of systematic reviews (Khan, et al., 2001; Evans & Benefield, 2001; Andrews, 2005), the method of this review takes the following steps.

3.3.1 Identifying the Review Questions for the Systematic Review

The objective of the review is to provide evidence and a basis for developing a cultural reference model that could support designers to develop learning objects with equally pedagogical effectiveness for learners with different cultural backgrounds. An intention of the reference model should be to be able to indicate culturally sensitive factors in the design and development of learning objects. Considering the domains involved in the study, the following questions are raised:

1. What factors that are culturally sensitive may relate to the knowledge involved in learning objects?
2. What factors that are culturally sensitive may relate to the pedagogical effectiveness during the instructional design of learning objects?

3. What factors that are culturally sensitive may relate to the accessibility of learning objects from the point of view of HCI design?
4. What factors that are culturally sensitive may relate to the technology which learning objects run in?

Therefore, the purpose of the review can be stated as to describe and explain cultural influences on effective learning practice through learning objects in order to build the cultural reference model.

3.3.2 Clarifying the Criteria for Exclusion and Inclusion in the Review

The area of cultural influence on design and development of learning object is broad. This study relates to three domains: culture, instructional design, and software development, and these domains often overlap each other in many literatures. To reduce the complexity and make a clear aim, the review is carried out as four parts. Each part focuses on one review question:

1. Focus on cultural diversity on knowledge
2. Focus on cultural diversity on pedagogy
3. Focus on cultural diversity on accessibility
4. Focus on cultural diversity on technology.

For example, by confining the studies to be reviewed to the disciplines, the first part of the review attempts to delineate culturally sensitive factors that relate to the learning content involved in learning objects. There are some overlaps between the disciplines which interventions might have addressed. For example, the review is not looking at studies which were targeted at the cultural issues in itself of a discipline (e.g., cultural differences of medical ethics in health care), but only those which exposed sensitive factors in a curriculum for students with different cultural backgrounds. However, we do include studies that took place in both traditional classrooms and e-learning environments.

There are many different taxonomies of culture to be used to explain differences in teaching and learning in current studies. For example, some studies analysed students' learning behaviours by using Hofstede's cultural dimensions, while others separate Eastern culture and Western culture, or simply point out countries. The term *culture* in this review is confined to national culture that would affect the learning attitudes and behaviours of learners. In part two of the review, which focuses on cultural influences on instructional design, the studies that used Hofstede's cultural dimension are included. For some studies that reported diversity of teaching and learning in different countries, the strategy is to reinterpret the phenomena by Hofstede's cultural dimension. If it works, the study would be included; otherwise, the study would be left out. The studies that referred to eastern and western culture are excluded because they were too general.

3.3.3 Data Resources

The major sources used for searching for studies for the review consisted of several electronic databases, in order to ensure comprehensiveness. The most comprehensive databases in the education field are the American Educational Resources Information Centre (ERIC), the British Education Index (BREI), and the Australian Education Index (AUEI), which are collected in the International ERIC. Several general databases are also searched:

- ScienceDirect,
- IEEE Computer Society Digital Library,
- SpringerLink,
- Online Resources in London Metropolitan University's library.

3.3.4 Quality Assessment

The studies are chosen in terms of the following criteria, which is drawn from principles of assessing the quality of qualitative research (Greenhalgh, 2001) and

an experience of systematic review of educational research (Evans & Benefield, 2001):

- It is an empirical research, not merely a "lessons learned" report based on expert opinion.
- It has at least an equivalent comparison group, not necessarily randomised.
- It reports on all outcome measures as described in the aims of the study.
- There is an adequate description of the context in which the research was carried out.

The eligible studies are reviewed to analyse the results on various dimensions (knowledge, pedagogy, accessibility, and technology) to be able to present the findings about the culturally sensitive factors in a manner that can be a basis for building the cultural reference model. Chapter 5 represents the results of the systematic review.

3.4 Summary

This chapter discussed research methodology that led the study to be accomplished. Because of the complexity of this study, multiple research methods were adopted to achieve the research goals in different research stages, which include (1) an empirical case study, (2) systematic review, (3) model building, and (4) evaluation.

The following chapters describe the research process and results followed the research methodology.

4 A Case Study for Elucidating the Influences of Culture on Using Learning Objects

Much research on cultural issues in e-learning has focused on two aspects, the differences of learning performances between students who have different cultural background, and the HCI design for cross-cultural usability. However, not enough is known to design reusable learning objects with cultural flexibility. On the one hand, the researches that focused on differences of cognitive styles tended to ignore what differences would appear if the online learning materials are used in different learning contexts. There is a limited amount on cultural differences in these researches. Most of them were carried out with participants who were studying in the same learning environments, even though some students came from different countries. But as overseas students, they intentionally or unintentionally adjust themselves to adapt to the currently local culture where they were living and studying. Therefore, the cultural differences in these students may differ from students who are in separate cultural environments. On the other hand, the researches that focused on cultural differences in HCI design rarely considered instructional design. For the development of learning objects, it is necessary to blend the issues of technology, pedagogy, and culture into the process of design. In addition, there is little practical research that concerns the cultural influences on reusability of learning objects.

This case study focused on using learning objects in different cultural settings, China and the UK, in order to clarify the influences of cultural elements on using learning objects. The learning objects that had been developed in the UK were separately used by students who were studying in China and the UK. The case study examined the reusability of the learning objects in different cultures and learning contexts. Students' attitudes towards the learning objects and the cultural differences in using learning objects are expected to be exposed in the case study.

This study is a preliminary investigation. The results of it will provide a practical basis for developing the cultural reference model that will contribute to the design and development of reusable learning objects with cultural adaptability.

4.1 Background of the Study

The aim of the study was to clarify how cultural elements affect students using learning objects with different cultural background. Through providing the same learning objects to Chinese and British students, the students' attitudes towards the learning objects and the use of learning objects were compared. The pedagogical effectiveness of the learning objects was also evaluated in the two educational systems, in which students have different cultural backgrounds.

4.1.1 Participants

The case study took place in the two universities: Beijing Union University (BUU) in China, and London Metropolitan University (LondonMet) in the UK. Around 167 students attending the study in Beijing Union University (BUU) were third year undergraduate (First Degree) students who were separately beginning to specialise in Computer Science and Information Management. They were involved in the study to learn Java programming using the learning objects as the learning aids in the first semester of academic year 2004-2005.

There were about 223 students who were the first year BSc students in LondonMet. They used the Java learning objects as online learning aids in their Java programming module. They completed a series of questionnaire and interview surveys to evaluate the learning objects in academic year 2002-2003.

These two universities have different educational systems. In LondonMet, the period of learning time for a first degree is 3 years, which includes 6 teaching semesters. Students, such as these in the Computer Department, begin to learn computer specialized modules from the first year when they enter the university.

In contrast, in BUU, the period of learning time for a first degree is 4 years, which includes 7 lecture semesters and one project semester. The broad elementary knowledge of science is paid great attention in the Chinese higher educational system, whatever the courses students learn, although without doubt, there are some differences of curriculum in different courses. So, the first two years is the time to learn the common basic curriculum and basic specialized curriculum, such as, mathematics, physics, philosophy, law, enterprise management, foreign language, electrical engineering, statistics, computer basics, etc. From the third year, students begin to learn a specialized curriculum. Students in BUU were new to learning the Java programming language despite being third year. Therefore, the experiences of using the learning objects by students in the two universities can be compared.

4.1.2 Learning Objects of Java Programming

The learning objects of Java programming used in the case study were designed and developed by a multi-disciplinary project team in the Learning Technology Research Institute in 2002. In the design phase the team synthesised software engineering and pedagogical principles to influence the structure and learning effectiveness of the learning objects (Boyle et. al., 2003). The learning objects have been successfully used and evaluated through the practice of a Java module in London Metropolitan University in the UK.

Choosing these learning objects in this study was decided upon for several reasons. Firstly, the content of the learning objects – Java programming was pure technology and did not relate to any social or cultural issues. Therefore, the culturally different understandings of the contents would not be an issue for either of the two groups of students (Chinese and British). The entirety of cultural differences that would be found in the study could be aimed at the design and use of the learning objects. Secondly, computer programming is a very popular module. The learning objects with these contents have high

reusability from the point of view of the application. The same module run in different cultural environments offered a parallel background in which to compare the cultural differences. Thirdly, the learning objects were developed by British researchers and developers. Therefore, when the learning objects were used by students in LondonMet they were in the local context, but when they were used in BUU they were received in an international context. Therefore, the effectiveness of the learning objects in the local context could be contrasted with the external context.

4.2 Research Method for the Case Study

The empirical study in BUU took place by offering the learning objects of Java Programming to students as learning aids in the first week of the semester. A questionnaire survey was then implemented after five weeks in which they had used the learning objects.

4.2.1 Questionnaire Design

The questionnaire consisted of 20 multiple choice questions focused on the feedback of using learning objects with students. The questionnaire was designed to examine students' attitudes towards the learning objects from various angles. First, the usefulness of using learning objects was examined to evaluate the pedagogical effectiveness of the learning objects used by students.

Secondly, the survey focused on the design of the learning objects. There were three forms of contents in the learning objects, Textual Description, Animated Explanation, and Question Test. Some questions related to the format, examples, and language of description in the learning objects.

The third angle of the survey was navigation of the learning objects. Navigation plays an important role in an e-learning context, because it guides learners scaffolding their knowledge structure. The effect of the navigation was checked

in the questionnaire. The influences of HCI on using learning objects were considered in the questionnaire as well.

4.2.2 Translation of Learning Objects

In order to make learning objects available for students in China, it is necessary to translate the learning objects from English to Chinese, because the textbook of Java programming they used was a Chinese version, and the teaching language is Chinese as well, although normally most of them can read English. The main issues of the translation is both keeping the layout as alike as possible and expressing the concepts correctly. An example of a page of learning object in Chinese version and English version is given in Figure 4.1.

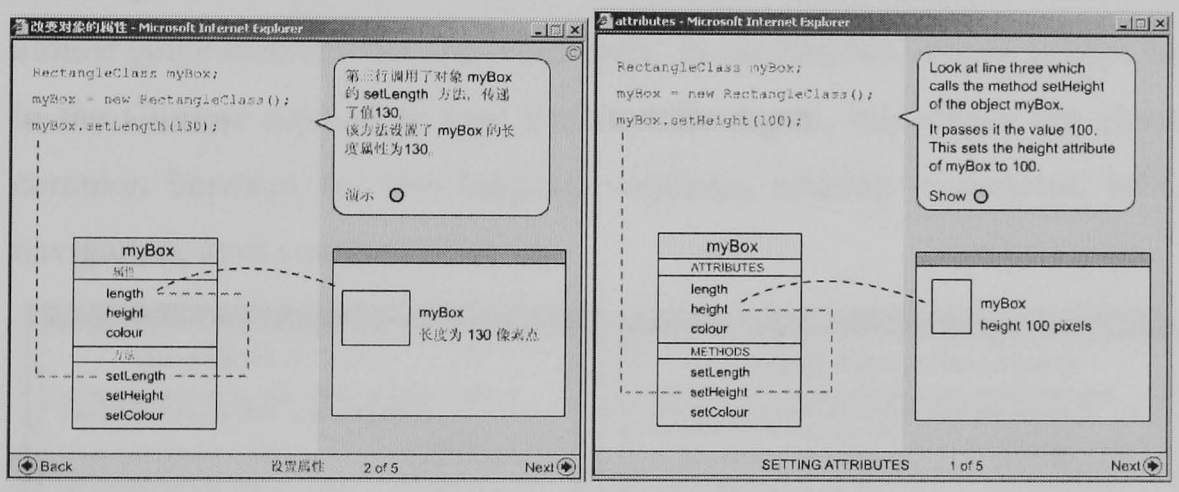


Figure 4.1 The "attributes LO" in Chinese version and English versions

The keywords of Java language are described by English characters, even in the Chinese version. Both Chinese and English would appear in one sentence in the learning objects of the Chinese version when using Chinese to describe a concept and keeping the keywords as English characters. So the learning objects necessarily mix Java code, which may stay exactly the same in some areas of the learning object, with Chinese, in the explanation areas. In addition, some English icons and textual cues are kept the same, while others are translated into Chinese. Making decisions about the exact balance between the two languages is partly

the skill of the translator, and partly as a result of observation, trial and error or evaluation. For example, the Chinese words cover space normally shorter than English words in a sentence of similar meaning. If translated directly, the layout would be out of shape, because the frame design of the learning objects is based on the English language. In order to keep the same layout and express clearly the contents, it is necessary to organize the Chinese language and keep the keywords of English letters (see Figure 4.1).

Not every word in the learning objects was changed. Some elements of design are kept in the Chinese version, which are either commonly used symbols or good design elements. A cultural consideration in the translation of a quiz in the learning object was the use of a term such as 'quiz' which might induce a sense of being tested in China, whereas in the UK, 'quiz' carries a more engaging, almost game element. So, the word 'quiz' in the English version is kept the same in the Chinese equivalent (see Figure 4.2). Again, this shows the elements in common between the two language versions, relating to concept, HCI, cues, navigation, Java content and so on.

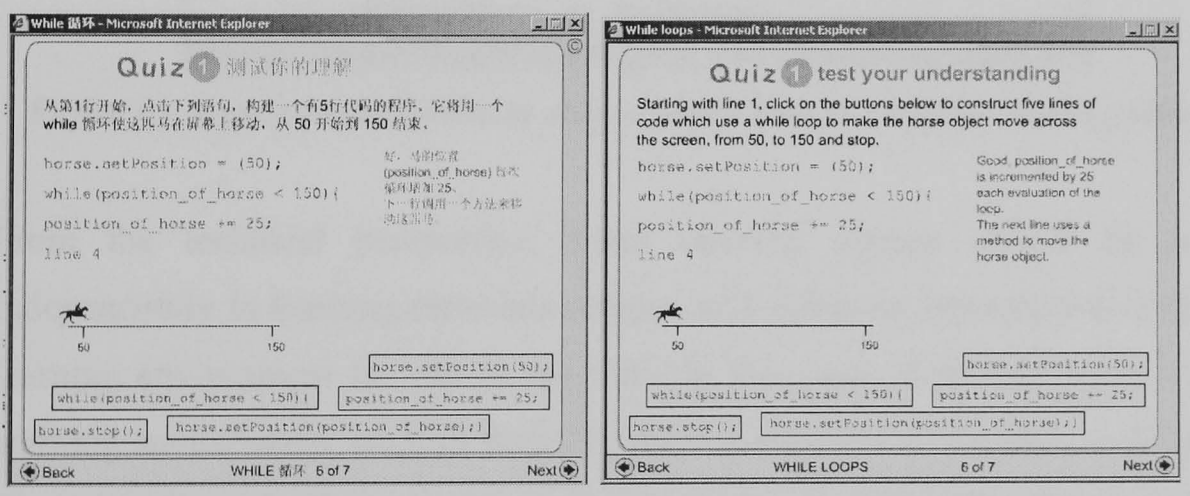


Figure 4.2 An interactive the quiz page in Chinese version and English version

4.2.3 Delivery of the Learning Objects in BUU

The learning objects were provided to students as learning aids assisting them to learn the Java module when beginning the semester. The learning objects

translated into Chinese were built in a Java courseware which is based on HTML pages. Each HTML page focused on one small topic of the Java programming with textual expression, and linked one or two optional learning objects which expatiated on the topic with multimedia in a column on the right-hand side (see Figure 4.3 as an example).

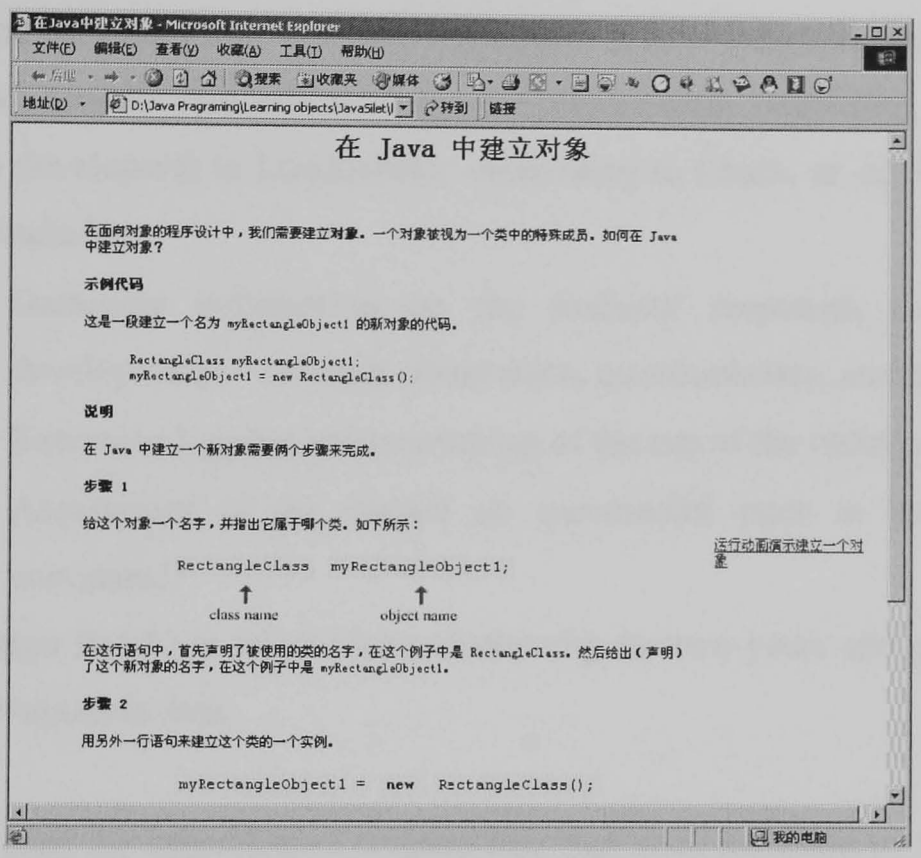


Figure 4.3 A compound courseware of Java, which links to 2 optional learning objects

From the technical perspective, these learning objects should be stored independently in learning materials servers, and delivered separately to a virtual learning environment for use at run time. In this case, there was not a virtual learning environment, such as WebCT that was used in LondonMet, to carry the learning objects in the computer network system in BUU. So, the courseware acted as a platform to run the learning objects. The courseware was delivered to students in two ways. In the lab, the courseware was stored in a server of the intranet of the lab, and students could download it from the server to their PC to use in class time. The other way was to directly copy the courseware to students, so they could install it on their own computers at home. Students were unable to use freely the computers in the lab because the scarcity of lab facilities in BUU.

Against that, it was quite popular for students to have an individual computer at home. To provide a copy of the courseware facilitated students using the learning objects.

4.2.4 Data from London Metropolitan University

As described earlier section, the learning objects of Java Programming had been used in Java module and evaluated by the project team (including tutors and multimedia developers) in LondonMet. According to Chalk, *et. al.* (2003), the evaluation includes:

- Gathering information on the students' responses to the new developments – through observation, questionnaires, and interviews;
- Extensive logging and monitoring of the use of the online resources;
- Assessment of the impact on success/fail rates in the modules concerned.

The evaluation had been taken place continually for two years and gained rich first-hand evaluation data.

This study used the unpublished original data that were provided by the project team in LondonMet as the comparable data with the responses of the Chinese students in BUU.

4.3 Analysis of Data

There were 141 responders in the questionnaire survey in BUU, which include 80 males, accounting for 56.7 per cent, and 61 females, accounting for 43.3 per cent.

Survey data showed that students in BUU perceived the learning objects were helpful. For the question *are the learning objects helpful for you to understand the topic better*, 27.7 per cent of students chose "very helpful", 65.2 per cent of students chose "helpful"; and 7.1 per cent of students chose "not very helpful".

The helpfulness rate was very high (92.9%). In contrast, there was an 86% rate of usefulness in the survey in LondonMet (Figure 4.4).

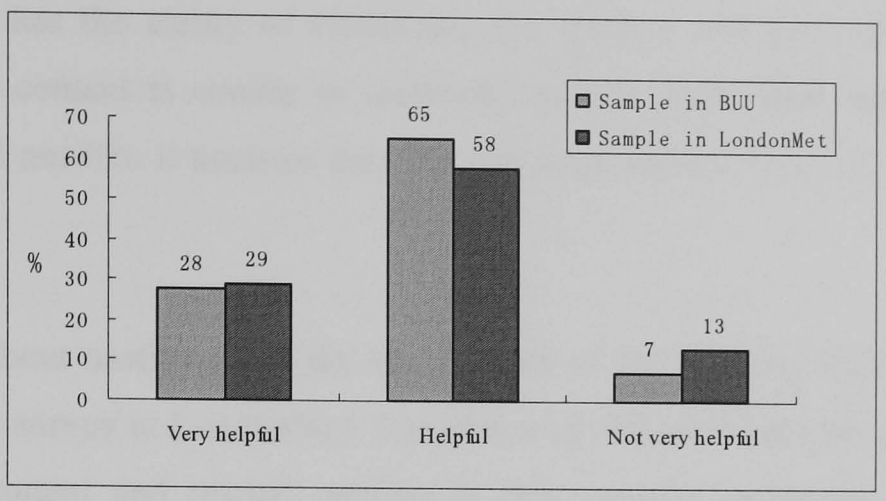


Figure 4.4 Comparing helpfulness of LOs between BUU and LondonMet

These data showed that the learning objects as online learning aids provided to students were perceived as effective in both countries.

A question about which part of the learning objects was most helpful showed very clear preference in the samples of BUU. 66 per cent students chose "Animation", 19.9 per cent students chose "Quizzes", and 14.2 per cent of the students thought that textual description of contents was more helpful (Figure 4.5, left). In another question, what kind of expression of the contents was easy to understand, 58.2 per cent students chose the item "Animated explanation", 28.4 per cent students chose the item "diagram or picture", only 13.5 per cent students chose the item "textual explanation" (Figure 4.5, right).

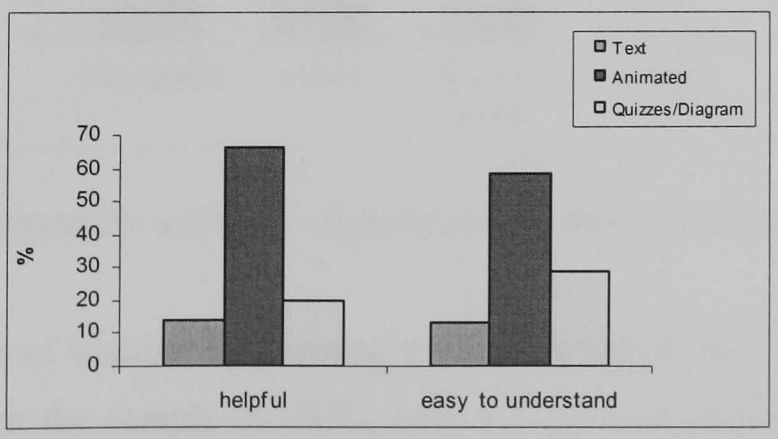


Figure 4.5 Comparing the components of LOs in BUU

These two questions showed similar results that animation was the preferred manner of presentation for students in BUU. It might be that animated explanation has the ability of visualizing the abstract and easy understanding. The textual content is similar to textbooks on the form. That was why most students did not like it because they did not need another copy of an electrical textbook.

Questions about usefulness of the components of the learning object were also asked in the survey in LondonMet. Students were asked to rate the usefulness of animated content and textual content in two separate questions, which was different from the question in BUU. In LondonMet, the animated content got 45 per cent of "very helpful", 44 per cent of "useful", and 8 per cent and 1 per cent of "not very useful" and "useless". The textual content got 29 per cent of "very helpful", 63 per cent of "useful", and 9 per cent and 1 per cent of "not very useful" and "useless" (Figure 4.6). These data cannot be compared directly with the data in BUU, but the rate of "very useful" (45% for animated, 29% for textual content) showed that students in LondonMet preferred animated content more than textual content, which was similar with the result in BUU.

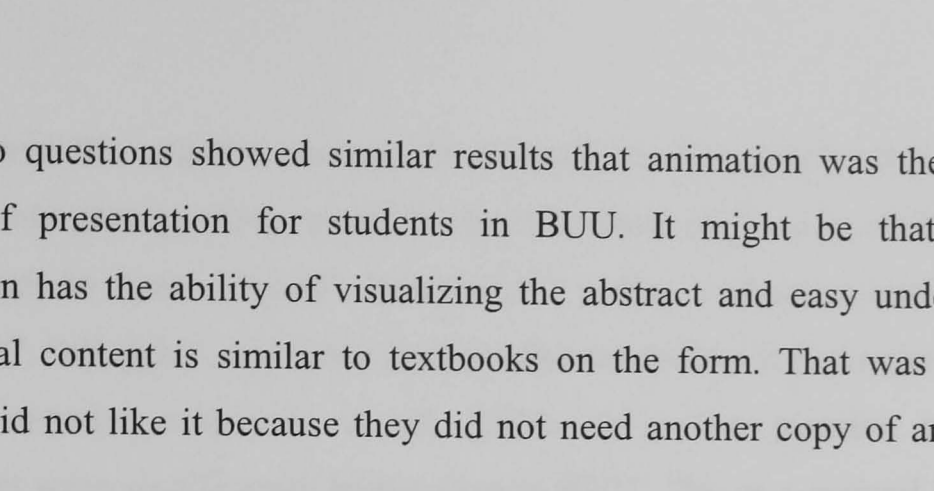


Figure 4.6 Comparative usefulness – animated and text content of LOs in London Met

For the question of whether the learning objects were attractive, the positive rate was very low in the sample of BUU, only 9.2 per cent students of gave the positive answer. Most students (61%) gave the neutral answer, 29.8 per cent of

students gave the negative answer. In contrast, in the sample of LondonMet, most students gave positive words to describe their impression of the learning objects, such as "yes", "good", "very nice"; a few students answered neutral words, "ok", "all right", and some students did not answer the question, but there were no negative responses at all (Table 4.1), The positive answers in LondonMet were significantly higher than in BUU. This is a general impression for the learning objects. The differences about details could be described as follows.

Table 4.1 Attractiveness of the online learning materials

	Positive	Neutral	Negative	No Answer
Samples in BUU	9.20%	61%	29.80%	0
Samples in London Met	67.60%	16.20%	0	16.20%

There were several probable reasons that caused the differences. The visible reasons might be: in London Met, the learning objects were running on a platform, WebCT. All materials of the module were built together, and students could access everything in the module including the learning objects through WebCT. The learning objects were embedded into the module content as a whole. It was closely related with the progress of the module. But in BUU, there was not any e-learning platform, like WebCT, in their computer network. The learning objects were separately used as a single file and did not relate closely with the course that lecturers gave. That might cause students to lose interest.

There were some examples used in the learning objects, such as throw a coin, launch submarine. An appropriate example could explain a complex concept very well and could be attractive for students, which was the basic pedagogical approach. Using illustration is more important in the design of learning objects, because there is less direction from tutors in an e-learning environment than in a face to face learning environment. A result of the survey supported this point of view, 53.2 per cent students in BUU thought they would lose interest for using online learning material if it "lacked appropriate examples". 22 per cent students did not like "too many questions to have to answer" and another 22 per cent

students would lose patience if there were "a lot of content in one section" (Table 4.2). The data showed that an appropriate example is very important to enhance the pedagogical effectiveness of learning objects.

Table 4.2 Reasons to lose interest

Problems	Frequency	Percent %
Lack appropriate examples	75	53.2
Too many questions	31	22.0
A lot of content in one section	31	22.0
Others	4	2.8
Total	141	100.0

However, what did students think about examples in the learning objects? In the survey, 18 per cent students in BUU thought the examples were 'very interesting', 79 per cent students thought them were 'ordinary', only 3 per cent students thought them "too simple" (Figure 4.7). For the question of what kind of example do they like, 48.2 students preferred example of 'familiar or daily', 41.8 per cent of students preferred example to be "applicative", only 9.9 per cent of students like "academic or scientific" examples. Illustration is an important method of teaching. Students who have different cultural backgrounds may be interested in different matters. In this case, even though many students preferred familiar things to be examples, they did not think the examples in the learning objects, such as throw a coin, were very interesting, because they might play a game like this infrequently.

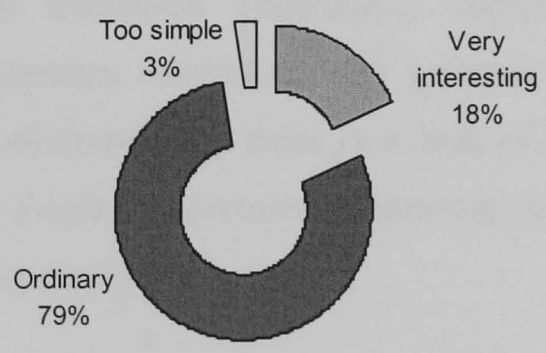


Figure 4.7 Feelings about examples

Quizzes as a way of interaction to check understanding and to consolidate memory were another component to be tested in the two universities. Students in

BUU (80%) held positive attitudes towards the quizzes much more than students in LondonMet (45%) (Figure 4.8). It is worth noticing that there were 47% of samples in LondonMet with no answer. Another data exhibited that 28 per cent of students in LondonMet did not use the quizzes at all. They were part of the 47% students who did not give the answer. This data showed that all students involved in the survey in BUU have used the quizzes and held more positive attitudes. Since academic success is highly valued in Chinese society and depends on passing numerous tests and examinations, students have developed a high sensitivity to task requirements.

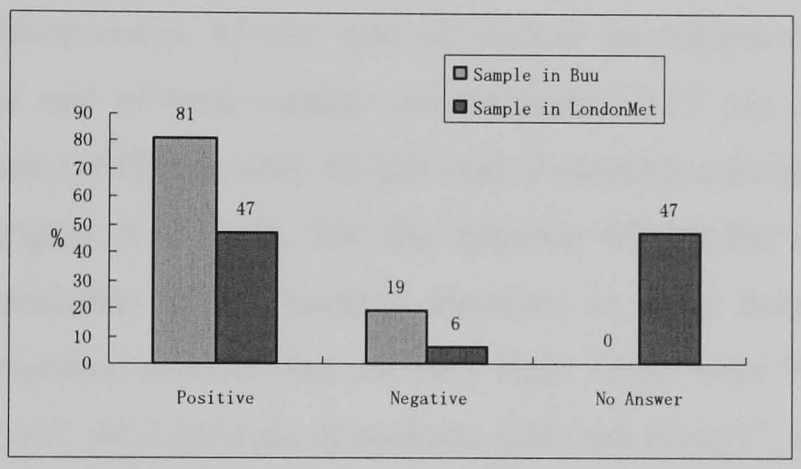


Figure 4.8 Perceptions of quizzes

For the language to describe the complex concepts in the learning objects, 59.6 per cent students in BUU prefer "plain language", 32.6 per cent students chose the item of "language between plain and academic", and only 7.8 students prefer "academic language". In traditional classrooms, teachers usually explain knowledge by verbal expression combining with gestures and writing on the board. But in e-learning environments, there is a lack of traditional teaching methods in the classroom. Explicit expression of learning content becomes more important in online learning materials.

"Clear explanation of concept", "rich examples", and "interacting exercises" was the sequence arranged by students according to which was more important to support their learning (Figure 4.9).

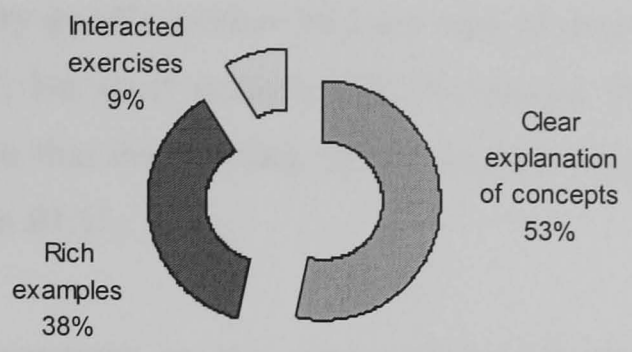


Figure 4.9 The order of significant parts in LOs of samples in BUU

Navigation is an element worthy of notice in learning objects affecting pedagogical effectiveness. 83 per cent of student considered that an explicit direction at the end of each section was necessary, 12.8 per cent of student considered it was indifferent, only 4.3 per cent of students considered that it was unnecessary (Figure 4.10, left). For the question of whether students could follow the instructions of the learning materials to study independently, the percentage of positive answers was not very high. There were 38.3 per cent of students said "yes", 44.7 per cent of students said "not always", and 17 per cent of students said "no" (Figure 4.10, right). These data showed that, on the one hand, students needed more clear direction to guide them; on the other hand, students did not have strong confidence to learn independently.

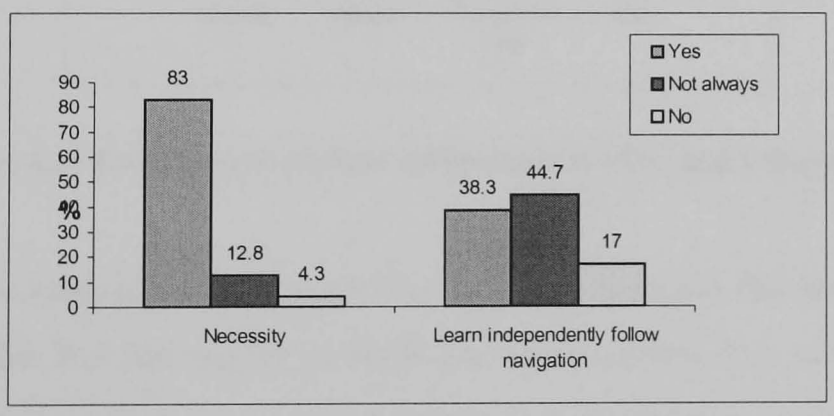


Figure 4.10 Attitudes towards the navigation of the LOs of samples in BUU

Interface is a very important feature of e-learning materials. The style of the display has a great influence on the learning process (Levin, 1997). For the interface of the learning objects of Java programming, 10.6 per cent of students

thought they were "very good"; another 10.6 per cent of students thought them were "not very good", but most students (78.7%) choose the neutral item of "ordinary". It was seen that the interface of the learning objects was basically approved by students in BUU.

There were several questions in the questionnaire related to the students' learning style. Lecture, textbook, and lab are three main learning assistants in campus based learning. For the question of which one was more useful for students' learning, the following data showed the students' answers in two universities. In BUU 36.9 per cent students chose 'lecture', 34.8 per cent students chose the item 'textbook', and 24.1 per cent students chose 'experiments in lab'. There were 6 students (4.2%) who chose 'others', and gave answers as "parents" or "peers". In LondonMet, the ratings separately were 37%, 24%, and 39% (Figure 4.11).

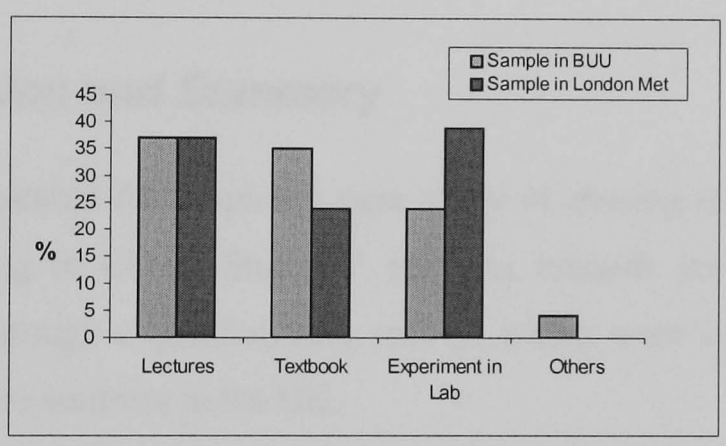


Figure 4.11 Usefulness of module components in BUU and London Met

The rate of the usefulness of lectures was the same between the samples in BUU and LondonMet. But the rate of textbook and lab exercises was just the opposite. Students in BUU relied more on textbooks and students in LondonMet relied more on the lab exercises. Scarcity of tutors to students in the lab class time was probably a reason, because a tutor needed to cover around fifty students in BUU. And the facilities in the lab were not enough for students to use for free time, so that the time students can be in the lab was limited. Otherwise, every student had

a textbook. That might be why the students in BUU thought textbooks were more important than experiments in the lab.

For the question of "*what might be the problem when you learn online alone*", the responses of this question were discrete. 48.2 per cent students chose the item "lack of instruction from lecturers", 22.7 per cent students chose the item "lack of interaction with peers", and 21.3 per cent students chose the item "lack of enough skill with computers'. Some students wrote others, which summed up as "not good enough with computer hardware", "lack of stimulation and patience". And 3 students wrote "no problem". The data showed that many students in BUU (70.9%) did not have strong confidence in learning online alone. This was understandable because it was the biggest difference between learning online and in traditional classrooms at the point of the process of learning. The level of this worry might change along with the level of dependence on lecturers.

4.4 Discussion and Summary

This chapter presented the empirical case study of reusing learning objects of Java programming in China. Students' attitudes towards the learning objects were collected through a questionnaire survey, which were compared with the data collected from students in the UK.

The data showed that the students both in China and the UK found that the learning objects were helpful for them. The learning objects as learning aids helped the students to understand the learning contents in the two different educational organisations, the BUU and the LondonMet. This is a quite positive evidence to suggest that the learning objects are culturally reusable, at least in these two cultural contexts.

However, differences in the reuse of the learning objects were also found between the two universities from several aspects. First, there was a considerable

difference in the attractiveness between the two groups of students, which was 9.2% positive answers in BUU and 67.6% them in LondonMet. The reasons for the difference may be because the learning objects were integrated into the model much closer in LondonMet than in BUU. In LondonMet, WebCT played an important role to provide a platform for students using the learning objects. This result led to a potential issue that may affect the reusability of learning objects; that is technology. The development and usage of learning technology may differ between countries. Both infrastructure and software platform might affect the reuse of learning objects efficiently if the technical foundation was not satisfied. Also, it may cause learners to lost interest, such as in this case, there was no e-learning platform to run the learning objects but the Internet explorer in BUU. Therefore, technology, including infrastructure and software should be an issue that is culturally sensitive.

Secondly, the data analysis showed that the Chinese students held much more positive attitude towards quizzes than the students in London Met. This finding could lead to two issues that may be culturally sensitive. The quizzes play as a self-test to scaffold learners' understanding. According to Hofstede (1998), using a test can be stimulation for one group of students but also can be a burden for others. The test can take effect only by being as the appropriate mode to students. On the one hand, students who were in a collectivism cultural society are more highly sensitive to the exam than students in an individualism cultural society. Because of the successful academic work is not only for themselves but relates closely to their families or the groups they are in (Hofstede, 1998). This is about cultural difference in attitude towards learning. On the other hand, if students were used to the form of a quiz or preferred this kind of learning activities, they would be happy to do the learning tasks (e.g., all students in BUU had used the quizzes, while 28% students in LondonMet had never used the quizzes until the survey took place). This is about cultural difference in learning style. Therefore, learners' attitude towards learning and learning style may be the issues that are culturally sensitive for learning objects.

Overall, this empirical case study suggests that cultural difference, in general, exist and affect students' attitudes and actions when reusing learning objects in different cultural environments. Culturally sensitive factors involved in each individual learning object may differ from others. The cultural sensitivity of a learning object may vary when being used in different cultural environments. In other words, when a learning object is appropriate in one culture, it does not mean that it will be culturally appropriate in another.

The complexity and uncertainty of cultural issues in learning objects, on the one hand, express that there is a necessity for a cultural reference model to support designers to improve learning object design in terms of cultural adaptability. On the other hand, it indicates that identification of culturally sensitive factors that may be involved in learning objects is the prerequisite for building the cultural reference model.

The complexity and uncertainty of cultural issues in learning objects also determine that a comprehensive set of culturally sensitive factors cannot be addressed by a single empirical study. A more effective research method is needed to accomplish the task. The culturally sensitive factors that may affect the design and development of learning objects were identified in the next chapter through systematic review.

5 Dimensions Sensitive to Culture-related Differences in Learning Objects

According to the literature review and the case study discussed above, it becomes clear that there are many culture-related factors that affect pedagogical effectiveness and reusability of learning objects in many ways. This leads to a requirement of clarification and classification of the culture-related factors to facilitate addressing cross-cultural issues in the design and development of learning objects. This chapter represents dimensions that contain cultural issues in learning object design and explores culturally sensitive factors in each of these dimensions.

5.1 Dimensions for Culturally Sensitive Factors in the Design and Development of Learning Objects

"The comparison of culture presupposes that there is something to be compared ..." (Hofestede, 2001, p24). In a general view, design and development of learning objects consists of creating learning content, instructional design, and implementation. The disciplines involved in learning objects are knowledge domain, pedagogy, and technology. By considering design and development of learning objects as a whole, there are four main aspects, knowledge, pedagogy, accessibility, and technology, which compose the design issues of a learning object. Exploring culturally sensitive factors in each of these aspects reveals an effective and viable way to address the issues of influences of culture on learning object design in the difficult situation in which various cultural phenomena combine with issues of instructional design and application of educational technology.

In order to identify and organise culturally sensitive factors, four independent dimensions are defined in this study. Each of these dimensions refers to one of the main aspects of learning object design. Each dimension is rooted in an area

which all learning objects have to deal with, but in which their values vary. The dimensions are as follows:

- *Knowledge Dimension*, which is related to the knowledge that is to be learned in learning objects and the knowledge context that may differ between learners in different cultural backgrounds.
- *Pedagogy Dimension*, which refers to the pedagogical issues that determine teaching methods and learning activities that are built into the learning objects and may be considered as having cultural preferences.
- *Access Dimension*, which is related to all aspects providing appropriate expression of the contents, accessible interface, and interactive channel between learners and the learning objects.
- *Technology Dimension*, which refers to technologies that are utilised to facilitate learning which include technical media used to develop learning objects and the technological context that may differ between learners and their cultural backgrounds.

The four dimensions cover the main aspects of the design and development of learning objects. Each dimension contains some culturally sensitive factors that may affect learning object design in terms of cultural adaptability and flexibility. These dimensions provide a basis for not only categorisation of the culturally sensitive factors but also possibility of mapping them to the design process.

There is no need to consider that any single learning object deals with all factors identified in the four dimensions, because of the granularity of learning objects, different disciplines, or teaching methods, etc. The extensive descriptions about the dimensions and the culturally sensitive factors contained in them are discussed in following sections.

5.2 Knowledge Dimension

Knowledge is the strategic resource for learning practice and also the purpose of learning efforts. According to Polanyi (1973) knowledge exists in two forms: explicit knowledge and tacit knowledge. Explicit knowledge can be transmitted in formal, systematic language. It is captured in records of the past such as libraries, archives and databases. It can be expressed in words and numbers and shared in the form of data, scientific formula, specifications, manuals and the like. Tacit knowledge, in contrast, is highly personal and hard to formalize. It is deeply rooted in individual's actions and experience.

Knowledge involved in learning object design includes explicit and tacit knowledge. Learning content that intend to be taught in a learning object belongs in the explicit knowledge and is the first culturally sensitive factor in the knowledge dimension. Some contents may include culturally sensitive issues, such as religion, gender, and custom; and others may not. Some issues may be sensitive very much; and others may be slightly sensitive. Therefore, "learning content" as a culturally sensitive factor can be a range of values from inclusive to exclusive in the knowledge dimension (see Figure 5.1).

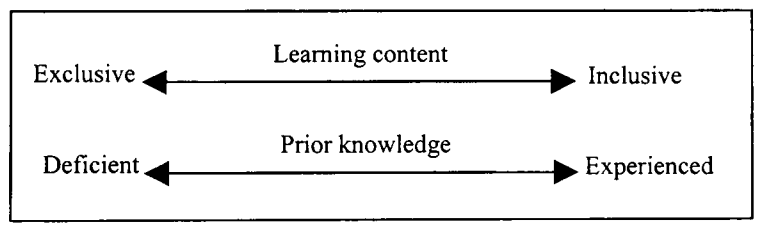


Figure 5.1 Knowledge dimensions

The second culturally sensitive factors in knowledge dimension "prior knowledge". The pre-knowledge refers to the background knowledge with regard to the learning content that learners already have (Stevens, 1980) including explicit and tacit knowledge. People have different prior knowledge based on their experiences of living and learning. A certain knowledge (e.g., information or skill) that is common for someone may be a very new knowledge for someone else. Therefore, prior knowledge as a culturally sensitive factor will have a range

of values between deficient and experienced in the knowledge dimensions (see Figure 5.1).

5.2.1 Cultural Issues in Learning Content

Culture-related issues can be seen in many subjects as components of learning content and permeate the core of the subjects. It is inevitable to talk about the sensitive issues, such as racism, religionism, and sexism, and to represent such issues in learning objects design. The representation of culture-related issues in learning content involves a growing number of disciplines or subjects that give specific consideration to the effect of variables such as race, class, religion, and gender. And many attempts have been made to reflect and support the cultural issues by the increasing availability of resource manuals for the modification of course content (Bronstein & Quina, 1988; Olsen & Jaramillo, 1999; RET, 2006).

For instructional design, designers need not only to consider the representation of the cultural issues but also the reaction of learners when they are dealing with the culturally sensitive content. Datum (1992) suggests that the introduction of these oppressive issues often generates "powerful emotional responses in students that range from guilt and shame to anger and despair". If teachers did not address these emotional responses, they could result in students' resistance to the culture-related content areas. Such resistance can ultimately interfere with the cognitive understanding and mastery of the content (Datum, 1992; RET, 2006). This resistance and interference are particularly detrimental to distance learning which lacks direct and immediate support from tutors.

The values of the culturally sensitive factor – learning content – shown in Figure 5.1 range from inclusive to exclusive. The value at the left end is exclusive which means no culturally sensitive factors are involved in the learning content. For example, the learning object of "*While Loops*" in Java programming that aims to teach a programming technique uses a hammer, a running car, and a

submarine as examples to explain the abstract concept. There is no any culturally sensitive issue included. In this case, the culturally sensitive factor of learning content directs towards the left end.

The other extreme value is at the right end, which means the learning object deals with a culturally sensitive content. For example, the learning object of "*Genomics - Ethical, Legal and Social Issues*" is about the ethical, legal and social aspects of genetic testing. It is fully related to the culturally sensitive issues. Therefore, the content of this learning object is culturally inclusive which is at the right end of the dimension.

Between the two extremes there is a continuum with a graduated range of values that indicate more or less culturally sensitive factors included. For example, the learning objects of "*Should Sarah smack her child?*", which explores the ethical dimension and different views surrounding the use of mild smacking as a means of punishment; "*Employability*", in which students are encouraged to have a look at the Interactive Employability Questionnaire and then complete the evaluation form; and "*Group Reflection in Action*" in which a group of students talk to each other about their experience of reflecting on their learning in a group. These learning objects involve more or less culturally sensitive issues in the learning contents, which should be located somewhere in the spectrum.

All these learning objects are referred to in the RLO-CETL learning object repository (http://www.rlo-cetl.ac.uk/joomla/index.php).

5.2.2 Diversity in Prior Knowledge

The term prior knowledge is generally also called background knowledge (Strangman, et al, 2003). For example, Stevens (1980) defines background knowledge quite simply as "... what one already knows about a subject ..." (p.151). Biemans & Simon (1996) define background knowledge is "all

knowledge learners have when entering a learning environment that is potentially relevant for acquiring new knowledge" (p.6). Prior knowledge is the whole of a person's knowledge, including explicit and tacit knowledge (Dochy et al., 1999) and represents a knowledge state at a certain time, that is present before execution of a learning task, that is directly available or can be retrieved, that is relevant for the objectives of the learning task, that is hierarchically structured, that is applicable to other learning tasks, that has a dynamic nature (Martens & Hermans, 1999 c.f. Dochy, 1992; Dochy & Alexander, 1995). Based on these definitions, the prior knowledge for using learning objects is considered as a synthesis of knowledge and skills in this study.

Prior knowledge has a strong influence on learners' performance (Dochy, et al., 1999; Langer, 1984; Stevens, 1980). High correlations have been found between prior knowledge and speed and accuracy of study behaviour (Dochy, et al., 1999) as well as students' interest in a topic (Tobias, 1994). Recent researches have also proved the correlation between prior knowledge and computer-based learning (Foster & Lin, 2003). These researches suggest that prior knowledge promotes better learning and higher performance. Sufficient prior knowledge is the pivot on which new knowledge and skills are scaffolded into learners' knowledge construction.

Prior knowledge is an important issue that cannot be ignored for designing reusable learning objects, not only because of the importance of it for further study in domains but also the differences of it between learners. These differences consequentially affect learners' performance in learning objects that may be reused in different cultural contexts.

In a traditional classroom, students have similar prior knowledge. For example, students enter universities by holding relevant qualifications, such as A level grades in the UK or passing a national examination in China. These qualifications ensure a basic level and relative equality of the prior knowledge

between students in the classroom. However considering learners of learning objects who are probably from different cultural environment, the differences of prior knowledge between learners would emerge.

The learners' prior knowledge as a part of learning context may differ at national, institutional, and individual levels. Social ideology and culture shape people's cognitive style and learning behaviours. Formal schooling builds learners' knowledge structure and learning experience. In the national level, the educational systems are different between countries. Comparing the higher education system in China and the UK, for example, the length of first degree even differs between universities in the two countries, which are four years in China and three years in the UK. Course structures are also different between universities in the two countries. In the case study described in chapter 4, which elucidates influences of culture on using learning objects of Java programming in two universities in China and the UK, the students in BUU were studying the module in their third year and had learnt C programming. In contrast, the students in LondonMet were first year students and had no experience of programming. There were differences in knowledge context for the two groups of students using the Java learning objects, which led to some different opinion (e.g., more easy use for students in BUU than students in LondonMet) towards the learning objects.

At institutional level, students' prior knowledge refers to two kinds of knowledge, explicit knowledge – the academic knowledge and skills they have learned in an institution; and tacit knowledge – the existence of a set of attitudes, values and practices (also called *learning culture*) they have been experiencing within an institution which supports and encourages a continuing process of learning for the institution and/or its members (Johnston & Hawke, 2002). Students' explicit prior knowledge may have variation due to the differences in course structure, teaching programme, laboratorial environments, etc. between institutions. Students' tacit prior knowledge is likely to vary at the institutional

level as well. For example, Cook, et al., (2006) report cultural differences about the process of e-learning development across three different kind of universities, London Metropolitan University, University of Cambridge, and University of Nottingham. The three universities in the UK share the British culture but maintain their own learning cultures.

Learners' prior knowledge at the individual level indicates differences between individuals. The differences exist in personal knowledge interest, knowledge needs, knowledge structure, or computer technical skill in e-learning environments. Empirical studies have pointed out that individual differences in prior knowledge affect learners' performance of using the e-learning resource and on learning outcomes (Chen, 2002; Foster & Lin, 2003).

The values of the second culturally sensitive factor – *prior knowledge* in knowledge dimension showed in Figure 4.1 indicate a degree of prior knowledge that connects with the learning task of a learning object. A position at the right end means that the prior knowledge is fully satisfied for a learning task, while at the left end means the prior knowledge is not sufficient at all. The middle points between the two extremes represent the degree of sufficiency of the prior knowledge. For example, if a learner has more prior knowledge of a topic area he/she might meet less difficulty when learning through the learning object, and vice versa.

The knowledge dimension categorises the culturally sensitive factors from the knowledge perspective, as *learning content* and *prior knowledge*.

5.3 Pedagogy Dimension

Pedagogical design for web-based learning cannot, and does not, exist outside of a consideration of cultural influences (Wild, 1999). Pedagogical effectiveness is the most important aspect of learning object design and also is the most complex

aspect. According to Reeves' (1992) and Henderson (1996) 14 pedagogical dimensions, from Epistemology to cooperative learning, are assumed that any of these dimensions has an underlying specific point that is culturally sensitive (see detail in chapter 2). For example, on the dimension of pedagogical philosophy, whereas constructivist pedagogy advocates, indeed demands, persistent questioning in the process of learning, questions, especially "why" questions, are inappropriate in cultures such as the Torres Strait Islanders of Australia (Henderson, 1996).

Reeves' pedagogical dimensions provide criteria for understanding, describing, and evaluating computer-based education at a high level. However, at the level of design and development of learning objects, the abstract diversity, such as on epistemology, pedagogical philosophy, and underlying psychology, would be embodied into performance of learning activity. Therefore, the pedagogy dimension for learning object design focuses on the learning activities that can be supported by learning objects and considers the instructional design factors that may be culturally sensitive.

According to Laurillard's (2002) conversational framework, which not only provides a detailed graphic representation of a cyclical learning process, but also explicitly relates learning to activity within the process, learning activities that educational media can support are categorized as narrative based, interactive based, communicative based, adaptive based, and productive based learning activities. Each group of learning activities identifies with particular kinds of learning experience. Table 5.1 summarize the groups of learning activity and the learning experiences that they covered.

In order to identify culturally sensitive factors involved in learning objects comprehensively, each group of learning activities was discussed with regard to culture-related aspects. These aspects are concentrated on participants and their roles in a learning activity (i.e., learners, teachers, and learning resources),

character of the learning activities, and their impacts on achieving the learning goal.

Table 5.1 Groups of learning activities with learning experiences covered (adapted from Laurillard, 2002)

Group of learning activities	Learning experiences
Narrative based activity	Attending, apprehending, experiencing
Interactive based activity	Investigating, exploring
Adaptive based activity	Scaffolding, experimenting, practising
Communicative based activity	Discussing, debating, group project
Productive based activity	Articulating, Synthesising,

The approach that discusses cultural issues following the groups of learning activity attempts to make the discussion to be more comprehensive and manageable. The culturally sensitive factors identified in each group of learning activity are not exclusive, but very much appear in other kind of learning activities. The narrative based activity was discussed first in next section.

5.3.1 Narrative Based Learning Activity

Narrative is a traditionally favoured teaching method in formal education in schools. It is the process by which a teacher or media provides learners with descriptions of a concept. Regardless of disciplines, narrative in educational domain refers to the structure, knowledge, and skills that are required to construct a story (McEwan & Egan, 1995). A narrative has two parts: story and discourse. The story includes the events, characters, settings, and etc. that constitute the content of a narrative. The discourse is the telling, expression, presentation, or narration of the story (Chatman, 1978).

There is a single direction of information in a narrative activity, sending from one side and receiving at the other side. Only the teacher is able to articulate the conception. Students embrace the conception, but are not able to represent their own reflection. It is a linear process with no learners' control. Narrative based activities in the e-learning environment, such as attending and apprehending, set

up a single direction of flow of information from the e-learning resource to learners, which is described as from teacher to student in Laurillard's conversational framework.

However, this approach does not mean that the learners are inconsiderable. Narratives are never straight copies of the world like photographic images. Teachers have their minds fixed on their students and engage in what McEwan (1987) calls "pedagogical interpretation". Herrenstein-Smith (1981) argues that narrative is more than simply a structural feature of texts, rather is something that is embedded in human action. Narrative, in this account, is a series of verbal, symbolic, or behavioural acts sequenced for the purpose of "telling someone else that something happened" (Herrenstein-Smith, 1981, p.228). Thus, the social context in which a narrative is related, the narrator's reason for telling it, the narrator's narrative competence, and the nature of the audience are important factors in developing an understanding of a narrative. McEwan and Bull (1991) claim that "explanations are not only of something; they are also always for someone" (p.332).

Design of narrative based learning activities involves not only subject matter for teaching, but also "teachers' beliefs of the subject matter" (Groossman et al., 1989, p31). Groossman and colleagues (1989) also claim that teachers' beliefs about the subject matter combined with their beliefs about students, schools, learning and the nature of teaching powerfully affect their teaching. These beliefs legitimate or exclude a range of pedagogical strategies that teachers feel to be appropriate or inappropriate for teaching their subject matter to a given group of students (Gudmundsdottir, 1995). From this view of point, narrative forms are culturally specific (Ochs & Capps, 2001) and should be viewed as culturally situated (Philpott, 2005).

Orientation

Narrative is used to make sense of facts and is fundamentally linked to cognition

by providing meaningful explanations. In terms of Laurillard's conversational framework, narrative based learning activities should be designed to "engage learners in reflecting and articulating at the discursive level" (Laurillard, 2002, p.92). Attending, apprehending, and experiencing a new concept in learning objects, for example, often adopt narrative based activities. Attending is an activity that describes an overall topic goal and aims to introduce learners into the learning process. Empirical researches have reported cultural differences in getting students to start learning. For example, in Asian countries such as China and Japan, children are socialized to be obedient, to conform, and to persist (Hess & Azuma, 1991; Chan, 1999); while Western children, on the other hand, are raised to be assertive, independent, curious, and to explore on their own terms (Biggs, 1998). Learners in these countries with large power distance culture tend to do things only because their teacher asks them to do so, while ones in a small power distance culture would think about the reason more independently. For this consideration, an orientation in a learning object would be sufficient to satisfy learners with a small power distance culture.

Elaboration

Narrative can be regarded as a manner of speaking (White, 1980) which involves linguistic phenomena. Recent trends in linguistics and philosophy emphasize that language is more than a medium for communication; rather it is "a cultural resource" that produces and reproduces the social world (Duranti 1997). Elaborating information with alternative examples to explain a new concept or alternative explanations for why a concept may be framed in a particular way makes the new information more meaningful for learners, from a viewpoint of cognitive perspective (Castaneda, et. al., 1972). Vygotsky's (1978) "Zone of Proximal Development" theory describes a cognitive practice that generates alternative interpretation makes it easier for learners to integrate new information in their existing cognitive framework and knowledge structure. Learners are then better able to comprehend and memorize the new information and to develop their own capacity and skill of processing new information. It would be easier

for a learner to understand or comprehend a new concept if the way that illustrates it is familiar or acceptable; contrariwise, an unsuitable illustration may confuse learners or even ruin their learning interest.

Elaboration – Instance

There are two kinds of probable problems in illustration that may be unsuitable for learners' cultural environment. One is using something that is unfamiliar to a particular group of learners to illustrate or express a new concept. Here is a simple example. There is a "Mobile Learning RLO – a tool for using mediaboard" (RLO-CETL, 2008), with "Tate" on the interface. The "Tate" refers to the Tate museum where the mediaboard is used. It would confuse students who do not know the modern museum in London if the learning object was reused in other countries. For this kind of problem, it simply needs to be localized on the particular culture. Or, in this case, it can use lexicon in the learning object to explain the "Tate" is a modern museum of art.

The other one is to elaborate a new concept by using something that is conflicting or unacceptable for a local religion, culture, or tradition (e.g., religion taboo). Some examples may not be against a local culture, but not quite appropriate for the cultural convention. For example, in the case study of learning objects of Java programming, some students in BUU thought the example of "throwing coin" was not very interesting, because it seems not serious enough to be used in an educational situation in Chinese traditional culture. For this kind of problem, designers need to consider carefully avoiding or eliminating the potential controversial elements.

Elaboration – Language

Using academic or plain language can be an alternative way to interpret a new concept, which may be culturally preference. For example, enigmatic academic language is approbatory as the sign of knowledge to be revered and expected in strong uncertainty avoidance culture. As contrast, learners in a weak uncertainty

avoidance culture prefer plain language are likely to be receptive and welcomed (Stroebe, 1996; Hofstede, 1984).

5.3.2 Interactive Based Learning Activity

Interactive based learning activity includes those that learners act within the environment to accomplish their learning task. The learners receive meaningful intrinsic feedback on their actions that relate to the nature of the task goal. In contrast with the narrative based activity, interactive activity is a two way process in which learners acquire knowledge or information from the teacher and communicate with their teachers, peers, resources, or with all three. Interaction in an e-learning system enables learners to actively participate in the learning process and promotes intrinsic motivation by highlighting relevancy. Interaction also allows learners to tailor their learning experiences to meet their particular needs or abilities. The purpose of interaction is to connect learning material to learners and to move them toward a further action state of goal attainment (Wagner, 1998).

Interactive based learning activity refers to those functions and/or operations made available to learners to enable them to work with content material presented in an e-learning environment. The interaction here is more about a "dialogue" (Jonsassen, 1988) that takes place between learners and the content that they are trying to master rather than physical interaction at the interface (e.g., button presses and mouse clicks). Interactive based activities cannot be trivialized or limited to simple menu selection, clickable objects or linear sequencing. It is not to say that basic interactivity, such as "point and click", is inappropriate, but rather the level of interaction may not be adequate to facilitate the acquisition of knowledge or the development of new skills and understanding. In fact, multimedia represents no significant challenge to developers who understand that the quality of an interactive activity in an instructional resource is a function of the design effort rather than the technology (Sims, 1997).

Learner control

The pedagogical focus of interactive activities in an e-learning environment is "the nature of the learner control" (Laurillard, 2002). The most important thing for learners is to figure out how the system works or what they need to do to start and carry on the learning process. The e-learning environment should provide learners with the information that is needed to manage the steps of study, scope of the content, type of alternative media needed for the content presentations, and approximate time spent on a particular learning task. The interaction for learner control is particularly important if learning is to take place in a distant or a distributed learning context. Interaction for learner control is to keep learners on promising learning paths, to mediate the need for additional information to complete one's understanding of a new idea, and to recognize when the learning task has been completed.

However, learners' attitude towards the approach of learner control, also named self-regulated or self-directed learning, may differ based on their cultural background. For example, learners from cultures where strong authority figures are common (i.e., from high power distance culture) would expect teachers to outline paths to follow, whereas learners from a low power distance culture may desire to find their own ways of study (Hofstede, 1986). Therefore, considering learners' culturally diverse needs and preference, design of learner control in a learning activity may need to provide direct instruction to learners who are used to learn dependently, or to provide oriented guidance for learners who prefer to find answers through independent thinking. An inappropriate control level may cause confusions or less confidence to learners.

Motivation and stimulation

Interaction in an e-learning environment is made up of a "circuit through which the user and computer are apparently in continuous communication" (Crawford, 1990, p.104). The communication promoted traditionally by teachers is based on a programmed learning model. In an e-learning environment the communication

entails the presentation of instructional stimuli, followed by some form of question raised by the learning resource, which presumably elicits a response by the learner, and finally offers the feedback (affirmation or rejoinder) to the learners by the system.

Motivation and stimulation emphasises the employment of different ways to encourage or stimulate learners to accomplish learning tasks. The constructivist perspective on learning deems that activity, motivation and learning are all related to a need for a positive sense of identity, shaped by social forces. Intense negative conditions and emotions (e.g., feeling insecure, worrying about failure) can frustrate the learning enthusiasm of learners and have strong impact on their achievement of learning. This is the reason for which it is important that an e-learning system have to provide learners with positive or inspiring atmosphere through various means, such as appropriate feedback, and effective support.

Motivation for learning is influenced by social culture that encompasses learners (e.g., expectation of a family and society, attitudes toward success and failure in academy, or expected roles of teachers and students) and could be a big obstacle that hamper learners' efforts to achieve their study (French, et al., 1999; Martinez, et al., 2004) if it does not match learners' needs mentally and emotionally. Unlike traditional face to face learning, where an experienced teacher can keep informed on how a student is progressing and timely communicate and encourage the student through a dialogue, a posture, an expression, or even a hug with warmth, stimulation in an e-learning environment mostly comes from interaction between a learner and the system which is almost unable to provide immediate support from instructors.

Learners' motivation affects their performance in learning with computers. For example, in the case study of the learning objects of Java programming (discussed in chapter 4), all the students in BUU used the quiz and most of them gave positive feedback, while only less half of the students in LondonMet used

the quiz. The Chinese students saw the quiz as a type of test that could help them to get a high grade in exam. To achieve great success in academy for Chinese students is closely related to success in family and social life. British students see it as quite unrelated (Salili, 1996). Learners with different motivation may respond to stimulation in different ways. (e.g,. using tests in the learning objects can be stimulation for the students in BUU, but seems a burden for the students in LondonMet). It does not mean that learners in a collectivist culture do not enjoy, or have less interest in a lively or game-based learning task than learners in individualist culture. However, they would consider more getting a high grade of exam when the expectation from their society and family becomes a large burden to them.

5.3.3 Adaptive Based Learning Activity

Adaptive based learning activity refers to learning activities by which learners apply their new knowledge and skill to solve a problem in a given situation, and then can obtain a comprehension of the knowledge and mastery of the skill. According to Laurillard (2002), working in an adaptive based learning activity learners make input to a given model that represent an aspect of knowledge, run the model, and then observe the results that are feedback from the medium responding to learners' action. The learners can explore an abstract concept or an aspect of the complex real world by acting on a simulated environment, experiencing some aspects of the practice of the discipline.

Feedback

In the learning process of adaptation, learners should receive meaningful feedback on their actions. It is critical. Both behaviourism and constructivism learning theory acknowledge the importance of feedback in learning processes. The feedback, on one hand, provides learners a visualized description (e.g., text information, a diagram, an animation) of the result to which the program react to the learner's input. On the other hand, the feedback may offer a comment to

judge the learner's action. Laurillard identifies these two forms of feedback as intrinsic feedback and extrinsic feedback:

- Intrinsic feedback is feedback that is internal to the action, that cannot be helped once the action occurs;
- Extrinsic feedback is feedback that is external to the action, which may occur as a commentary on the action.

(Laurillard, 2002, p.126)

The intrinsic feedback in this sense is usually discipline related, without judgment from a third party. Therefore, cultural influence may relate to the culturally sensitive learning content, which is discussed in the first section of this chapter. In addition, there may be culturally sensitive factors on the level of presentation, which is detailed in next section.

The extrinsic feedback provides judgment of the quality of learners' performance of the learning tasks. Wagner (1994) suggests that there are two different perspectives of considering feedback. From a behaviouristic perspective, feedback provides reinforcement, which is intended to correct and direct performance. From cognitive perspective, feedback provides learners with information about the correctness of a response either so that they can determine if the response is right or not, or to allow learners to correct an incorrect response so that long-term retention of correct information is enabled. In an e-learning system the feedback can be obtained from a variety of sources: from the system automatically, provided by human tutors, or peers; and the first one is the most immediate and efficient. Therefore, instructional design should focus on how to make the most of the feedback of systems to promote the interaction between learners and the systems.

However, a difficulty exists in design of an effective response-feedback mechanism because the perceived advantage of interactivity in e-learning systems is based on its equivalence to real life teacher-learner or learner-learner communication (Sims, 2000). This communication is shaped by learning culture

which may differ on the views of roles of teachers and learners, the forms of asking questions and expected answers, and the attitudes towards errors or mistakes in learning (Hofstede, 1986, 2001; Biggs, 1998). Learners from different cultures may expect or be willing to respond to different ways of simulation and feedback, because there are difference in attitudes toward the responsibility and roles between teachers and students (Collis and Remmers, 1997; Ikuta et al., 1998; Jin and Cortazzi, 1998). Attribution of success and failure can also be seen in different cultures (Hess & Azuma, 1991; Holloway, 1988), which have great impacts on learners' motivation and behaviours of learning. Therefore, feedback should be appropriate for learners' cultural convention as it plays such an important role in e-learning environments.

Type of learning tasks

Adaptive based learning activity is a kind of experiential learning, but students' actions are confined to operating in a given model (Luarillard, 2002). The model, at the level of a learning object, could set up exercising tasks towards the goal of the learning object. By accomplishing the tasks learners acquire a more comprehensive understanding of the concept and scaffold their knowledge (Bransford, et. al., 2000).

However, empirical studies show that there are differences between learners with different cultural background in terms of the type of learning tasks. For example, learning tasks could be open-ended or require accurate answers. Students in strong uncertainty avoidance culture, which is likely to be intolerant of differences and ambiguity and to be reluctant to take risks (Hoftstede, 2001), are more likely to feel challenged or uncomfortable with the learning tasks if the answer is unpredictable or unique. In contrast, students in a weak uncertainty avoidance culture may be eagerly compliant to discover something new by themselves.

In addition, learners in a small power distance culture are encouraged to find their own way to solve a problem, while learners in a large power distance culture expect their teacher to outline paths to follow, and teachers usually do so (Hofstedes, 1986, 2001).

5.3.4 Communicative Based Learning Activity

Communicative based activity includes learning tasks through discussion, debate, and group projects. The common trait of this kind of learning activities is to involve learners in such a learning community so that they take part in the collaborative learning activities. Communicative based learning activity, as an effective learning approach, involve learners working together to create meaning, explore a topic, or improve skills (Harasim, et. al., 1995). As Seufert et al. (2002) described, ensembles of learners "share a common language, world, values in terms of pedagogical approach and knowledge to be acquired and pursue a common learning goal by communicating and cooperating through electronic media in the learning process" (p.47). The learners are connected via the Internet in which they act in roles. DeSancitis and Gallupe (1987) argue that provision of an electronic communication channel enhances information exchange within in a group and leads to a more balanced involvement of group members, which will in turn lead to better decision outcomes. This argument implies two assumptions that may be culturally specific. First assumption is that it is important for each group member to have an equal opportunity, regardless of status diversity, to express an opinion in a group discussion. Second, it assumes that all group members prefer open and direct communication to resolve conflict or disagreement.

Cultural influences are often at the root of the communication challenge (DuPraw & Axner, 1997) where misunderstandings and misinterpretations occur (Geer, 2001). Learners of different cultural backgrounds may have different attitudes towards collaborative manner (Freedman & Liu, 1996), division of

labour (Watson, 1994), and handling conflict and making decision (Watson, 1994; DuPraw & Axner, 1997). Because collective working is the essence of communicative based activity, Hofstede's cultural dimensions of individualism vs. collectivism and power distance are germane to this study.

Cultural differences between collectivism and individualism affect learners' performance during discussion and debate in group learning. Collectivism culture promotes collective goals and individualism culture favours individual rights (Hofstede, 2001). In the latter there is a sharing of authority and acceptance of responsibility among group members for the group's actions. The underlying premise of collaborative learning is based upon consensus building through cooperation of group members. Communication based learning activities pursue cooperative or competitive goals. Some activities are developed to lead members to compete against one another while others emphasize cooperative goals and minimize team competition (Joyce, et al., 2004). The goal of the cooperation is for the group as a whole to achieve a positive outcome. Each member of the group has very few items or a small task to master and shares their information or results. In contrast competition encourages individuals to be better than other group members. Some researchers claim that cooperation increases learning (Johnson, 1990, Sharan, 1990) but others argue that the competition between learners benefits learning (Slavin, 1983). They are all reasonable in a particular situation. But a certain collaborative learning modality may not generalize directly to different cultures. Collectivism culture places a high priority on group harmony and maintenance of social structure. Group members are sufficiently satisfied with a group solution and could create greater shared understanding of a broad set of beliefs. In contrast, learners from individualism culture demonstrate a higher capacity for accommodating differences, and encounter many situations where divergent views must be reconciled in order to reach a decision (Watson, et. al., 1997; DuPraw & Axner, 1997; Wang, 2007).

Communication between members of a learning group includes synchronous and asynchronous modalities. Although the two modalities are reported to be useful by all participants of a survey completed by Wang (2007), the students from collectivism culture, e.g. China and Korea, in particular, preferred more asynchronous discussion than American students who are in an individualism culture. Students from collectivism culture feel that the asynchronous type of communication allows them to think through discussion topics and to contribute more thoughtful and better-worded ideas (Watson, et. al., 1997). This delayed-time discussion also supports a salient Asian cultural trait in interpersonal communication: think more, talk less, and think it through before speaking (Wang, 2007).

Timing is another reason that learners may prefer asynchronous communication. Salmon (2002b) and Martinez, et al. (2007) report difficulties in managing time in virtual environments, which make it difficult for students to communicate in a synchronous way to perform the learning activities. Howell and Jayaratna (1998) also report a study of different groups of students in a distance learning course; these students preferred the asynchronous communication to work in groups because "they could communicate at a time most convenient to them" (Howell & Jayaratna, 1998, p.3). In a cross-cultural learning context, the problems of language, such as misunderstanding or putting the written word into context (Collis, 1996), irritates the impatient (Hiltz and Toroff, 1993), and inhibits those who lack self-confidence to participate (Harasim, 1996), could make the asynchronous communications more difficulty.

There are many aspects of a communicative based activity that are influenced by social culture because learners need to work together as a group or team. For this reason, it is rarely built into a learning object. Communicative based activity often occurs in an e-learning system (e.g., a course) where learning objects are reused. Therefore, cultural influence on communicative based activity mainly relates to the reuse of learning objects.

5.3.5 Productive Based Learning Activity

Productive based learning activity is a type of learning activity in which learners have to synthetically use their knowledge and skills to produce their own contribution that can be a representation of a concept, a new idea, or a product. Productive based learning activities allow "learners to go beyond exploration of a given model to creating their own model" (Laurillard, 2002, p.167). Through the learning process, learners reflect upon theory in the light of the experiences. Therefore, productive based activity has a great emphasis on reflecting on conceptions and building artefacts by their own way.

Theoretical frameworks concerning productive learning, as Reeve, et al (1998) suggested, are most appropriately drawn from experiential learning (Kolb, 1984) and reflective practice (Schon, 1983). Learners are involved in a productive activity which is used to test out ideas and assumptions rather than to obtain practice passively. So it is essential to "enable learners to create and produce a system of their own, designed to achieve a specific end" (Laurillard, 2002, p163). This process must be for learners to exercise some independence from their teachers. It is not sufficient simply to have the experience. Learning from experience must involve links between doing and thinking – reflection. Intrinsic feedback provided from a productive learning system is crucial for learners to have the evidence upon which to reflect. It is also important to establish an appropriate emotional tone for learners to value their own experience and to trust themselves to draw conclusions from it.

Engagement

It is the principal task of a productive based learning activity that learners contribute their own idea, opinion, or product. How to engage learners into the task is a culturally sensitive issue, because there are different attitudes and traditions towards expressing themselves. Empirical researches found that some students, e.g. in Scandinavian countries, are willing or expect to express their

own opinion, and even feel inconvenient if a system does not provide them an opportunity to do so (Russo & Boor, 1993). In contrast, others, such as in China, may experience a hard time when they are asked to express their own opinion (Biggs, 1998). This difference can be explained from a point of view of cultural diversity. Small power distance cultures expect students to find their own paths and allow them to contradict or criticize authorities, while in a large power distance culture teachers usually plan everything for students to follow, and respecting teachers and authorities is expected. In addition, students have more opportunities to speak in an individual culture than a collectivist culture (Hofstede, 1986). The Scandinavian countries, like Denmark, have a low score in the power distance index and a high score in individualism, while China has a high score in power distance index and very low score in individualism based on Hofstedes' cultural dimension scores (Hofstede, 2001). These cultural diversities may affect learners' performance and further affect the effectiveness of the productive based learning activities.

Value of error

It is hard to not make mistakes in experiential learning. Experiential learning is highly valued because it provides opportunities for learners to "learn from mistakes" (Beard & Wilson, 2002). However the attitude towards the "value of error in learning" is not fit for all learning contexts. Reeves (1997b) describes a pedagogical dimension of value of errors that has two extreme perspectives from errorless learning to learning from "trial and error" experience. Reeves provides two examples to explain the application of the value of errors in computer-based education programs. One is the IBM's Writing To Read program in which prohibition of errors is the principle of the alphabet learning system (Freyd & Lytle, 1990, cited in Reeves, 1997b). As contrast, in "The Case of Dax Cowart", an interactive videodisc simulation created at the Centre for the Design of Educational Computing at Carnegie Mellon University (Covey & Cavalier, 1989, cited in Reeves, 1997b), students are confronted with negative outcomes of what they chose; and each choice is treated as an "error" from which valuable lessons

can be learned. The two examples were designed based on different learning approaches, rather than considering cultural diversity.

The cultural difference on the value of errors in learning has been examined through both theoretical and empirical ways. Tweed and Lehman (2002) use a Confucian – Socratic framework to analyze culture's influence on academic learning. In their framework they suggest that Socratic-oriented learning (in the Western culture) highly encourages learners to question and evaluate material presented by instructors. Questioning the ideas of others asserts one's independence and thereby fulfils the cultural ideal of individualism. Exposing an error in a person's answer and evoking a doubt is believed to be the first step in attaining knowledge (Jacobsen, 1999). On the other hand, the Confucian-oriented learning (in Chinese culture) is not focused mainly on questioning, evaluating and generating knowledge but expects learners to respect and obey authority figures. Innovation is acceptable in certain contexts, but the tendency to innovate or criticize without extensive preparatory knowledge is a fault, according to Confucius (1979, 7:28, 16:2). So teachers tend to fully structure contents to ensure students correctly acquire the knowledge; and students rarely ask questions in classrooms to avoid making mistakes (Biggs, 1998; McCargar, 1993).

In addition, empirical researches based on Hofstede's cultural dimensions of individualist vs. collectivist explain the cultural differences on the attitude towards error in learning (Biggs, 1998; Jin & Cortazzi, 1998). Students in a collectivist culture avoid making mistakes to save "face" among their group members. In contrast, in an individual culture, students' "face consciousness is weak" (Hofstede, 1986). Therefore, an error or a mistake that takes place in a learning activity may become a stimulant for some students to explore the right solution, but may also cause others to feel frustration and even drop out of the activity.

Cultural influences on performance of learners may become stronger along the degree of complexity of tasks in productive based learning activities. In learning objects, productive based learning activity focuses on application of one concept, e.g., building a piece of program of a While Loop in Java programming learning objects. Less cultural sensitive factors may be involved. At the level of using learning objects, a productive based learning activity in general may include more complex tasks that would involve more contexts, such as the problem background, cooperation with peers or other participants, and assessment criteria. There may be more culturally sensitive factors involved.

5.3.6 Summary of Pedagogy Dimension

The pedagogy dimension explores the culturally sensitive factors likely to be encountered in instructional design of learning objects. This dimension focuses on the influence of culture on instructional activities themselves, i.e. learners' performance and probable reactions to the learning tasks in learning objects, rather than learners' human-computer interaction, which will be discussed in the following section. The analysis is grounded in the most dominant characterstics that are correlated with culture in each type of learning activities. Each section discusses one type of learning activity in which culturally sensitive factors can be examined relevantly, e.g., an appropriate elaboration is enhanced with comprehension in narrative based learning activity, adequate learner control can keep learners on promising learning paths in interactive based learning activity, and so on. Table 5.2 summarises the culturally sensitive factors in the pedagogical dimension.

The culturally sensitive factors in each type of learning activity do not mean that they only exist in this type of learning activity but can also appear in other types of learning activities. For example, motivation is a culturally sensitive factor that should be considered not only in interactive based learning activity but any type of learning activities during design and development of learning objects.

Table 5.2 Culturally sensitive factors in the pedagogy dimension

Factors	Description
Orientation	To introduce learners into the learning process in a proper way, e.g., quick introduction or extended introduction
Elaboration	To interpret or explain a concept with proper language, e.g., academic language or plain language, and examples
Learner control	To guide learners to accomplish a learning task in a proper way, e.g., to outline the path and ways or only direct orientation and aims
Motivation and stimulation	To elicit learners' performance of learning by using different ways, e.g., encouraging, praising, spurring, or urging
Feedback	To respond to learners' actions in a proper way which may be a extrinsic answer, analytic algorithm, or opening a further task
Practical task	To require learners to apply the new knowledge by generating questions on the topic that may be closed or open-ended
Collaborative task	To require learners working together to achieve a learning goal which may relate to collaborative manner, group size, division of labour and teaching support
Communication manner	To create channels for learners to communicate with each other which may need to be synchronous or asynchronous, and anonymous or signed
Engagement	To engage learners in a productive or creative task which may need to provide extra explanation or support
Value of error	To consider the difficulty of practical tasks and to refrain from depression or frustration and promote learning progress

5.4 Access Dimension

Accessibility for e-learning systems indicates whether the resources "can be used by all learners regardless of environmental or technological constraints, and allows individual learning styles and preferences to be accommodated" (Perry, 2004, p1). The purpose of an accessible interface that serves as a media to connect learning material to learners is to move them toward a further action state of goal attainment (Wagner, 1998). If a mismatch existed in the medium, the movement would be towards a wrong direction or even suspended from the

journey. Cultural diversity can cause serious mismatch between the interface of e-learning resources and learners' needs and preferences (Russo & Boor, 1993; Veres & Day, 1997; Smith, et al., 2001). The access dimension focuses on the influences of culture on human-computer interaction (HCI) design of learning objects, which involves interface design, accessibility of the software.

Specific preferences and need for accessibility of learning resources represent what the user wants a system to look like and what functionalities should be included. The idea of "access for all" (IMS, 2004) is "intended to make it possible to identify resources that match a user's stated preference or need" (p1). The IMS Accessibility for Learner Information Package Specification (IMS ACCLIP Specification), which is part of the IMS Learner Information Package (LIP) Specification, defines three groups of elements that represent accessibility preference of learners. The three groups are

- Display: display technology preferences that indicate how user interfaces and content should be presented, typically are visual but could be an auditory screen reader or tactile Braille display.
- Control: technologies that provide alternative ways of controlling a device, typically are keyboard and mouse but could be switches, touch-screen, joystick tactile devices or an auditory voice recognition system.
- Content: preferences regarding the content which specify any desired transformation or enhancement, are primarily visual, auditory media or textual components that can be read or transformed into auditory components by a screen reader.

This specification considers accessibility to meet individual needs or performance with regard to how learners interact with an e-learning system, especially special needs for disability. Therefore, the focus of ACCLIP is to accommodate learners' needs and preferences for "particular technology areas". For example, language subtitles could be an alternative to a visual presentation

of content if it is necessary. Or a voice recognition system could be an alternative input device for someone who needs or prefers it to control the resource.

For the purposes of this study, accessibility denotes the global requirement for access to learning objects by individuals with different abilities, skills, requirements, and preferences in a variety of contexts of use (ISO, 1997). Its meaning is restricted to the target user population and cultural differences. It describes a relationship between a learner and a learning object as accessible when the characteristics of the learning object are delivered match the learner's culturally particular needs and preferences. Therefore, the access dimension addresses culturally sensitive factors that affect the accessibility of learning objects with regard to the presentation of content and HCI (Figure 5.2). The content presentation points out the culturally specific or preferred characteristics of components of an interface of a learning object. The HCI design points out how learners prefer to interact with learning objects from a cognitive perspective. These preferences are likely to have a considerable impact on user interface design of learning objects.

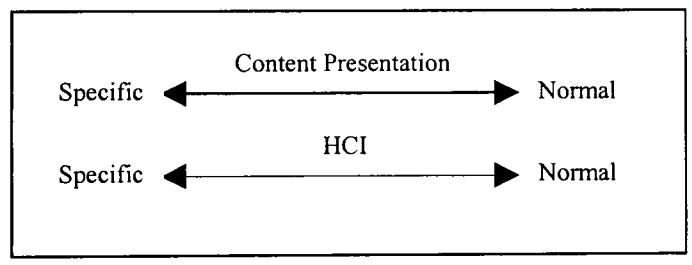


Figure 5.2 Access dimension for design of culturally sensitive LOs

5.4.1 Content Presentation

The importance of cultural issues on interface design for international users has been reported in many literatures. Fernandes (1995), for example, suggests that users would be frustrated by a culturally inappropriate interface because it would not represent their view of the real world around them. An interface is culturally inappropriate when it is not localized to accommodate the user's cultural background (e.g., an interface with a national bias from the country in which it

was developed) and conveys messages that are interpreted as inappropriate by the user. This lack of familiarity could lead to frustration and after that to rejection of the products.

Some researches (del Galdo, 1990; Russo & Boor, 1993; Galdo & Nielsen, 1996; Badre, 2000) on cultural aspects of interface design have tried to outline a range of cross-cultural elements, in order to provide some guidelines. Galdo and Nielsen (1996) describe the following aspects influenced by culture:

- Character sets: Different scripts (Cyrillic, Hebrew, Kanji, Latin) need different functionality and display features
- Collating sequences: Different cultures have different rules for sorting characters
- Currency, time, date, and numeric formats and telephone numbers
- Icons, symbols and colours
- Screen text
- Menu accelerators (positional keys) and documentation

Russo and Boor (1993) examine the factors on interface design for international use. They describe that information, such as text and graphical components of an interface, should be arranged on the screen in a way that depicts the logical flow of information; for example left -to-right or right-to-left orientation on the screen because of reading/writing background. The functionality, like images, colours, and symbols, and product features chosen for one culture may not be appropriate for all cultures.

The other researches, however, focus on the underlying notion of real world objects, habits, and values to virtual representation in the interface. Fernandes, (1995) discusses various instances of when well meant cultural localization efforts turn into ambiguity for users in his book *Global Interface Design*. He claims that users would be frustrated by a culturally inappropriate interface because it would not represent their view of the real world around them.

Besides the interface design elements (e.g., icons, images) which can be interpreted differently by users from different cultures, some researchers also evaluate features of interfaces of web sites designed in different cultures by applying Hofstede's cultural dimensions (Marcus, 2001; Marcus & Gould, 2001; Dunn & Marinetti, 2002; Dormann & Chisalita, 2002; Ford & Gelderblom 2003). For example, Marcus and Gould (2000a, 2000b) compare differences between web pages designed in different countries by using Hofstede's cultural dimensions. They found culutral differences in two groups of Websites from Malaysia, which is a high power distance culture, and Holland, which is a low power distance. They also propose a guideline for web interfaces design for high power distance culture as that

- providing highly structured access
- giving prominence to leaders
- using both explicit and enforced security measures
- having a strong focus on authority, certification, or official stamps.

These should be opposite for a low power distance culture, according to Marcus and Gould (2000b).

However, the use of Hofstede's cultural dimensions model of managing the aspects of cross-cultural interface design has been criticized as being too stereotypical (Bourges-Waldegg & Scrivener, 1998) or rigid (Jagne, et al., 2004). Some previous attempts to apply Hofstede's cultural dimensions to interface design have resulted in conflicting and inconclusive findings. For example, Gould, et al., (2000) found that Malaysian websites contain links on the home page to website administration, which relates to the high power distance culture of Malaysia. However, this does not explain why low power distance cultures, such as the US, also contain such links on their websites.

The contrast seems to suggest that there are cultural differences on presentation of content between different cultures, but cultural dimension models should be

used with care (Fitzgerald, 2000) unless their relevance to interface design is better proved.

Analyzing the existing literature in this area, a fundamental problem of designing interfaces for culturally diverse users can be understood as a divergence between what the target meaning and the interpreted meaning of presentation is (Bourges-Waldegg & Scrivener, 1998). It is because the meaning of metaphors and other representations used in a system may be rooted in culturally specific contexts, and user's interpretation of a representation's meaning may be influenced by specific cultural contexts. Therefore, understanding of a representation's meaning in a given context is the main issue of designing culturally appropriate interfaces. The culturally sensitive factors of representations are concluded into the following Table 5.3:

Table 5.3 Culturally sensitive factors to content presentation

Name	Description
Language	Langue that represents the learning content (includes language in video and audio files) Special jargon, slang, adage, etc.
Number	Number format, e.g., 6.5 or 6,5 using a comma or period to separate the whole part of a number from the decimal part
Date	Date format, e.g., day-month-year or month-day-year
Time	Time format, e.g., 12 hour clock (9pm) or 24 hour clock (21:00)
Image	A image that is comprehensive and acceptable by target users
Symbol	A symbol that cannot be misinterpreted by target users
Colours	users' preferred colours for a particular cultural context
Flow	The arrangement of texts and graphics components of an interface on a screen which depicts a logical flow of information

5.4.2 Human-Computer Interaction

Besides paying attention to the surface level of translation of text, date, time, number and symbols (del Galdo, 1990, Russo & Boor, 1993; Galdo & Nielsen, 1996; Badre, 2000), the issues of internationalization for HCI design need to be addressed on a deeper level in which cultural characteristics of potential users of e-learning resources may influence their performance in the learning process. Some studies address cross-cultural HCI design with specific concern for user preferences from a cognitive perspective (Choong & Salvendy, 1999).

Cognitive style, as defined by (Riding & Rayner, 1998), is an individual's preferred approach to organizing and representing information. Anthropological and psychological studies of general cognitive processes continue to suggest that cognitive styles are connected to culture (Chen & Ford, 1998; Luria, 1976; Nisbett, et al., 2001; Riding & Rayner, 1998; Castaneda, et al., 1972; Hansen, 1995). These culturally influenced cognitive styles, when employed in HCI design, result in information production that is dictated by existing culturally bound patterns of thought of designers, and can be identified by a range of design components. In addition to the explicit cultural differences (e.g., text, numbers, dates, and symbols), more critical are the implicit and less formal standards of page format, information architecture, and human-computer interaction (Faiola & Matei, 2005). Therefore, to build a robust interactive interface, it is necessary to understand how cognitive style can directly impact interface design and user interaction, and their consequences for users' behaviour in e-learning environments.

In interaction with a computer, users' performance could be impeded if the information representation of the system does not match their cognitive style. Empirical studies show that cognitive differences at the design level exist in the form of cultural styles that are perceptible to users. Faiola and Matei (2005) report that online task time performance of users is faster when using the web

sites that are created by designers from their own national culture, and vice versa. Choong and Salvendy (1999) investigate the relationship between users' performance and different structures of HCI interface from the cognitive perspective. They provided an application software with two different structures of interfaces, functional and thematic, to American and Chinese students to assess the effects of cultural attributes on the computer performance in terms of performance time, error rate, and memory recall. They found that for the Chinese students, the provision of a thematic structure (rather than a functional structure) of computer systems reduced the performance time. In contrast, the thematic structure was more difficult for the American students and led to longer performance time. For the Chinese student, the number of errors was smaller when using the thematic structure than the functional structure, whereas American students committed a smaller number of errors when using the functional structure than the thematic structure. Through an examination of the memory recall, they found that the information was more easily retrieved from the memory of the Chinese students provided with a thematic structure of the computer software rather than for those provided with a functional structure. The memory recall did not have significant difference between the thematic and functional structure for the American counterparts.

These studies show the practical impacts of cultural difference on HCI design and user's performance from a cognitive perspective. The cultural differences in cognitive styles should be taken into account for HCI design, even though the results cannot be simply generalised as a design principle. However, the effects of cognitive styles are quite subtle and difficult to capture during the design processes. In order to make a more measurable factor for considering cultural difference in cognitive styles on HCI design, a term of *holistic structure* of interface may be helpful to capture the implicit cognitive effects. The holistic structure refers to interface design with holistic consideration of how to organise components of an interface.

An easy and appropriate accessible interface of learning objects provides a basis of learning task performance. Task performance is a complex outcome, modulated by multiple factors, including those resulting from the cultural diversity between designers and learners. Culturally sensitive factors in the design of accessibility contain explicit factors at a surface level (e.g., translation of text, date, time, number and symbols) and implicit factors at a deep level (i.e., cognitive level). The explicit factors are easy to determine based on learners' cultural background. The implicit factors, in this study, are regarded as part of a holistic structure to ensure ease of measure.

5.5 Technology Dimension

The increasing use of information and communication technology in education throughout the world has raised important questions about the relationship between cultures and technologies. Many researchers identify the symbiotic relationship of society and information and communication technology. Davies (1988), for example, states that "the creation of a technology does not occur in a vacuum but instead encompasses social and cultural phenomena" (p.163). Layton (1994) also argues that tools and machines reflect the values of the culture in which they are designed.

The technology is the foundation of developing of e-learning materials and the basic external condition of using them. Technological issues relate to the aspects of learners' attitudes towards learning through or with computer, learners' prior experience and skills of using the technology, learners' special needs about the technology, e.g., phonetic control for disabilities, and computer network as the infrastructure. Hence, the technology dimension examines the cultural difference on the technologies at national infrastructure level and individual knowledge and skill level (Figure 5.3).

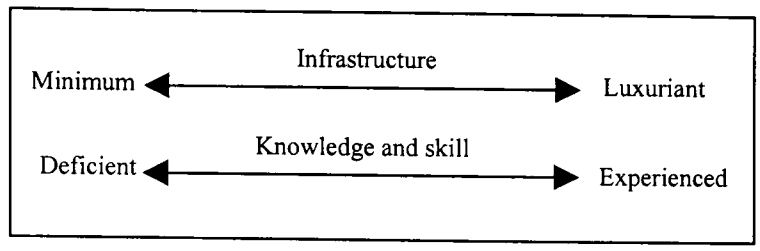


Figure 5.3 Technology dimension for design of culturally sensitive LOs

The first culturally sensitive factor in technology dimension, *infrastructure*, indicates a requisite infrastructure that a learning object operates on. The second culturally sensitive factor, *knowledge and skill*, indicates the requirements of a learner's knowledge and skills about the technology that is prerequisite of using the learning object.

5.5.1 Infrastructure

Cultural difference relate not only to the aspects of mentality and behaviour, but also to the aspect of material (Bodley, 2000). There are regional and national factors that have a stronger economic base and may be of importance to understanding the differences among groups of learners and how they use the technology to enhance learning. Economy is an important factor that affects the use of international information systems (Ein-Dor, et al., 1993). Zahedi, et al., (2001) categorize the economic factors that may impact upon the use of web technology as national factors. Based on Hofstede's (1994) cultural dimensions, they argue that "to a large degree the cultural dimensions capture the economic differences among countries" (Zahedi, et al., 2001, p.93). The national factor indicates the technology infrastructure of the country, which includes communication and information technology. The technology infrastructure and the use of them are more behind in poor countries than rich countries (Meyer, 1991; Streeter, et al., 1996; Chen & Chen, 1998). Lack of infrastructure severely restricts use of the Internet, which is primarily limited to scientists and the academic elite of the less developed countries, and students access to computers in minimal, e.g., the only viable access is at learning centres in these countries

(Rogers, 1998; Haymond, 1998; Latchem, et al., 1999). As Eastmond (2000) claims, there is a technological challenge to promote e-learning in low technology countries, who cannot provide the advanced information communication infrastructure than the high technology countries do.

On other hand, not all e-learning activities require equally technological supports. For example, the narrative based learning activity requires less specialized equipment and facilities, e.g., narrative media (Laurillard, 2002). The other activities, such as interactive and communicative based learning activities may require interactive multimedia, special hardware and software, or optional equipment. It may be a potential problem for designers as to whether the infrastructure is sufficient for the technology (hardware and software) employed in learning objects.

The culturally sensitive factor, *infrastructure*, has a range of values, showed in figure 5.3. The position at the left end indicates the minimum running environment demanded, including hardware and software. The position at the right end indicates what facilities can make the most of the pedagogical and technological effectiveness of a learning object. The middle points between the two extremes represent the degree of the quality of an infrastructure that fit a learning object. For example, running a learning object with synchronous communicational activity between learners, a high speed broadband network would be better than a phone line connection network, because high speed network can technically keep the communication fluent, especially for audio or video communication.

5.5.2 Personal Technological Knowledge and Skills

Learners' experience in computers and their knowledge and skills of information technology make a difference in their perception of the e-learning (Francis, et al., 1996, Freedman, & Liu, 1996). Zahedi, et al. (2001) assert that those who have a

higher level of ICT knowledge will use web documents more effectively because their skills with the technology give them more ease in accessing what they need and prevent anxiety or distraction regarding the technology. Handzic (1994) also suggests the effect of previous computer experience on user acceptance of information technology. Moreover, learners' personal belief about their ability to perform specific tasks influence computer use. Individuals with higher level computer skills are more positive regarding the outcomes of computer takes (Compeau et al., 1999). Barker (1998) found that the "novice basically exhibits a very different degree of receptivity to different interface and media type than does the experienced user" (p.60). Therefore, if a user of e-learning resources lives in a country that has more communication facilities and ICT is used more widely, then the user is expected to be more at ease with using the e-learning resource, and vice versa.

Despite the influence of application of technology, students' experiences of using ICT for learning also are found to be different between cultures. Li and Kirkup (2007) compared Internet usage patterns between Chinese and British students and found that both Chinese and British students reported that they used the Internet for study and personal interests, but Chinese students used the Internet for mainly personal interests, and British students used it mainly for study purposes. This difference reflects, on the one hand, the different teaching style in the two countries. In the UK much of higher education is project-based with students being required to identify useful resources for assignment topics. Under this educational style, British students need to explore various resources by using libraries, the Internet, and online databases. However, in Chinese higher education, the focus is still very much on textbooks. Chinese university students give most respect to textbooks, and the materials assigned by lecturers. Therefore, use of the Internet as a resource for study and research has not, in the past, been an issue for teachers and students in China, as it has in Britain (Li and Kirkup, 2007). On the other hand, this difference also reflects the different stages of integration of ICT in high education and the way it is used in the two countries.

In the UK educators and students are being encouraged to use ICT for their teaching and learning by policies of both the government and schools, and many useful websites and online learning resources are available for students (Somekh, 2000). In China, however, the use of ICT in higher education is still at a very early stage; especially the availability of online learning resources and supporting technical platforms is poor (Sun, 2002; Li & Kirkup, 2007). The case study of the learning objects of Java programming used in China and the UK also found these differences. For example, the learning objects was blended into the learning materials of the course and accessed through WebCT in LondonMet, while they was used as associate learning material and accessed through Internet Explorer in BUU.

The culturally sensitive factor, *knowledge and skill*, has a range of values, showed in figure 4.3. The position at the right end is fully experienced for the technology, while the left end is not sufficient at all. The middle points between the two extremes represent the degree of sufficiency of the knowledge and skills about the technology. For example, if a learner has more experience of using the technology, he or she will be technically effective for the use of the learning objects, and vice versa.

The technology dimension categorises the culturally sensitive factors based on technique-related cultural diversity, as *infrastructure* and *knowledge and skills* of the technology. Learning objects can be effective when it fits within the technological infrastructure and learners' technical knowledge and skills, whether utilizing high or low technology.

5.6 Summary

The cultural influences may occur at different aspects of the design and development of learning objects, and are often subtle and hard to manage. This chapter proposed a structured approach to explore and organise the culturally

sensitive factors that are likely to be encountered in the design and development of learning objects – the four dimensions for culturally sensitive factors in the design and development of learning object.

1. The knowledge dimension examines the cultural issues that associate with the knowledge domain including learning contents in learning objects and prior knowledge of learners.

2. The pedagogical dimension explores the culturally sensitive factors from the activities of teaching and learning. Five types of learning activities that could cover learning activities included in learning objects (referred from Laurillard (2002)) are the basis for examining the cultural influences on effectiveness of learning from the perspective of pedagogy.

3. The access dimension focuses on the cultural diversity in HCI design. The culturally sensitive factors associate with both aspects of content representation and holistic structure of interface design which is considered from the perspective of culturally diverse cognitive styles (Nisbett, 2003).

4. The technology dimension focuses on the cultural differences in technical infrastructure and learners' technological knowledge and skills. These differences influence usage of learning objects and learners' experience of using learning objects.

This chapter also identified culturally sensitive factors in each of the dimensions. The cultural dimensions and the culturally sensitive factor are summarised in table 5.4.

To categorise the culturally sensitive factors into the four dimensions, on the one hand, summarises the massive and jumbled cultural items in a manageable

format. On the other hand, it provides a basis to address the cross-cultural issues during the process of design and development of learning objects. These cultural dimensions and the culturally sensitive factors are then used in next chapter as a basis for drawing up a cultural reference model for the design and development of learning objects.

Table 5.4 culturally sensitive factors associated with design and development of LOs

Factors	Description and Cultural Sensitivity
knowledge Dimension	
Learning Content	The topic to be taught in the learning object Culturally sensitive issues included in the learning object, e.g., race, class, religion, gender, etc.
Prior Knowledge	The knowledge related to the topic that learners should have beforehand in learning through the learning object Special knowledge involved in the learning object that may be not familiar to learners in other cultures
Access Dimension	
Language/ Text	Text that represents the learning content (includes language in video and audio files) Special jargon, slang, adage, etc.
Image	Images or pictures that visually describe the learning content (include images in animation and video files) Difficult or impossible to understand or comprehend in other cultures Containing potentially controversial elements,
Symbol	A symbol that cannot be misinterpreted by target users Causing potential misinterpretation
Number, Date, Time	Number, date, time format Using a comma or period to separate the whole part of a number from the decimal part (6.5 or 6,5); day-month-year or month-day-year or year-month-day; 12 hour clock (9pm) or 24 hour clock (21:00)
Colours	Colours used in the interface Special meaning of colours for particular cultures
Navigation	Navigation patterns that direct learning through the LO on the structural level Selection of navigation tools: including Section buttons, Previous/Next buttons, Back/Forward buttons, Map, Index, Menu, and hypertext links
Holistic Structure	HCI design with holistic consideration of how to organise components of an interface Organisation of components of an interface, e.g., functional or thematic structure
Technology Dimension	
Infrastructure	Software and hardware equipments needed for running the learning object Special software or hardware that are out of main stream and not used commonly
Experiences or Skills	Technological knowledge and skills that are prerequisite to use the learning object Special knowledge or skills that learners may not have it generally

Factors	Description and Cultural Sensitivity
Pedagogy Dimension	
Orientation	To introduce learners into the learning process in a proper way, e.g., quick introduction or extended introduction Groups of potential learners differ in motivation of attending the learning and may need different type of introductions to attract or engage them in the learning.
Elaboration	To interpret or explain a concept with proper language, e.g., academic language or plain language, and examples Language involves differences in acceptable tone and style of communication; Examples may contain particular social cultural contexts.
Learner control	To guide learners to accomplish a learning task in a proper way, e.g., to outline the path and ways or only direct orientation and aims Cultural differences in perception of appropriate allocation of responsibilities between learners and teachers.
Feedback	To respond to learners' actions in a proper way which may be a extrinsic answer, analytic algorithm, or opening a further task Groups of potential learners prefer or expect different feedback which may affect their performance of learning emotionally.
Motivation and Stimulation	To elicit learners' performance of learning by employing different ways, e.g., encouraging, praising, or urging Cultures differ on meaning of success in academic and manner of stimulation.
Practical task	To require learners to apply the new knowledge by generating questions on the topic that may be closed or open-ended Learners' experiences differ in terms of performance of practical tasks.
Collaborative task	To require learners working together to achieve a learning goal which may relate to collaborative manner, group size, division of labour and teaching support Egalitarianism, non-critical acceptance of ideas, or presentations of thoughts are different in the Western and the Eastern culture.
Communication manner	To create channels for learners to communicate with each other which may need to be synchronous or asynchronous, and anonymous or signed There are cultural differences in preferences for the manners of communication.
Engagement	To engage learners in a productive or creative task which may need to provide extra explanation or support Learners have different experiences for the learning task that are creative, contributed, or productive.
Value of error	To consider the difficulty of practical tasks and to refrain from depression or frustration and promote learning progresses Cultural differences on the value of errors in learning.

6 A Cultural Reference Model for the Design and Development of Learning Objects

The chapter begins by discussing the principles of dealing with cross-cultural issues in learning objects. Then a framework that maps the dimensions of culturally sensitive factors (discussed in last chapter) to the design and development of learning objects is represented. The last section discusses adaptation strategies for reuse of learning objects.

For learning to be equally effective in different cultures, learning objects should be relevant to the targeted learners' interests and background. At the design level, designers have to have a cross-cultural understanding to enable them to make decisions to meet potential learners' needs. The challenge is that designers are not cross-culturalists. It is also impossible to illustrate every cultural trait in e-learning for each particular culture by a standard. For these reasons, the cultural reference model does not provide illustrations of the cultural phenomena, which cannot be comprehensive, but based on analysis of the culturally sensitive factors provides principles for dealing with cross-cultural issues in learning objects. In order to facilitate examining cross-cultural issues in the design process explicitly, the model provides a framework that maps the culturally sensitive factors to the process of design and development of learning objects. A set of recommendations for each of the culturally sensitive factors are also provided in the model.

6.1 Principles for Dealing with Cultural Issues of Learning Objects

Reusability and pedagogical effectiveness have always been juxtaposed in considering the design principles of learning objects (Wiley, 2003; Boyle, 2003). On the one hand, when lecturers or instructional designers use a learning object, they are actually placing it into a local learning context. It requires that the internal context involved in the learning object has to match the external context

into which it is being placed. Otherwise the learning object would be incapable of fit in that learning context. Therefore, the less specific internal context a learning object has, the more learning contexts into which it will fit, and vase versa. For example, if a learning object was typically designed for a group of learners in a particular culture, it might be difficult to be reused in another culture because the cultural elements involved in the learning object may not suit for the other culture. Therefore, cultural specifics should be avoided or mitigated at the design level of learning objects from the point of view of reusability. For example, an English idiom should be avoided in a learning object, because it may confuse learners who are not natural English speakers, even if they use English as their study language.

On the other hand, learning is not context free or context independent. The modern learning theories have explained the importance of social context in learning, such as the "Zone of Proximal Development" (Vygotsky, 1978). There should be an internal context that is the underlying basis for creating a learning object. Some culturally specific factors may exist as part of the internal context that has to be involved to satisfy the educational aim of the learning object. The design of learning objects also cannot be context free or context independent because designers are in a particular cultural environment. They are inevitably influenced by the norms, customs, and traditions about teaching and learning of the culture.

The ideal design is to contain cultural specifics as less as possible and to maintain proper pedagogical meaning of a learning object. Therefore, it has to be considered carefully about what kind of culturally sensitive factors we are dealing with and what impact they may have on reuse of the learning objects. There are some principles for dealing with cross-cultural issues of learning objects discussed below.

6.1.1 Reducing Cultural Specifics in the Design of Learning Objects

Reusability means that learning objects are orientated towards different targeted users when they are reused in different learning environments. The cultural specifics of the users are unlikely to be matched properly through a one-off process. Any cultural specifics involved in a learning object may be likely to be found by potential users as inappropriate for them. Therefore, the design and development of learning objects should be containing cultural specifics as little as possible to maximize the reusability of the learning objects.

The cultural specifics involved in learning objects represent the designers' own cultural traditions and conventions and are usually brought into the learning objects unconsciously. For example, designers create the HCI by items and structures that they are familiar with or favour. Designing reusable learning objects requires a cultural awareness which enables designers to consider the cultural issues consciously. It may be difficult for the designers to understand other cultures that they are unfamiliar with. But it should be possible for the designers to be aware of the specifics of their own culture. Therefore, it is feasible from the point of view of the designers to avoid culturally specific factors during the design and development of learning objects.

It is a considerable question that the reduction of cultural specifics may debase the pedagogical effectiveness of the learning objects. It can be explained from two aspects. Firstly, many of the culturally sensitive factors involved in a learning object are related to the aspect of representation, such as a statement of a culturally sensitive perspective or the design of an interface. The reduction of this kind of cultural specifics will enable the learning objects to be accepted more sassily by the potential targeted learners with different cultural backgrounds, and hence ensures the pedagogical effectiveness of the learning objects. Secondly, since a learning object is a minimum pedagogically meaningful unit, there is a limited number of culturally sensitive factors that

relate to instructional design in a learning object. For example, a collaborative learning task could be very culturally sensitive, because it contains many cultural issues such as individualism vs. collectivism (Wang, 2007). However, collaborative learning tasks are usually bigger than the learning activities defined in learning objects. Hence they are rarely to be employed as a pedagogical methodology to design learning activities in learning objects.

In addition, reducing cultural specifics does not mean that the learning objects are culturally neutral. Even with an effort to reduce cultural specifics, it is likely that potential users will find some aspects of the learning objects that are inappropriate. Since learning objects contain micro-contexts (Boyle, 2003), it is reasonable that some cultural specifics may be involved in learning objects. The consideration of cultural specifics in learning objects brings out another principle of dealing with cultural issues for the design of learning objects, which is to highlight the culturally sensitive factors that are included in the learning objects.

The highlighting of the culturally sensitive factors makes explicit the cultural attributes of the learning objects. It further can help local users (tutors or developers of the course/lesson) to localise the learning objects to meet their local needs and preferences.

Design for culturally sensitive learning objects is often in a dilemma about how to make decisions to meet learners' needs in different cultural contexts. Sometimes, it is necessary to give up some cultural specifics to avoid bringing on intense cultural conflicts and to gain high reusability culturally. For example, *language* is a culturally sensitive factor. Using enigmatic academic language is the extreme value of the factor, which may be preferred in a strong uncertainty avoidance culture but may be not for learners in a weak uncertainty avoidance culture. A learning object could be culturally inappropriate for learners in one culture if it emphasised other cultural specifics. A doable way is to take the middle value in between of the two extreme points, so that learners in two

cultures could be receptive to the design even though it may be not perfectly matched to the both. In this case, a type of language that is in between of the extreme enigmatic academic language and informal everyday language may be acceptable in the two cultures. It is not easy, however, to balance the cultural preferences, because there is a risk that it may be viewed as perplexing by learners in both cultures.

6.1.2 Tackling Different Sorts of Culturally Sensitive Factors

Trompenaars (1993) illustrates the idea of cultural layers using the image of an onion. The outer cultural levels are the most visible and the easiest to change, whereas the inner core that determines cultural assumptions is hidden from view, more difficult to identify, and not easily changed. The culturally sensitive factor involved in learning objects can be seen at different levels. Some (e.g., *Image* or *Colour*) may be more visible than others (e.g., *Learner control* or *Engagement*). Therefore, the culturally sensitive factors need to be tackled differently.

The first sort of culturally sensitive factors is about culturally unacceptable, unsuitable, or inadaptable factors. Something extremely antipathetic or offensive, like a religious issue, and something merely unsuitable, like an unfamiliar example, are of this sort. For example, daily-life instances are often used to illustrate an abstract concept, but not all of them can be compatible with different cultures. A funny instance may be thought too unserious to be used in an educational context in a Strong Uncertainty Avoidance culture, but seems to be welcomed in a Weak Uncertainty Avoidance culture. Therefore, it is important to choose instances or examples carefully to prevent cultural conflict. Most of these kinds of culturally sensitive factors concern the representation of learning contents and learning activities. To get rid of this kind of conflictive the designers should (1) avert this sort of culturally sensitive factor in the learning objects, or, if cannot avert it, (2) pay more attention to the expression of these factors to avoid cultural offence.

The second sort of culturally sensitive factor is concerning regional features. Ideally, if a learning object was culturally neutral, it would be best for reuse. In fact, design of learning object is about contextual design. Social and cultural environment also impacts designers' selections and decisions. Designers should avoid consciously embedding their special cultural characters into the learning objects, especially for something that is thought to be common knowledge for the local culture. Some particular elements of local culture that cannot be eliminated from the learning objects should be made explicit in terms of adding a glossary to explain the meaning in a common way so that those who are in different cultures can understand. Here is a simple example. There is a title of "MediaBoard User Guide – Tate" in the learning object "Mobile Learning RLO – a tool for using MEDIABOARD" (LTRI, 2004). The "Tate" simply needs explaining as a modern museum in London somewhere of the learning object, so that it is easy for learners to understand the background of the learning object and explains the famous London museum to learners in other countries.

The third sort of culturally sensitive factor is about functionally special needs. Learners in different cultures may prefer different learning styles or need some special function provided in learning objects. For example, cultural differences can be seen in the method of engaging learners into a study. In a large power distance society, learners tend to do things only because their teachers ask them to do so, while in a small power distance society, learners may think about the reasons for the learning more independently. A quick introduction of the topic at the beginning of a learning object, hence, may be sufficient for getting started for the learners in a high power distance culture. By contrast, learners from a small power distance culture may expect more explanation of the topic to catch their interest. The key issue for this sort of culturally sensitive factor is how to support two or more culturally different needs in a learning object. A probable solution is that one culturally sensitive factor is prepared with multiple functions to cater for the different needs in different cultures. In other words, the learning objects

should provide options open for learners with culturally different needs. If the design of learning objects does not provide suitable options, it would put a larger burden on lecturers to add appropriate functions when they are reused.

These different sorts of culturally sensitive factors need to be tackled in different ways. Yet, the basic principle is to be identical – to reduce cultural specifics, which has to be done throughout the process of design and development of learning objects. The principles describe basic strategies for dealing with cultural issues during design and development of learning objects and reuse of them in culturally different learning contexts. The following sections will discuss the detailed model based on the principles.

6.2 *A Conceptual Framework for Mapping the Cultural Dimensions to the Design of Learning Objects*

Polsani (2003) suggests two basic foundational principles for understanding the concept of learning objects, "learning intent" and "reusability". The learning intent indicates the pedagogical purpose of learning objects. Each learning object contains selected learning content and pedagogical design towards an established learning goal. The reusability emphasises the distinguished feature of learning objects, which means that the learning goals expect to be achieved equally regardless of learning environments where the learning objects are reused. The "learning intent" and "reusability" indicate the aim of the design of learning objects. Therefore, how to examine the cultural impact on the design of learning objects should be around these two basic principles.

6.2.1 Mapping the Cultural Dimensions to the Design of Learning Objects

The consideration of cultural issues is always associated with the process of the design and development of learning objects. The culturally sensitive factors are not isolated elements attached to learning objects. They are part of the learning

objects and may be seen as any format and at anywhere in the learning objects. For example, culturally sensitive factor can be a sentence or an icon; it also can be a task or an activity in learning objects (see a full list in table 4.4). Therefore, reducing cultural specifics is not an isolated task, but in combination with the process of the design and development of learning objects. Along with the iterative process of the design and development of learning objects, the culturally sensitive factors can be examined in different design stages.

The main stages in the design of learning objects, which were discussed in Chapter 2.3.3 (see Figure 2.4) include:

- Needs analysis
- Creating learning content
- Instructional design
- Implementation

Each design stage focuses on one design aim and would involve particular culturally sensitive factors.

The analysis of learner needs is a start point of learning object design. The analysing stage is the foundation for all other stages of learning object design. This stage focuses on analysis of problems that students face when they learn a topic, and how these can be addressed by developing learning objects to produce enhanced learning experience for the students (Boyle, et. al., 2006). The needs analysis usually aims at a particular group of students to whom tutors are teaching a topic of a subject. It is, therefore, considered to be culturally specific. To develop reusable learning objects, it is necessary to analyse "culturally-based needs" (Edmundon, 2008) of learners.

In the stage of selecting learning content, designers select and decide what learning content will be included in a learning object. This is discipline related. The focus of this stage is on the knowledge that will be learned by learners.

Therefore, culturally sensitive factors that are categorised in the knowledge dimension may occur in this stage.

In the stage of instructional design, learning activities are designed in the light of pedagogical theories and instructional design approaches to build a learning process in order to achieve the learning goals of learning objects. The pedagogical dimension indicates culturally sensitive factors that relate to pedagogical design and should be considered in this stage.

In the stage of implementation, multi-media designers develop learning objects in terms of the design results of the first two stages. Designer will implement the interface of HCI and accessing ways for the learning objects based on applicable technology. Therefore, the access dimension and technology dimension indicate culturally sensitive factors that are likely occur in this stage.

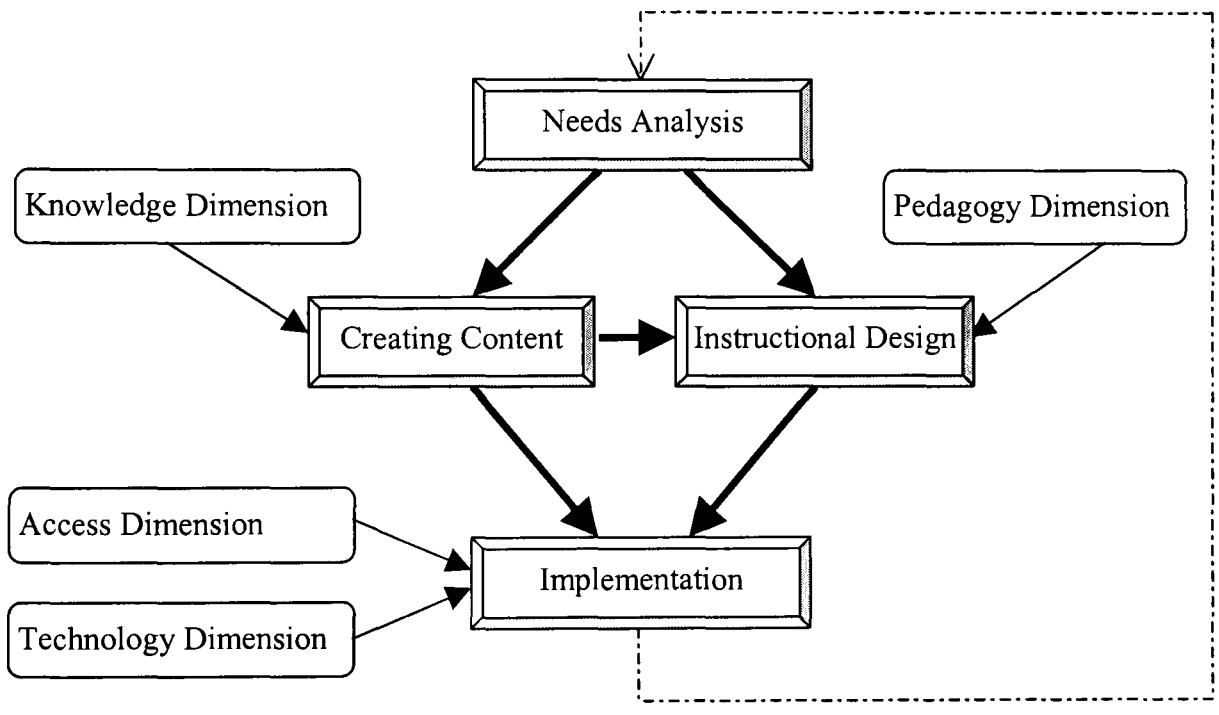


Figure 6.1 Relation between the cultural dimensions and the design stages

Figure 6.1 shows the relations between the cultural dimensions and the design stages. Each design stage has its most relevant cultural dimension(s) that contain culturally sensitive factors that may occur in the stage. The process of the design is marked by the heavy arrows. Analysis of learning needs provides the prerequisite for the creating content and the instructional design by determining

the learning goal of a learning object. These are in turn to be the basis of the implementation by determining what will be taught and how to teach. The light arrows connect the cultural dimensions to the design stages that are most relevant to them.

The conceptual framework for learning object design with cross-cultural perspective represents different stages of learning object design and relevant cultural dimensions that connect to each of the design stage. It means that designers can focus on the culturally sensitive factors that are indicated in the relevant cultural dimensions in each design stage for enhance cultural sensitivity of the learning objects.

The design and development of learning objects is an iterative process. Each of the design stage interrelates with others. Consideration of cultural issues should be an iterative process along with the design cycles, rather than a one-off process.

These stages of the process of design and development of learning objects are a broad conceptual partition. In practice, learning object design methods or approaches may consist of more detailed steps or phases.

6.2.2 Making Culture Relevant to the Design Process

Cultural sensitivity of learning objects resides in a number of questions that should be answered during the design and development of learning objects. Does a learning content contain culturally sensitive factors? Does a learning activity suit a different learning style or satisfy learners in a different learning culture? Is the stimulus employed in a learning object appropriate for emotional needs in different cultures? Is accessibility and interface design suitable or adequate for learners in different cultures? Are there any technical requirements or restriction in the learning object? These questions are concerned with different stages of the design process of learning objects.

6.2.2.1 The stage of creating learning content

In the stage of creating learning content, considerable cultural issues relate to the knowledge dimension, which includes culturally sensitive content and difference of learners in prior knowledge.

Culturally sensitive content is very much discipline related. Some learning content may be culture-dependent and require substantial cross-cultural integration, such as in teaching international business. The other learning content may be culture-exclusive, such as in the teaching of computer programming languages. Learning content that involves culturally sensitive factors should be examined very carefully in order to avoid any cultural offence or reduce cultural confusion.

If there were any culturally sensitive factors involved in learning content, one would first try to avert the culturally sensitive issues to make the content more accessible to a wider audience. For some cultural factors that are a part of learning contents and have to be addressed, designers should pay more attention to cautious expression of the issues, so that the learning objects could be more acceptable. For example, topics that represent and explore cross-cultural differences in perspectives should be signalled the level of "culture-saturation" (McLoughlim, 1999) in the learning objects in order to avoid them being attached to a particular worldview.

The other culturally sensitive factor in the knowledge dimension is prior knowledge. To deal with this kind of culturally sensitive factors, designers have to be very careful to select and decide any special knowledge used in a learning object, because learners in some countries may do not know it very well. For example, a learning object of about arithmetic quotes a Chinese abacus as an example. This may cause unnecessary confusion for learners who have no idea

about Chinese abacuses. Special events or peculiar things, hence, should be used cautiously in learning objects.

To keep cultural diversity in mind, designers need to examine the content with a cross-cultural perspective. This can be fulfilled by asking questions about the culturally sensitive factors before they make any decisions during the stage of creating learning content. Table 6.1 summarises the questions and relevant actions that designers may consider when examining cultural issues in learning contents.

Table 6.1 Questions and relevant actions for the knowledge dimension

	Knowledge Dimension
Question 1	Does the learning content contain culturally sensitive issues, like race, religion, etc.?
Actions	1. Try to avert the culturally sensitive content. 2. Change the expression of the content 3. Add extra explanation for the culturally sensitive content.
Question 2	Is there any culturally special prior knowledge involved in learning objects?
Actions	1. Try to avert the culturally special prior knowledge. 2. Add explanation for the culturally special prior knowledge.

6.2.2.2 The stage of instructional design

The pedagogy dimension includes culturally sensitive factors that often occur in aspects of instructional design of learning objects. The key point of instructional design for learning objects is that it has to ensure pedagogical effectiveness and also increase reusability of learning objects.

To ensure pedagogical effectiveness in learning objects means that the instructional design has to accommodate learners' needs as far as possible. Taking a cultural perspective to consider this issue, a question should be asked about whether the instructional design is sufficient for learners who are in culturally different learning contexts. For example, learners with different cultural background may have different experience or preference for the direction of learning. Design for giving learner control, hence, needs to examine

whether the method of control is sufficient for different learners. Is it necessary to add an alternative way to meet some learners' needs? Once a learning object can meet learners' needs, the learners can benefit more from it. If more learners can benefit from a learning object, the learning object would have more reusability.

In addition, to increase reusability means reducing cultural specifics from learning objects. The key point for instructional design is to eliminate special requirements for learners when they take part in the learning tasks or activities. The requirements may relate to special skills, experiences, or even emotion. For example, if a learning task is designed based on the principle of "learn from mistakes" (Beard & Wilson, 2003), the designer may need to consider whether making the mistakes would affect learners' emotion. If the principle of "learn from mistakes" is the best choice for the topic or the learning goal of the learning object, some extra explanation would be useful for learners who may be frustrated by the negative outcomes of what they chose. Therefore, in order to eliminate cultural specifics in learning objects, designers should try to relax (make less strict) the requirements. If a specific is necessary from pedagogical viewpoint, then the specific should be highlighted for learners to understand the requirements.

Table 6.2 suggests questions and relevant actions that designers may consider when examining cultural issues for instructional design.

Table 6.2 Questions and relevant actions for the pedagogy dimension

	Pedagogy Dimension
Question 1	Is the instructional design sufficient for different learners?
Action	1. Add other alternatives to the design.
Question 2	Is there any special requirement of learning skills, experience, or emotion?
Actions	1. Try to relax the requirements by offering extra supports. 2. Highlight the requirements somewhere in the learning objects (maybe in metadata).

Instructional design is complex and concerns many aspects of learning context. The pedagogy dimension contains more culturally sensitive factors than the other three dimensions. However, there are some common questions needed to examine the culturally sensitive factors, such as those showed in Table 6.2, which make the examination manageable.

To facilitate designers to handle the cultural issues in the instructional design stage, the recommended suggestion for each culturally sensitive factor in the pedagogy dimension, are summarised in Table 6.3.

Table 6.3 Recommendations for the culturally sensitive factors in pedagogy dimension

Culturally Sensitive Factor	Recommendations
Orientation	Provide options of a quick introduction and an extended introduction to meet needs of different learners.
Elaboration	Avoid using either extreme enigmatic academic language nor too informal language; Choose commonly acceptable examples to elaborate concepts.
Learner control	Provide multiple ways that enable learners to control their own learning paces (e.g., ordinal, jump forward and back, etc.).
Feedback	Some extra explanation or direction may be needed to support different learning styles (i.e., inexperienced learners need additional instruction especially at a position where two or more directions are available).
Motivation and Stimulation	Build positive or inspiring atmosphere that is effective for most cultures.
Practical task	Provide optional additional directions to open-end tasks to support learners with less experience or feeling challenged; Provide optional open-mind tasks that allow learners to submit their own opinions.
Collaborative task	Provide additional information to help learners in a group to divide labours, organise cooperation, handle conflict, and make decision.
Communication manner	Provide multiple communicational channels to meet learners' preference of communication (e.g., synchronous or asynchronous, and anonymous or signed).
Engagement	For productive or creative tasks, more instruction may be needed to provide additional support to learners with less experience of this kind of tasks.
Value of error	Provide positive or encouraging feedback to any error or mistakes learners made, especially to the sort of tasks of "learn from mistakes" to encourage learners who are more sensitive to making mistakes to complete it.

During the instructional design, the culturally sensitive factors in the knowledge dimension and pedagogy dimension can be evaluated. Academic tutors may take

more responsibility for the examination of cultural issues in these design stage. The next stage is implementation. The culturally sensitive factors that will be examined in implementation belong to the access dimension and the technology dimension.

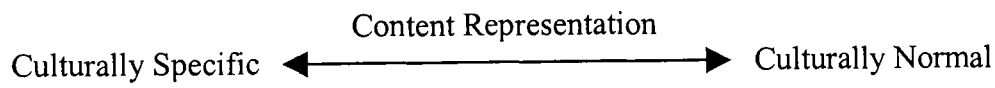
6.2.2.3 The Stage of Implementation

In the stage of implementation, the focus is to implement the results of the previous design stages into a learning object paradigm. It mainly reflects the technological attributes of learning objects. The culturally sensitive factors involved in this stage relate to the access dimension and the technology dimension.

The Access Dimension

The access dimension includes culturally sensitive factors that may consist in the representation of learning content and relevant learning activities, and HCI design. Therefore, the culturally sensitive factors should be examined during the process of implementation.

The content representation expresses a group of culturally sensitive factors in the access dimension showed in Table 5.3. The extreme value of the content representation can be culturally specific or culturally normal.



For achieving a high acceptable interface, designers should examine their design with answering followed questions:

Q1. Is the representation sufficient for different cultures?

This question aims to examine whether the representation is common enough or whether any culturally specific elements are involved. For example, a jargon or

slang is not common language to learners to understand. The name of a local company can cause unnecessary confusion to learners.

For this question, two actions can be adopted to solve the cultural problem:

1. Try to use a common fashion to represent the content (e.g., using plain language instead of a jargon) or
2. Add alternative representation (e.g., adding a glossary to explain the meaning of the name)

Q2. Are there any culturally sensitive or taboo elements in the representation? This question can remind designers to avoid any culturally unacceptable, unsuitable, or inadaptable factors in their design. To solve this kind of cultural problem, two actions are suggested:

1. Avert or eliminate the culturally sensitive factors or
2. Adopt commonly acceptable elements instead of the taboo one.

Table 6.4 summarise the questions and relevant actions for the access dimension.

Table 6.4 Questions and relevant actions for the access dimension

	Access Dimension
Question 1	Is the mode of access sufficient for different learners?
Action	1. Add other alternatives to the design.
Question 2	Is the representation sufficient for different learners?
Actions	1. Try to adopt a common fashion. 2. Add other alternatives of representation.
Question 3	Are there any culturally sensitive or taboo elements in the representation?
Action	1. Adopt commonly acceptable elements instead of the culturally sensitive or taboo one.

In the last decade, many studies have found that cognitive styles have significant effects on students' navigation behaviour and design of navigational tools (Chen & Macredie, 2002). An important issue concerning the navigation refers to the different tools, e.g., index, site map, search machine that should be integrated into learning objects. A high variation of navigation tools and access possibilities might lead to a better acceptance by the users. This view is supported by various

studies reviewed by Chen and Macredie (2002). They recommend that an alphabetical index may, for example, better support learners who tend to be analytical, a site map may better support learners who prefer to process information.

Table 6.5 summarises the recommended design solutions to each culturally sensitive factors.

Table 6.5 Recommendations for the culturally sensitive factors in access dimension

Factors	Recommendation
Language	Use plain language and avoid to use jargon or slang, in some culture academic language is preferred
Image	Use comprehensible and acceptable images, Avoid or eliminate images containing potentially controversial elements, Add necessary explanation in images to reduce confusion
Number, Date, Time	Use the metric system to describe data as possible, or supply explicit measure unit (e.g., date: 01-01-2000 (day-month-year))
Symbol	Avoid or eliminate symbols that may cause potential misinterpretation
Colours	Do not use only colours to convey information to learners (e.g., red means error or green means right), Use colours with relevant text messages (e.g., X wrong answer)
Navigation	Provide different navigation tools (e.g., index)
Holistic Structure	Simplicity, with clear metaphors, limited choices, and restricted amounts of data (Burgmann, et. al., 2006)

Noticeably, accessibility often implies that a resource enables the user to make sensory and cognitive contact with the content of the resource (IMS, 2004). For example, textual components can be used to enhance the understanding of auditory contents; an auditory voice recognition system can provide a more facilitated way of controlling a device. The IMS "AccessForAll" proposal defines a description of a user's control, display and content needs and preferences. Designers can check the description of user's needs and preferences against components of the learning objects being developed until they match

(Green, et. al., 2006). The accessibility in this perspective, therefore, relates more to individual diversity and is out of discussion of this model.

The Technology Dimension

The culturally sensitive factors in the technology dimension concern the technology that is employed to develop and use learning objects. Because of the imbalance of the development of the technology between different countries, it is expected that using learning objects in different contexts may run into obstacles. As discussed in the technology dimension, the obstacles include two aspects: technological infrastructure at a social level and technological knowledge and skills at an individual level.

Infrastructure provides a platform for running learning objects. The requirements of the infrastructure are determined by the technology, including software and hardware, employed in learning objects. The latest technology may offer the best design of learning objects, but may require much infrastructure. Therefore, designers may have to decide what functions are necessary and what are so luxurious that they may reduce reusability of the learning objects from the viewpoint of technology.

Similarly, the differences between learners' experiences and skills about technology may affect the use of learning objects as well. Mainstream technology should be more familiar for learners. Designers may also have to face the decision of what can be used through the balance of high technology and reusability.

Suggested questions and relevant actions that may help to examine the cultural issues in the technology dimension were listed in Table 6.6. These questions and relevant actions are raised by the thinking of cultural diversity that may affect the pedagogical effectiveness and reusability of learning objects. They provide an explicit way to evaluate culturally sensitive factors that may be involved in the

design and development of learning objects and sometimes they are involved unconsciously. Design and development of learning objects with a consciously cultural perspective can ensure the pedagogy of learning objects is equally effective in different cultural contexts.

Table 6.6 Questions and relevant actions for the technology dimension

	Technology Dimension
Question 1	Is there any special hardware that is necessary for using the learning object?
Action	1. Try to use alternative instead of the special hardware. 2. Highlight the special hardware (maybe in metadata)
Question 2	Is there any special software that is necessary for using the learning object?
Actions	1. Try to use alternative instead of the special software. 2. Highlight the special software (maybe in metadata)
Question 3	Is there any special knowledge or skill that is necessary for learners to use the learning object?
Actions	1. Try to relax the requirement of the knowledge or skill. 2. Highlight the requirement of the knowledge or skill (maybe in metadata)

To facilitate designers to handle the cultural issues in the implementation design stage, the recommended suggestion for each culturally sensitive factor in the technology dimension, are summarised in Table 6.7.

Table 6.7 Recommendations for the culturally sensitive factors in technology dimension

Culturally Sensitive Factors	Recommendations
Infrastructure	Adopt mainstream and fully developed technology to minimize technical barriers to reuse of the learning objects.
Experiences or Skills	Avoid complex operation techniques and add online help (e.g., pop-up windows) if necessary to guide learners who have less experience or skills.

It is noticed that a single learning object may touch only some of the culturally sensitive factors described above, which may vary between learning objects. For example, since race equality as a cultural issue in learning content does not appear in the Java programming learning objects, they would not include the culturally sensitive factors like this. If a learning object does not consist of cooperative learning activity, the culturally sensitive factors of group work would be not involved in the learning object. Some culturally sensitive factors,

such as the factors in the interactive dimension may be very common, existing in many learning objects. That is what designers should take into account during the process of design and development of learning objects.

6.3 The Cultural Reference Model for Learning Object Design and Evaluation

The framework developed in the previous section described relationships between culturally sensitive factors and design stages of learning objects. Each design stage relates to one or two dimension(s), which explicitly showed relevant culturally sensitive factors that designers should take into account in that stage. The framework, along with the four dimensions of culturally sensitive factors and the recommendations for dealing with them in the design process, compose a cultural reference model that will facilitate improvement of the design and development of learning objects in terms of cultural adaptability.

The cultural reference model for learning object design and evaluation provides a guideline for handling of cross-cultural issues in learning object design. Cross-cultural issues and their impact on learning object design are complicated and subtle. Thus, it is fundamental to identify what factors are culturally sensitive in a particular design. And then the factors can be treated explicitly with a cross-cultural perspective. The cultural reference model divides the process of handling cross-cultural issues in learning object design into three steps (see Figure 6.2).

(1) Find potential culturally sensitive factors (CFS)

It is the first step. The aim of this step is to find out if there are any factors that are culturally sensitive in a particular design. The design can be a section of learning content, a learning activity, a page of interface, or a whole learning object. To facilitate the identification, the cultural reference model provides four dimensions of culturally sensitive factors that designers are able to refer to.

(2) Examine the culturally sensitive factors (CFS)

The aim of this step is to acknowledge the characteristic of the culturally sensitive factors identified in step 1 and to decide what principles should be followed to deal with the factors. The cultural reference model describes three sorts of factors and provides relevant principles for dealing with the factors (see Section 6.1).

(3) Refine the culturally sensitive factors (CSF)

This is the step to refine the design that includes the culturally sensitive factors. The cultural reference model provides recommendations about how to deal with the culturally sensitive factors to improve the design in terms of cultural adaptability.

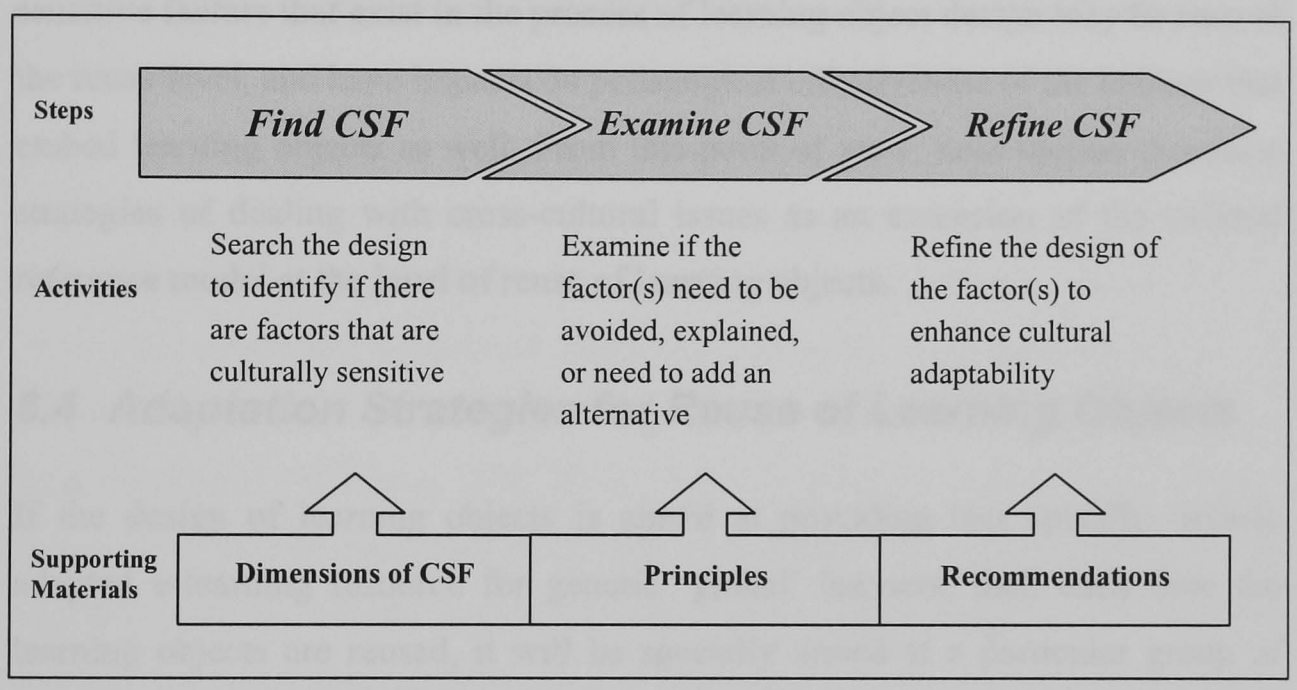


Figure 6.2 The cultural reference model for dealing with cross-cultural issues in learning object design and evaluation

It is complicated and iterative to identify culturally sensitive factors and refine the design over the stages of the design and development of learning objects. The cultural reference model provides the consistent process of the three steps to handle that at different design stages. Only the dimensions of culturally sensitive factors and their recommendations differ between the design stages (see Figure 6.1). For example, when designers follow the three steps to improve their design culturally, they focus on the culturally sensitive factors in the knowledge dimension at the design stage of creating content, while at the stage of

instructional design they need to focus on the factors in the pedagogy dimension. With the support of the four dimensions of culturally sensitive factors and their recommendations, the cultural reference model attempts to provide an explicit guideline for the improvement of the design of learning objects that are culturally sound. A complete list of the culturally sensitive factors and their recommendations are attached in Appendix A.

The cultural reference model is intended to be applicable to the design and evaluation of learning objects. However, cross-cultural issues affect not only the design and development of learning objects but also the reuse of them. Culturally sensitive factors that exist in the process of learning object design may be seen at the reuse level, and have impacts on pedagogical effectiveness of the courses that embed learning objects as well. From this point of view, next section discusses strategies of dealing with cross-cultural issues as an extension of the cultural reference model at the level of reuse of learning objects.

6.4 Adaptation Strategies for Reuse of Learning Objects

If the design of learning objects is aimed at providing less specific, widely adapted e-learning resource for generic 'global' learners, then each time the learning objects are reused, it will be specially aimed at a particular group of learners in a particular learning context.

6.4.1 Embedding Local Cultural Context for the Reuse of Learning Objects

There are two basic instructional design considerations in relation to the effective use of learning objects. Firstly, a carefully defined learning goal of a course is important for repurposing learning objects. Only through the considered definition of the desired outcomes of an individual unit of study is it possible to build an instructional program that employs learning objects in an instructionally effective manner (Thomas, 2003). As Linn and Gronlund (2000) suggest, the

careful definition of objectives effectively drives the instructional process. Accordingly, well-defined learning objectives are able to provide a solid foundation for the selection and arrangement of learning objects within the instructional program.

Secondly, a curriculum alignment needs to be emphasised. According to Biggs (2003), an aligned curriculum can have maximum consistency and compatibility between the learning objectives, content, teaching methods and assessment techniques which together form the broad curriculum framework. Therefore, the process of integrating learning objects into a coherent course of study must constantly refer to the structure of the broad curriculum framework so that the learning objects can truly combine with the learning context.

As Williams (2000) suggests, "Learning objects may be defined in isolation but they can only be employed as such in instructional situations or contexts. … What the context and associated instruction are varies with the perspectives of different users. And these variations shape the definition of the associated learning object" (Williams, 2000, p16). From the point of view of cross-culture, lecturers or course designers may need to identify the characteristics of the existing learning objects and determine if those characteristics matched the cultural profile of their students. If not, what might need to be done in order to adapt the learning objects to the needs of those students? For example, a lecturer in Beijing Union University (BUU) wants to use the learning objects of Java programming, which were developed in London Metropolitan University in the UK, in her Java module. She first identifies that English is the language used in the learning objects and it is not satisfactory to her Chinese students. So she has to translate the learning objects from English to Chinese before they are introduced into her module. In fact, translation is at the very basic level of the adaptation. The cultural characteristics of learning objects may be identified in different aspects. The four cultural dimensions discussed in the last chapter

describe the culturally sensitive factors that are possibly included in learning objects.

To identify the cultural characteristics of learning objects is one step in blending them into a local learning context. The other step is to understand what learners' culturally specific needs really are in a particular learning context. By integrating constructivist and culturally sensitive principles, Biggs (2003) presents a cross-cultural teaching ladder for a cross-cultural educational system, and aims to capture the culturally related problems that international students may experience in their learning (Figure 6.3). The cross-cultural ladder includes three levels; each of them indicates a degree of cultural inclusion in a teaching environment. Adapting the cross-cultural teaching ladder to the design of e-learning courses that employ learning objects provides a framework for examining the cultural issues in a methodical way.

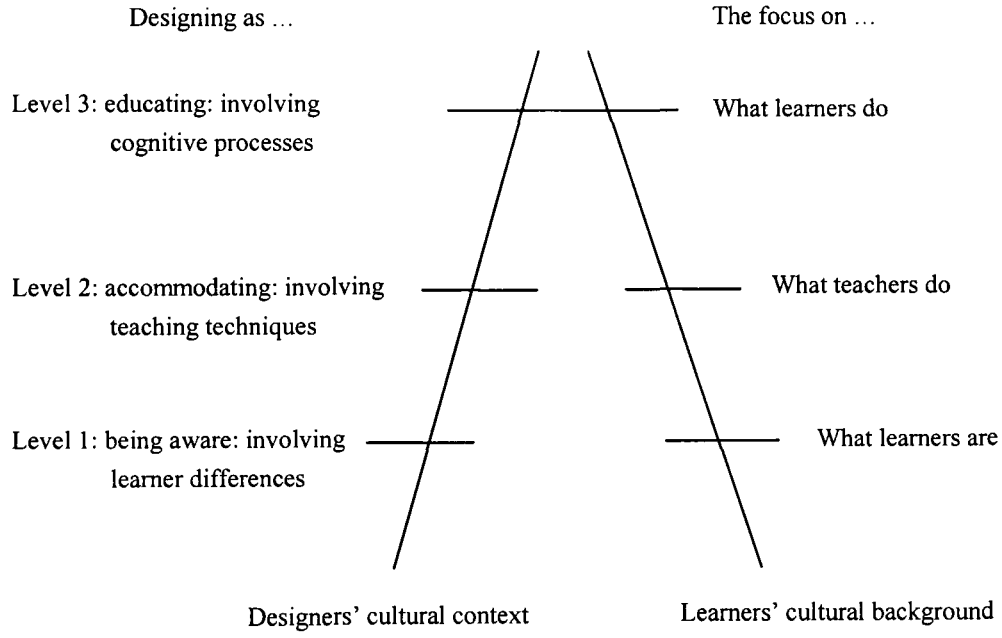


Figure 6.3 Focus in cross-cultural design (adapted from Biggs, 2003)

Biggs claims that "The strategy is to focus on activating students' learning processes as appropriate to the objective, as does good teaching anywhere. The means of activating those learning processes, however, could well differ between cultures" (Biggs, 2003, p133). At the level 1, e-learning course designers or tutors need to be aware of the cultural differences between the cultural specifics

embedded in internet context of the learning objects that are being used to build the course and the target learners' cultural backgrounds. This level may focuses on the apparent differences that are expressed by learners, but not on the differences in learning processes. Language translation and little or no adaptation might be necessary at this level.

Level 2 contains increasingly stronger manifestations of cultural differences and requires modification. At this level e-learning course designers or tutors need to recognise the differences of learners' preferred learning styles and methods and adapt the learning objects that are being used to accommodate the differences. For example, examples may need to be familiar to the targeted culture; more directions may need to be provided as extra support for the learners who are not experienced in the learning activities.

The first two levels focus on the adaptation that occurs on the inside of learning objects. The level 3 considers cultural inclusion not only in learning objects themselves but also among them. At this level, e-learning course designers or tutors need to culturally contextualise the adaptation of learning objects to the environment of the e-learning course being built.

The adaptation strategies of the three levels represent cultural adaptability of a learning object to a particular learning environment and how to enhance the adaptability when using the learning object. The key issue for the adaptation, just like in the design and development of learning objects, is to recognise the factors that are culturally sensitive to the learning environment and to tread them with a cross-cultural perspective. The four dimensions of culturally sensitive factors defined in chapter 5 can be used as supporting materials to facilitate the adaptation culturally. Figure 6.4 shows links between the four dimensions of culturally sensitive factors and the adaptation levels. Next section gives a more detailed description of the strategies at each level.

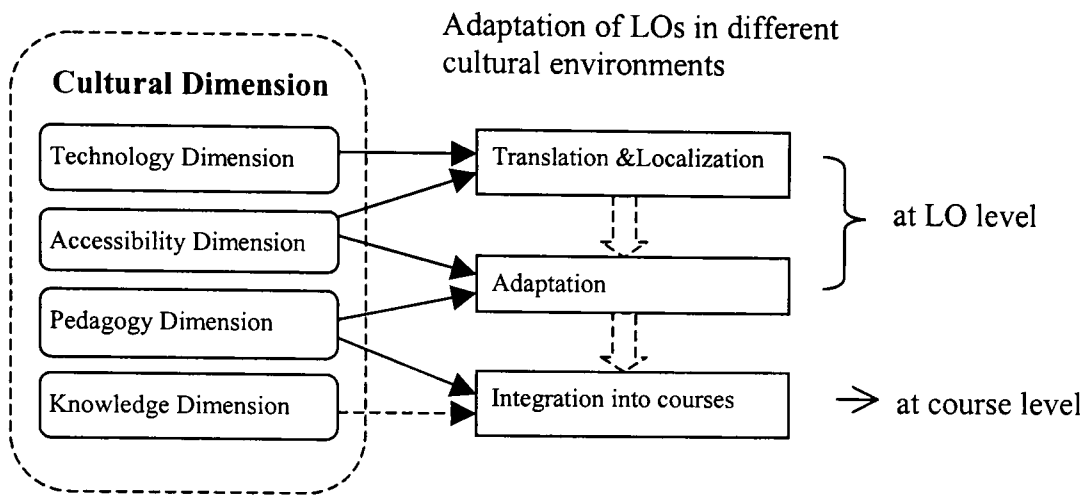


Figure 6.4 Links between the cultural dimensions and the adaptation levels

6.4.2 Strategies for Dealing with Cross-Cultural Issues at the Reuse Level of Learning Objects

Figure 6.4 shows three levels of adaptation of learning objects in a particular cultural environment. Each level requires different adaptation strategies to get maximum efficiency of reuse by doing minimum transformation.

6.4.2.1 Translation and Localization

Translation and localization are the simplest level of adaptation of learning objects. In this level, course designers identify the characteristics of learning objects from a visible or apparent point of view and determine if these characteristics matched the cultural profile of their students. The visible or apparent characteristics concern the natural language (e.g., English or Chinese) or spellings used in learning objects. For example, if a learning object was developed with British English and the cultural profile of local students showed that the language is Chinese, they are not matched. Translation from English to Chinese has to be done for the adaptation of the learning object. If the learning object will be reused in America, changing spelling and phrases from British English to American English may need to be made.

Other visible or apparent characteristics concern the mode of representation of content in learning objects, such as images, examples, or colours. For example, course designers need to evaluate if the images used in a learning object match the local cultural convention; or if the examples selected for a learning object are familiar to their students. If they are not matched, the localization has to be made.

The translation and localization make adjustments for the visible or apparent characteristics of learning objects. Only the culturally sensitive factors in the technology dimension and the access dimension are evaluated at this level. It is a lower level of adaptation. The transformation made in this level can usually have the aid of authoring tools that enable the work easily and quickly. The GLO Maker, which is developed by LTRI, is one of this kind of tools (see website: http://glomaker.co.uk/).

6.4.2.2 Adaptation

Adaptation is the transformation that occurs inside the learning objects. In this level, the characteristics of learning objects to be identified relate to learning experiences and cognitive styles. Course designers need to identify the characteristics of learning objects from an educational point of view and determine if these characteristics match the cultural profile of their students.

The transformation of learning objects at this level may relate to the culturally sensitive factors in the knowledge dimension and the pedagogy dimension. For example, the students in BUU have more interest in the quizzes in the learning objects of Java programming than their counterparts in LondonMet. It may be because the motivation of using the quizzes for the students in BUU is much stronger than their counterparts in LondonMet. Learning motivation is not something easy to observe. It requires a deeper understanding of a particular culture. Therefore, to complete the transformation at this level, course designers have to clarify cultural characteristics of the learning objects and understand

learning specifics of their students from a social and cultural point of view. It is a high level of adaptation.

The adaptation of learning objects to a particular culture makes adjustments for pedagogical characteristics in the learning objects lighted by the understanding of influences of social culture on learning behaviours and conventions. For some cultures, it may require some change to be more compatible with the learning experiences of the targeted learners (e.g., extra direction). However, the core of the instructional design in a learning object (e.g., a learning activity) should not need to be modified in terms of the conception of reuse.

Because of the small size, learning objects generally involve relatively simple learning activities. Therefore, the transformation usually happens at the level of translation and localisation. Less transformation needs to be made at the adaptation level. In addition, if the culturally sensitive factors in the pedagogy dimension have been evaluated during the developing phases, different functions for the culturally sensitive factors should be provided as options. Course designers can simply choose the most appropriate options for their students.

6.4.2.3 Integration into courses

Cultural coherence is required between individual learning objects, learning objects and course contexts, and learning materials and the learning management system. Thus, the internal cultural characteristics of a learning object should accord with the big learning context where it is integrated.

The context of an e-learning course "encompasses all the information that shapes e-learning situations, from physical settings to virtual space, from individual interests to social culture, from explicit conversations to tacit cognition, from technical media to human emotions, etc." (Zheng & Yano, 2007, p.199). It is the most complex level to integrate learning objects into e-learning courses. These

issues are beyond the scope of this study, but could open up further research about cultural influences on reuse of learning objects.

This section briefly described some basic strategies dealing with cross-cultural issues at the reuse level of learning objects, which is based on the understanding of culturally sensitive factors involved in the design and development of learning objects. This section can be read as an extension of the cultural reference model at the level of reuse of learning objects. The cultural reference model developed in this study does not intend to be applicable for the reuse of learning objects, but for the design and development of learning objects.

6.5 Summary

This chapter has sought a way to generate a reference model by which designers are able to explicitly address the elusive cross-cultural issues in their products to enhance the reusability of learning objects. This model is developed by considering four aspects of the influences of culture on learning object design.

(1) Factors that are culturally sensitive in learning objects

To be aware of what factors are culturally sensitive is the prerequisite to design learning objects that are culturally sound. This model first identified culturally sensitive factors and organised them into four dimensions (knowledge, pedagogy, access, and technology dimension).

(2) Principles for reduction of cultural specifics of learning objects

Three different sorts of culturally sensitive factors were discussed by means of their cultural acceptability.

- Avoid culturally unsuitable or unacceptable factors
- Provide explicit explanation for culturally specific factors
- Provide alternative options for culturally preferred factors

(3) Relationships between the culturally sensitive factors and the design process of learning objects

A conceptual framework was described to map the four dimensions of culturally sensitive factors to the design stages of learning objects (see Figure 6.1). Each design stage was linked to one or two relevant cultural dimensions which contain culturally sensitive factors that may be involved in the design stage. It will benefit to predigest the complexity of cultural influences on learning object design by focusing on one or two relevant dimension(s) of culturally sensitive factors at each design stage.

(4) Solutions for dealing with the culturally sensitive factors

In order to help designers to deal with the cross-cultural issues, recommendations for each of the culturally sensitive factors were proposed. The recommendations will work as asking self-evaluated questions to examine whether a factor contains culturally sensitive elements in terms of content, representation, or function. Actions, if the answer of a question is true, were also proposed in principle. Possible solutions for each culturally sensitive factor were suggested to refer to (see Appendix A).

The cultural reference model aspires to set up a structure of dealing with cross-cultural issues in the design and development of learning objects, rather than expertises of cultural specifics. In this way, it provides a consistent process capable of improving learning object design culturally. Because cross-cultural issues are often complex and subtle, the cultural reference model is intended for designers to have an explicit cross-cultural perspective to enhance the cultural adaptability of learning objects. Next chapter reports the evaluation of the cultural reference model.

7 Evaluation of the Cultural Reference Model

As an important stage of development, the cultural reference model was evaluated by analysing the opinions and comments about the model from participants who were experienced learning object developers and/or academic lecturers. This chapter presents the evaluation of the model. Success indicators of the cultural reference model were defined in the first section. Section 2 describes the methodology employed in the evaluation. The evaluation results are revealed in the third section and followed the section of discussion and summary.

7.1 Success Indicators for the Cultural Reference Model

In order to define the success indicators of the cultural reference model, it is necessary to have an overview of the main aim and objectives of the model.

7.1.1 Overview of the Cultural Reference Model

The cultural reference model is intended to provide learning object designers with cross-cultural insight about influences of cultural diversity on learning object design so that appropriate improvements can be adopted prior to the design completion. It delimits four cultural dimensions among design factors of learning objects, knowledge dimension (KD), pedagogy dimension (PD), access dimension (AD), and technology dimension (TD), and identifies culturally sensitive factors for each dimension. It also sets up a framework to map the cultural dimensions to stages of the process of the design and development of a learning object, which reflects probable influences of the culturally sensitive factors on design decisions in each stage. The stages, including needs analysis, creating learning content, instructional design, and implementation, are intertwined with the examination of the culturally sensitive factors to produce learning objects with cultural sensitivity. Finally, the cultural reference model recommends interventions during different stages of the design and development of learning objects. The interventions highlight responses to specific concerns

and challenges that come from identified culturally sensitive factors in each design stage. The recommendations take the form of self-evaluating questions and suggested solutions that will help designers to examine culturally sensitive factors and make decisions on their design with cross-cultural consideration.

7.1.2 Defining Success Indicators

According to the aim and objectives of the cultural reference model, there are four success indicators that are able to measure the outcome of the model.

1) The culturally sensitive factors can cover most comprehensively potential cross-cultural problems in learning objects.
2) The four cultural dimensions rationally and effectively organise the culturally sensitive factors and are conducive as a basis for mapping the culturally sensitive factors to the design of learning objects.
3) The framework should indicate relations between the culturally sensitive factors and the design stages of learning objects (i.e., a particular design stage links particular dimension(s) of culturally sensitive factors). This can help designers to be aware of the cross-cultural issues and catch potential cultural problems during the design process.
4) The recommendations should be a useful guideline for designers to deal with the culturally sensitive factors. To be aware of the culturally sensitive factors can make the learning object designer more sensitive to cross-cultural issues which in turn will affect their design of learning objects.

To measure the success indicators described above, the following questions have to be answered.

For the culturally sensitive factors (success indicator 1):

- Is the range of culturally sensitive factors comprehensive for the design of learning object?

- How important are the factors to the design of learning objects with cultural sensitivity?
- How do designers recognise the culturally sensitive factors?

For the cultural dimensions (success indicator 2):

- Do the four dimensions rationally and effectively organise the culturally sensitive factors?

For the framework (success indicator 3):

- How do designers consider the cross-cultural issues when designing learning objects?
- Does the framework provide designers with a cross-cultural insight to the design of learning objects?

For the recommendations (success indicator 4):

- What difficulties have designers encountered during the design of learning objects?
- Can the recommended solutions help them to deal with the difficulties?

After clarifying the goal of the evaluation, choosing methods to undertake the evaluation is the key to effectively achieve the goal.

7.2 Methodology of the Evaluation

The questions about the success indicators discussed above relate to some aspects that make the evaluation more complex. First, the reference model includes 21 culturally sensitive factors which are categorised in four dimensions. The four dimensions map to different stages of the process of learning object design. Each factor is provided with recommendations about how to deal with it during the design of learning objects. Informants need to recognise each of the factors. It would take them time to do so. Second, cross-cultural issues are often subtle and are difficult to identify. People often have different opinions about culturally sensitive factors based on their cultural backgrounds and experiences of design and/or use of learning objects, which make it difficult to reach a clear understanding between all parties concerned. Third, to evaluate and improve the

reference model this study requires rich quality feedback from designers. One-to-one interviews are a good technique to get deep responses. A short time interview cannot cover all questions that should be asked. For practical reasons, however, it is often unfeasible to keep people for a long-time interview. The question is how to provide informants with enough knowledge of the model and get quality feedback from them in a reasonable period of interview.

Because of these complexities described above, no single method, either a questionnaire or an interview, can provide sufficient data for the evaluation. It is necessary to combine multiple evaluation methods to acquire sufficient data. The methods employed in the evaluation were expert review, one-to-one interviews, and practical tasks that culturally examine two developed learning objects by the support of the cultural reference model. This evaluation synthesises qualitative and quantitative data analysis but place emphasise on qualitative data analysis.

7.2.1 Expert Review

Expert review is a widely used method for evaluations of usability, validity of a design or research in many fields. Tessmer (1993) identifies expert review as the review of an instruction by experts, with or without the evaluator present. Expert reviews are cost and time efficient instrument to gain wide and deep responses and can also serve as a foundation for the preparation of practical tests.

An expert review is the first step of this evaluation. The expert reviewers, who are academic lecturers and multimedia developers in this evaluation, were given the four dimensions of culturally sensitive and the recommendations to be reviewed. The four dimensions of culturally sensitive and the recommendations was organised into a format of questionnaire. Participants were asked to rate cultural sensitivity of the factors and usability and adaptability of the recommendations. The questionnaire did not only collect the quantitative data but also offered the experts the information about the reference model. After

completing the questionnaire, they were asked to attend a one-to-one interview for further discussion about the cultural reference model and to take part in a practical task to identify potential cross-cultural problems in developed learning objects assisted by the cultural reference model.

7.2.2 Sample of People – the Expert Reviewers

Expert reviewers are often expert in a particular area. "Generally, experts we seek for an expert review are specialists, people who have special knowledge, skill, or experience with regard to the content, features, or audience of the instruction" (Tessmer, 1993, p48). The participants (experts) selected in this evaluation should have experience of the design and use of learning objects, because the cultural reference model is developed particularly for the design of learning objects with cultural sensitivity when they are reused in different cultural contexts. Learning object developers and academic lecturers who participate in the design and use of learning objects were the target users of the reference model. Their opinion and feedback are important to the evaluation and improvement of the reference model.

The learning object developers and academic tutors were selected from the members of the RLO-CETL (http://www.rlo-cetl.ac.uk/joomla/index.php) project team and lecturers in London Metropolitan University who have been involved in the design and/or use of learning objects. These people were selected because they have the knowledge and experience of the research of learning objects. Some of them have successfully developed learning objects. Some of them have been using learning objects in their teaching practice. The other practical reason was that they had known the learning objects that would be used in the practical task during the interview. They had no culture-related problem with the learning objects. Thus, it was expected to find that they could identify potential cross-cultural problems in the learning objects when they were offered the cultural reference model.

A total of 15 participants, including 9 academic lecturers and 6 media developers, took part in the evaluation.

This is a small sample. However, the small size of the samples would not damage the generalisation of the result of the study. Firstly, to improve the reference model, deep and rich quality of responses is the first concern of this study. Every participant is required to read and give their answers about the range of the culturally sensitive factors and suggested solutions in the questionnaire and then attend an interview. It is a time consuming task. Therefore, from the concern of practices the sample of people cannot be a large size. Also, the participants can provide quality responses only if they have enough knowledge and experiences of the design and/or use of learning objects within a multi-cultural environment to. It leads to a small number of the population who actually work in the area and are available to be respondents. Secondly, the samples we selected in the study are a group of people who are typically designers of learning objects (i.e., educators and multimedia developers who collaborate in developing high quality learning objects). They are representative of the population of learning object designers. Thirdly, the items that were evaluated in the study (e.g, the culturally sensitive factors and their impacts) are likely to show the similar patterns in different learning objects that may be developed by different people. Therefore, the results of the evaluation expect to be generalised to a large group of learning object designers.

7.2.3 Questionnaire

A questionnaire was given to the participants for their review. The questionnaire was composed of two sections. Each section has 21 options pointing to the culturally sensitive factors (for full questionnaire see Appendix B). The first section lists 21 culturally sensitive factors and their explanations and asks informants to give scores to each factor in terms of the cultural sensitivity and

importance of the factor. The scale indicates the degree of cultural sensitivity of a factor (i.e., if a factor was culturally inappropriate how much damage it would cause to learning through the learning object) and includes marks in 0 to 5.

"5" – most strongly sensitive,

"4" – strongly sensitive

"3" – sensitive

"2" – less sensitive

"1" – least sensitive

"0" – not sensitive

This section expects to reflect opinions of designers of learning objects (including developers and tutors) about which factors are more culturally sensitive and which are less. The scores can also present the cultural dimension in which most culturally sensitive factors are located. It is important to notice the distribution of the culturally sensitive factors in the dimensions, because it relates to the process of learning object design. For example, if the most culturally sensitive factors are located in the access dimension, that means that designers should pay more attention to cross-cultural issues during the design stage of implementation. If the most culturally sensitive factors are dispersed equally in the four dimensions, that means that designers should consider cross-cultural issues throughout the process of learning object design.

The second section presents the recommendations to each culturally sensitive factor about the possible solutions and asks informants to give scores to each factor in terms of the usability and applicability of the recommendations. The usability and applicability indicate whether a suggested solution of a culturally sensitive factor is usable and adaptable to the design of culturally sensitive learning objects. The scale includes marks in 0 to 5.

"5" – most strongly usable and adoptable,

"4" – strongly usable and adoptable

"3" – relevant usable and adoptable

"2" – less usable and adoptable

"1" – least usable and adoptable

"0" – no usable and adoptable

These questions expect to reflect the evaluation of the usability and applicability of the suggested solutions by designers (multimedia developers and academic lecturers) of learning objects. Integrated with the first section, it is also expected to provide feedbacks for improving the reference model. The complete questionnaire is in Appendix B.

The questionnaire was sent to participants by email with an invitation to interview. The participants answered the questions and sent them back before the interview. Any concerns about the culturally sensitive factors and the suggested solutions were discussed in the interview.

7.2.4 Interview for Further Evaluation Data

The interview in this study is the key way to acquire designers' feedback about the cultural reference model. The interview is a semi-structured process. A series of pre-structured questions were asked to each interviewee. The discussion about the culturally sensitive factors and their suggested solutions was flexible depending on the feedback of the questionnaire of the interviewee. The interviewees were encouraged to talk about more the factors that they were interested or experienced rather than only to focus on the questions.

The interviews include three parts.

a) Posing questions

   This is a structured process to ensure that the same questions would be asked to each interviewee. There are slight differences in the questions to be asked between developers and academic lecturers because of the differences of their role in designing learning objects. The interview questions are in Appendix C.

b) Discussing the culturally sensitive factors and their solutions

Interviewees were asked to explain their comments and scores about the culturally sensitive factors and suggested solutions in the questionnaire they have done before the interview. It aims to probe additional information about the culturally sensitive factors and especially the solutions in the model.

c) A practical task of identifying potential cross-cultural problems in learning objects

Interviewees were asked to practise two selected learning objects, read them page by page, and try to identify potential cross-cultural problems involved. If they found one, they were asked for a solution to solve the problem. A list of the culturally sensitive factors and suggested solutions was offered as a tool to help the interviewees to do the task. The practical task is a real test as to whether the cultural reference model can give an impetus to people becoming more culturally sensitive. It also provides real examples of how the culturally sensitive factors exist in learning objects and would have potential impacts on learners in different cultural contexts.

Through the three parts an interview could have very rich feedback from designers about the cultural reference model. All of the interview participants were very helpful and cooperative and were interested in knowing about the cultural reference model. The interviews were on average 60 minutes long.

7.2.5 Learning Objects Used in the Practical Task

The samples of learning objects were used in interviews as instances by which the culturally sensitive factors and their suggested solution will be measured. The selection of learning objects, therefore, has to consider the measure issues:

A. Identified potential cultural problems

B. Clear guidance on how to deal with these issues

C. Available to be reviewed.

The RLO-CETL learning object repository is the resource that provides available learning objects for the study. Two learning objects were chosen to be the samples of the study:

"Stakeholders RLO" developed by London Metropolitan University

"Should Sarah smack her child?" developed by University of Nottingham.

The two learning objects can be found at the website of the RLO-CETL (http://www.rlo-cetl.ac.uk/joomla/index.php).

For the timing limitation of an interview and concentration on cultural issues, it would be better if culturally sensitive factors occur more often in one learning object. The learning object of "Stakeholders" is designed to take students through the process of applying a stakeholder analysis to a case study. It takes the coffee industry as an example. This learning object is chosen because it involves some particular culturally sensitive factors, such as image, data format, and culturally sensitive content. The learning object of "Should Sarah smack her child?" explores an ethical dimension and different views surrounding the use of mild smacking as a means of punishment. This learning object involves not only culturally sensitive content, but also some culturally sensitive factors in pedagogical design. The instructional model used in it is Role Playing, which needs learners to be highly involved. In this process of learning, some culturally sensitive factors should be evidently observed.

7.3 Data Analysis

The evaluation data includes quantitative data, which is collected through the expert review, and qualitative data, which is collected through one to one interviews with lecturers and developers. This section represents the findings of the evaluation.

7.3.1 Views about Cultural Issues in Learning Object Design

In the interview, participants were asked to express their views and experiences about developing and/or using learning objects in terms of cross-cultural issues. The topics were discussed at three levels: (a) consideration of cross-cultural issues (b) recognition of culturally sensitive factors, and (c) difficulties of dealing with the cultural issues.

(a) Consideration of cross-cultural issues

When participants were asked whether they usually consider cross-cultural issues or cultural diversity of learners in their experience of developing and/or using learning objects, most answers are like "*almost No and a little bit Yes*". Only two lecturers said yes. For the reasons that drew their attention to the cross-cultural issues, both the lecturers emphasized the diversity of students' nations in their classes, which brought a lot of differences about learning styles, group works, communications, English language, and so on.

> *It is so obvious in this university. You really have to consider cross-cultural issues from the beginning of designing a curriculum or a learning object.* (L1*)

Other lecturers expressed that they noticed cultural differences in their students, in their classes, but they consciously did not think about the differences during the design of learning objects.

Developers had very common concerns about this question. They took into account the differences in terms of accessibility in their design and try to make their design as simple as possible so anybody can navigate and understand what the instruction means.

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* In this chapter the L stands for a lecturer, and the D stands for a developer who took part in the evaluation.

> "*I considered the differences in terms of design, like navigation, accessibility to dealing with people with disability, not dealing with culture. I wouldn't say I deal with navigation system in different ways for different cultures.*" (D1)

They also stressed the role of lecturers in the design process. For example, sometimes cooperating lecturers may raise a cross-cultural issue, such as a mixed photograph of black people, Asian people, not only white people; and they would do that.

(b) Recognition of culturally sensitive factors

Participants felt it is difficult to recognise culturally sensitive factors or potential cultural problems during the design and development of learning objects. There were a couple of ways that make them recognise cross-cultural problems summarised from their answers. (1) Some participants thought that some factors can be seen quite obviously, such as religion and gender. They tried to avoid the things that might offend people. (2) Some participants mentioned that students' feedback and peer reviews provided different opinions. But they also pointed out that it was thinking about not just cross-culture but also thinking about students' capability or disability in terms of learning with the technology.

Several participants thought that they were unlikely to recognise cross-cultural factors on their own initiative during the design of learning objects because they lacked the associated knowledge of cross-culture and experiences of involving a kind of environment of cross-culture. A developer expressed:

> "... *I am English, communicate with English people, speak English, so I may not recognise it (cross-cultural problem). I remember that we were discussing a learning object months ago. The question was about whether we can use a gambling situation as an example. Someone said that some Muslim students may not like the idea of gambling, so probably we would have to change that idea. But I*

wouldn't think about that because I am not a Muslim. So it is not necessarily me but maybe someone else notices it. ... I may not recognise in fact something may be offensive in other culture. I have limited knowledge about culture. But no one knows everything about all other cultures." (D2)

(c) Difficulties of dealing with the cultural issues

Lack of the knowledge of cross-cultural issues is a major concern when participants were asked to identify difficulties they thought about or experienced with dealing with the cultural issues. Many participants thought being aware of cultural issues is very much necessary for improving learning object design culturally.

"*I think to be culturally sensitive means you have to be more culturally aware what the things might be. That might be the starting point really. Otherwise, I will be guessing.*" (D1).

"*The cultural knowledge, I would say, is the difficult thing for me. I think there should be some training about cross cultures for people who develop learning objects. I would say, not just specifically about cultural differences in learning content, but accessibility also has cultural differences. I think that would be a good thing (to have some training). ... Again, that would be more about awareness. That would be the difficulty.*" (D3)

A lecturer also mentioned there was not enough training to individually identify culturally sensitive factors.

"*... It is interesting. We have quite a lot of technical training in the CETL when we developed the learning objects. We have developers' forums. We have showcases. We have the GLO Tool and workshops from that. We have mobile learning workshops. We haven't had any*

workshop for culture diversity. We very much depend on students' feedback because I don't think we have enough training to individually identify culturally sensitive factors." (L1)

Some participants thought that they were developing learning objects for university students in the UK rather than any other particular cultures. They did not really think about cultural differences. But what they did think about is to make sure that people are able to use the learning objects, for example, adding transcriptions to audio records. A developer explained.

"*I think we are pretty good in terms of making things accessible and describing things, especially describing things in what the resource is, what students has to do, and different options that are available to students. But I don't actually think about the cultural differences.*" (D4)

Nearly all participants have mentioned the awareness of cultural diversity that is crucial to improve the design of learning objects culturally; but they have little knowledge about it.

7.3.2 Cultural Sensitivity of the Factors

This section analysed the data about the cultural sensitivities of the four dimensions of culturally sensitive factors. The data was collected from section 1 of the questionnaire (see Appendix D) and through the discussion of the interview. Table 7.1 shows the results collected from the questionnaire. The right column (Total Median) is the median score of each factor that is calculated for all responses. The two middle columns are the median score that are collected from lecturers and developers. At vertical direction, the culturally sensitive factors were organised into the four dimensions: knowledge dimension (KD), access dimension (AD), pedagogy dimension (PD), and technology dimension (TD).

17 of the 21 factors got a median score of cultural sensitivity over 3 (M>=3) (sensitive). The highest median score (M=4) goes to *learning content* in the KD, *language/text* and *Image* in the AD, and *feedback* in the PD. The other 4 factors got a median score that equal to 2 (M=2) (less sensitive). They are *number/date/time*, *navigation*, *colours*, and *holistic structure*. When analysing the data in the four dimensions, the factors' scores show different features in the four dimensions.

Table 7.1 Level of cultural sensitivities of the factors viewed by lecturers and developers

Recommendations for each factor	Lecturers (n=9) Median	Developers (n=6) Median	Median
KD			
Learning Content	4	3.5	4
Prior Knowledge	3	3	3
AD			
Language/Text	4	4	4
Image	4	3.5	4
Number, Date, Time	4	4	4
Symbol	2	2	2
Colours	3	1	2
Navigation	2	2	2
Holistic Structure	3	2	2
TD			
Infrastructure	3	2	3
Experiences or Skills	3	3	3
PD			
Orientation	3	3	3
Elaboration	4	3	3
Learner control	4	3	3
Feedback	4	4	4
Motivation and Stimulation	4	3	3
Practical task	3	3	3
Collaborative task	4	3.5	3
Communication manner	3	3	3
Engagement	3	2	3
Value of error	4	2	3

Factors' Scores in Knowledge Dimension (KD)

The factors in the KD seem to be the most culturally sensitive (*learning content*: M=4, *prior knowledge*: M=3). The scores of the factors also show that the opinions of the respondents are highly consistent. First, there are no big differences between the lecturers and developers (e.g., *learning content*: $M_{lecturers}$=4, $M_{developers}$=3.5; *prior knowledge*: $M_{lecturers}$=3, $M_{developers}$=3). Second, the standard deviation (S.D.) of the scores showed that opinions within lecturers (e.g., *prior knowledge*: S.D=0.471) and developers (e.g., *prior knowledge*: S.D=0.490) are similar as well.

Factors' Scores in Technology Dimension (TD)

In contrast, the total median scores of the factors in TD showed that *infrastructure* and *experiences/skills* were both considered as cultural sensitive (M=3). However, the standard deviation (S.D) of the scores showed that people had quite different opinions about the factors. *Infrastructure*, for example, was ranked from 5 to 0 by lecturers (S.D=1.663) and ranked from 4 to 0 by developers (S.D=1.327). The reason that caused the diversity seemed to be that people had different interpretations about the *infrastructure*. A typical thought with regard to a less culturally sensitive *infrastructure* was that infrastructure was fixed, there are nothing can do for designers.

> "*I don't think you've got much choice about it, because infrastructure is already there. You only can use it and cannot change it.*" (D2)

> "*For me personally, I would not worry about that (infrastructure). You don't use learning objects if you don't have a computer.*" (L2)

> "*I think it depends on what you are assuming, where your learning objects can be used. Obviously, if you ask, 'can we use the learning materials in a country where there is very low infrastructure?' then I would say that it is very important thing, because obviously people can access the Internet very easily here.*" (D4)

However, the point is that design of learning objects is not going to change an infrastructure, but to try to fit it by a flexible design. If a learning object was not suitable or adaptable for an infrastructure, there would be design problems in terms of reusability.

Factors' Scores in Access Dimension (AD)

The scores of the factors in the AD show that some factors, such as *language/text*, *image*, and *symbol* (M=4), are considered strongly culturally sensitive by both the lecturers and developers (see Figure 7.1). There was no particular mention of these factors during the interviews. The cultural diversities of these factors are much more visible and always encountered when designing learning objects. That may be why they got high scores. The other factors, like *number/data/time*, *colours*, *navigation*, and *holistic structure* (M=2), are considered less culturally sensitive by participants than the first three factors (see Figure 7.1).

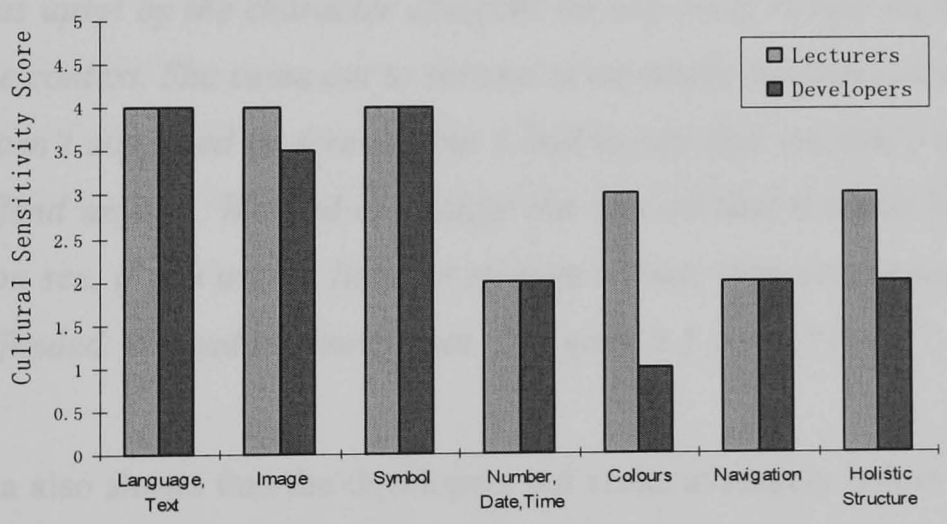

Figure 7.1The scores of cultural sensitivity of the factors in access dimension given by the lecturers and developers

People seemed to have quite different opinions about the factors based on their experiences. The *colours*, for example, got scores from the highest 5 to the lowest 0. Someone thought that colour is not important issue for learners' learning through learning objects:

> *"The colours used in traffic lights, red, yellow, and green, are the same everywhere. I am not quite sure what differences occur when colours are used in interface. But we have a learning object designed with four different colours of background. A student came and said to me: 'this colour is boring. I don't like it.' You know, I really didn't care what colour is there. To me, it is nothing to do with what students' learn. But she thinks it is a very important thing."* (L3)

However, others who experienced problems about colours in their design felt it is a very culturally sensitive factor:

> *"I think that people may not pay enough attention to colour if they don't have a design background. Because colour is a very, very, important thing. And they work at specific levels. It is not that people immediately know why they could cause problems. You need a little bit of work to get them to say something. For example, I had a character in a game we designed. ... She (the lecturer's assistant) was upset by the character designed on one white colour then put in the context. She came out to scream at me about the skin. I mean she wasn't supposed to scream, but I had to say that we don't want to offend anyone. We had to change the skin so that it could look ok. You see, if you used a little bit strange colour, then people would be offended. We had to change that. So I gave it 5 score."* (L4)

The data also shows that the developers put ranks averagely below 2 on the last four factors, which is even lower than lecturers (see Figure 7.1). It may be because the issue of internationalisation in development of software has been discussed (e.g., Russo, et al., 1993) and guides and standards have also been developed for designing global software products (e.g., Sun Microsystems, 1991) since the early 1990s. These guides and standards impact on developers' work. As a developer said when explaining why he put 0 on the *Colours* factor:

> "*I see that might be an issue. In fact I read someone's research about colours in different cultures. If they have three colours, it would be black, white, and red. They have particular order. You know, the order of black and red is in my culture. But in presentation design, if you put green button for Next, and red for Stop, then those important things in multimedia presentation for learning objects as such, I think, they work very well in cross-cultures*".

A main season that people did not care very much about *Navigation* and *Holistic Structure* is that there were templates available for their design. They followed templates and did not change much.

> "*A lot of stuff we developed uses templates we got. The templates we got and reused seem to work very well with students.*" (D4)

Factors' scores in Pedagogy Dimension (PD)

The scores of the factors in the PD show that they are considered to be culturally sensitive as the median scores are all above 3 (M >= 3). The *feedback* is the factor that got the highest score (M=4). If comparing the scores given by lecturers and developers, we could see that the scores given by lecturers were higher then or equal to developers' on all factors in PD (see Figure 7.2).

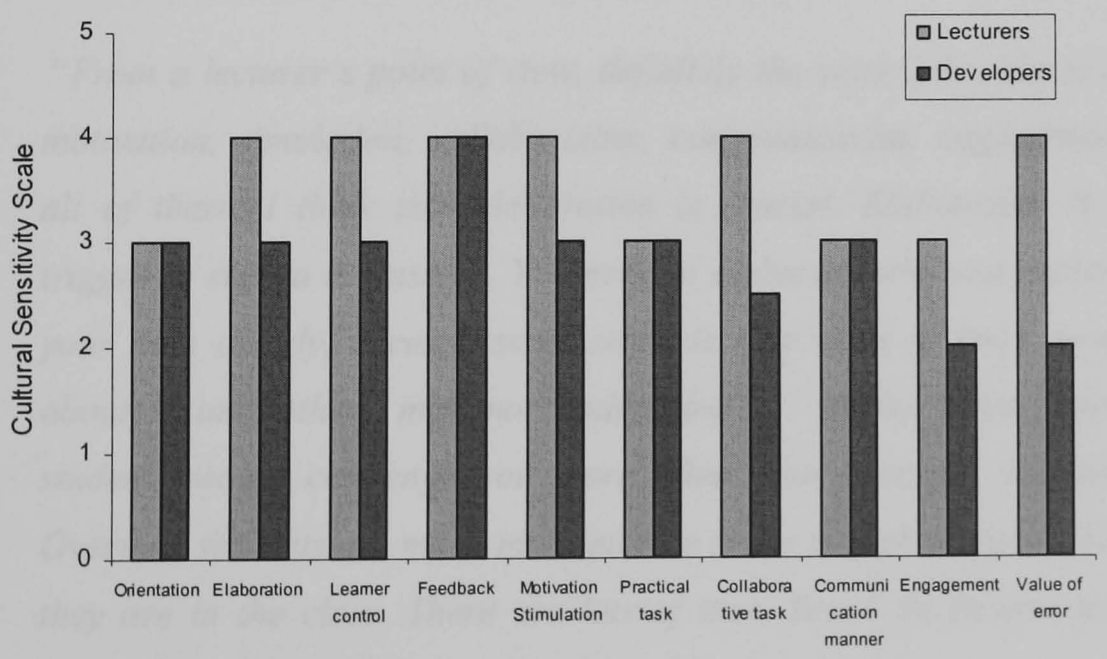

Figure 7.2 Sensitivities of pedagogy dimension viewed by lecturers and developers

The factors in PD are all related to the teaching process. The lecturers work directly with students' learning and have more experience of cultural diversity on teaching and learning, especially in the London Met which includes a high percentage of population of international students. It can explain why lecturers put high scores on the factors in PD. The following extract illustrates the experiences about students' diversity in their language and learning styles of some lecturers:

> "*... we got 192 different languages across our international students in business school. ... Most of our national students, they don't have English spoken at home. So English isn't the first language. ... You really have to consider cross-cultural issues and the reason to give advice on the language of a student who comes from abroad, a student who lives in the UK. I think that is really significant. And the other thing is that we had beginning an influx in the last five years with lot of European students. They are all coming in. They have very good spoken English. But their learning experience is very distinct. You know, such as this is what lecturers say; I am going to do what exactly lecturers say because it is right answer. ... You have to correct them starting from designing your syllabus, your curriculum. You really need to be aware of cross-cultural factors.*" (L1)

> "*From a lecturer's point of view, definitely the work I do relates to motivation, simulation, collaboration, communication, engagement, all of these. I think that elaboration is crucial. Elaboration is a trigger to start a discussion. You need to elaborate why you explore your idea clearly, because some students may want to know more about it and others may not understand. ... In my class, home students would challenge you more often than overseas students. Overseas students are much more mature in the way they study when they are in the class. There are lots of that. Yes, I do believe that students learn in different ways.*" (L2)

In contrast, developers saw the pedagogical factors as less culturally sensitive normally than the lecturers did. All developers mentioned in interviews that lecturers were responsible for the pedagogy design in their experiences of developing learning objects. They do what lecturers ask them to do in terms of teaching contents. The following extracts are what the developers said to describe their experiences in the design of learning objects:

> "... *my role is actually to do what I am told from tutors who come to say design this, design that. I mean I can actually influence the design, but they are general dominant that actually leads to the design as such. So if they haven't thought about whether the culture factors are important, I wouldn't think about them.*" (D2)

> "*Sometimes it's made aware (a cultural issue) by a lecturer, because we develop resources with lecturers usually. So it is in a partnership with lecturers.*" (D3)

> "... *So I develop things exactly how the scientists tell me to do, because I am not expert on health science and don't know if the equipments up there work. ... Stuff has to be down exactly how the lecturers tell me that it needs to be down.*" (D4)

The different roles between the lecturers and developers in the cooperation of the design of learning objects may be the reason that caused the differences in reporting the culturally sensitive factors.

Evaluating the level of cultural sensitivity of the factors is the first part of the questionnaire. The second part is to evaluate the level of usability and applicability of the recommendations for each of the culturally sensitive factors. The next section analyses the data about the recommendations collected both from the questionnaire and interview.

7.3.3 Recommendations for the Culturally Sensitive Factors

The section analysed the data about the recommendations for the culturally sensitive factors. The data was collected from section 2 of the questionnaire and through the discussion of the interview. Overall, participants expressed positive views about the recommendations for the culturally sensitive factors. Considering all participants as a whole, the median scores of the recommendations are all greater then or equal to 4 (M >= 4). Four recommendations, *Language/Text*, *Elaboration*, *Motivation and Stimulation*, and *Value of error*, got the highest median score 5 (M = 5).

Comparing lecturers and developers, the median scores given by developers are generally little higher than the lecturers' (see Figure 7.3). In Figure 7.3 the square line showed the developers' scores; the diamond line showed the lecturers' scores. Lecturers and developers hold identical views on some recommendations, such as, *Orientation*, *Practical task*, *Collaborative task* ($M_{Lecturers} = M_{Developers} = 4$). But some deviations also existed between lecturers and developers on other recommendations. The biggest difference was on the factors *Holistic Structure* and *Infrastructure* (see Figure 7.3). The developers' scores ($M_{Developers} = 5$) are much higher than the lecturers' ($M_{Lecturers} = 3$). These two factors relate to the aspects of implementation of the design of learning objects. This may be the reason that developers were more interested the recommendations for these two factors.

For individual recommendations, the following tables show the scores of each of them gathered in the four dimensions. Table 7.2 shows the scores of the recommendations for the factors of *Learning Content* and *Prior Knowledge* in KD. 66.7% participants ranked the recommendation of factor *Learning Content* as "strongly useful" (score = 5 and 4). 20.0% participants ranked it as relevant useful (score=3). And the other 13.3% participants thought that it was less useful (score<3). The percentages of the scores of the recommendation of factor *Prior*

Knowledge are 73.3% (score = 5 and 4), 6.7% (score = 3), and 20.0% (score < 3).

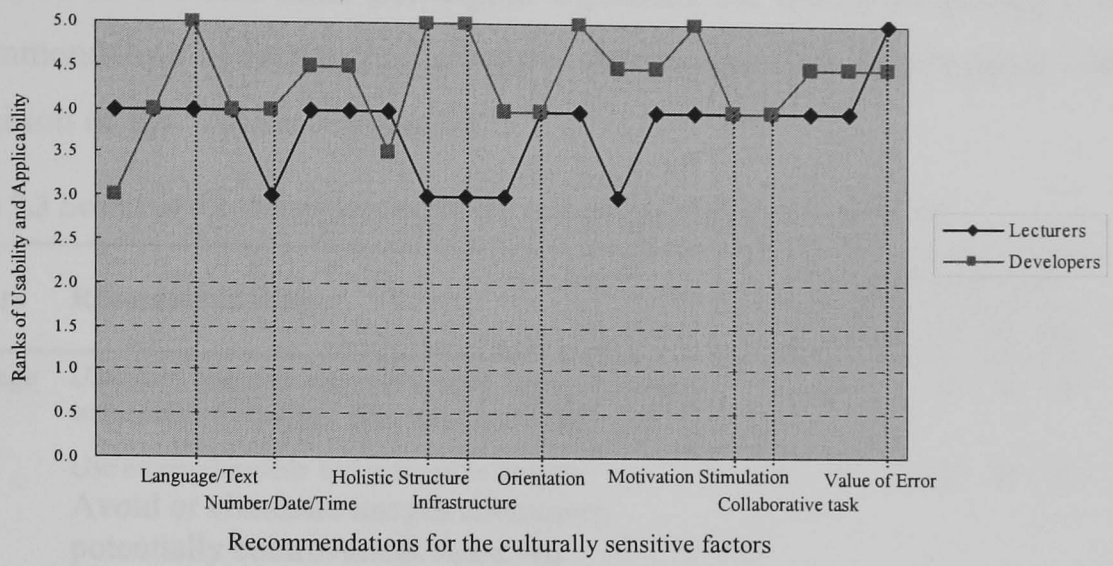

Figure 7.3 Ranks of usability and applicability for the recommendations of culturally sensitive factors

Table 7.2 Scores of recommendations for the culturally sensitive factors in KD

Factors	**Recommendations**	Amount of each score					
		=5	=4	=3	=2	=1	=0
Learning Content	Try to avert the culturally sensitive content; If it is necessary, be careful with the expression of the content and add extra explanation of context or condition for why it is used.	6	4	3	2	0	0
Prior Knowledge	Try to avoid the culturally special prior knowledge; Add extra explanation of the knowledge if it is necessary.	3	8	1	3	0	0

Table 7.3 shows the scores of the recommendations for the culturally sensitive factors in AD. The recommendation for the factor *Language* got the highest scores of 93.3% for "strongly useful" (scores = 5 and 4). The recommendations for the factors *Number/Date/Time* and *Navigation* got lowest scores which include 53.3% for "strongly useful" (score = 5 and 4), 26.7% of "relevant useful" (score = 3) and 20.0% for "less useful" (scores = 2 and 1). There were 2 scores of 0 (not useful at all) given to the recommendations of factors *Colours* and

Holistic Structure. For giving score of 0 to the recommendation of factor Colours, the participant said in interview "*I think I made a mistake here. It shouldn't be 0*". The other participant explained the reason of putting 0 to the recommendation of factor "*Holistic Structure*" as that she did not agree with the definition of the "*Holistic Structure*".

Table 7.3 Scores of recommendations for the culturally sensitive factors in AD

Factors	**Recommendations**	Amount of each score					
		=5	=4	=3	=2	=1	=0
Language	Use plain language and avoid to use jargon or slang, in some culture academic language is preferred.	8	6	1	0	0	0
Image	Use comprehensible and acceptable images, Avoid or eliminate images containing potentially controversial elements, Add necessary explanation in images to reduce confusion.	5	7	1	2	0	0
Number/ Date/Time	Use the metric system to describe data as possible, or supply explicit measure unit (e.g., date: 01-Jan-2000).	4	4	4	0	3	0
Symbol	Avoid or eliminate symbols that may cause potential misinterpretation.	4	6	3	1	1	0
Colours	Do not use only colours to convey information to learners (e.g., red means error or green means right), Use colours with relevant text messages.	6	5	2	1	0	1
Navigation	Provide different navigation tools (e.g., index, site map, etc.) to prevent learners from becoming lost.	5	3	6	1	0	0
Holistic Structure	Simplicity, with clear metaphors, limited choices, and restricted amounts of data.	6	4	2	2	0	1

Table 7.4 shows the scores of the recommendations for the culturally sensitive factors in TD. 53.3% participants ranked the recommendation of factor *Infrastructure* as "strongly useful" (score = 5 and 4). 26.7.0% participants ranked it as "relevant useful" (score=3). And other 20.0% participants thought it was "less useful" (score<3). The percentages of the scores of the recommendation for the factor *Experiences or Skills* are 53.3% (score = 5 and 4), 33.3% (score = 3), and 13.3% (score < 3).

Table 7.5 shows the scores of the recommendations for the culturally sensitive factors in KD. The recommendation of the factor *Value of error* got the highest scores of 86.7% for "strongly useful" (scores = 5 and 4) and 13.3% for "less useful" (score =2 and 1). The recommendation of the factor *Practical task* got

lowest scores which include 53.3% for "strongly useful" (score = 5 and 4), 26.7% of "relevant useful" (score = 3) and 20.0% for "less useful" (scores = 2 and 1).

Table 7.4 Scores of recommendations for the culturally sensitive factors in TD

Factors	**Recommendations**	Amount of each score					
		=5	=4	=3	=2	=1	=0
Infrastructure	Adopt mainstream and fully developed technology to minimize technical barriers to reuse of the learning objects.	5	3	4	2	1	0
Experiences or Skills	Avoid complex operation techniques and add online help (e.g., pop-up windows) if necessary to guide learners who have less experience or skills.	3	5	5	1	1	0

Overall, the percentages of the scores for the all recommendations are 68.25% of "strongly useful" (score > 3), 20.95% of "relevant useful" (score = 3), and 10.79% of "less useful" (score < 3) (see Figure 7.4).

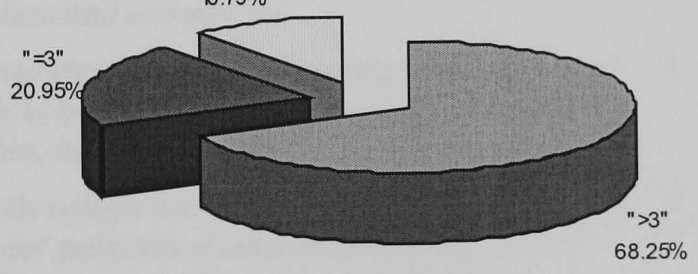

Figure 7.4 Distributions of scores for the all recommendations

During the interviews participants gave quite positive feedback about the recommendations in general as saying, "*it is very important work to enhance the reusability of learning objects*", "*there are something that I should know for my work of developing learning objects*", and "*I think that what you designed, what you suggested are great*". When focusing on individual recommendations participants express their views with different concerns.

Table 7.5 Scores of recommendations for the culturally sensitive factors in KD

Factors	**Recommendations**	Amount of each score					
		=5	=4	=3	=2	=1	=0
Orientation	Provide options of a quick introduction and an extended introduction to meet needs of different learners.	4	7	3	1	0	0
Elaboration	Avoid using either extreme enigmatic academic language nor too informal language; Choose commonly acceptable examples to elaborate concepts.	8	4	3	0	0	0
Learner control	Provide multiple ways that enable learners to control their own learning paces (e.g., ordinal, jump forward and back, etc.).	6	4	4	1	0	0
Feedback	Some extra explanation or direction may be needed to support different learning styles (i.e., inexperienced learners need additional instruction especially at a position where two or more directions are available).	6	4	4	0	1	0
Motivation and Stimulation	Build positive or inspiring atmosphere that is effective for most cultures.	8	2	3	1	1	0
Practical task	Provide optional additional directions to open-ended tasks to support learners with less experience or feeling challenge; Provide optional open-mind tasks that allow learners to submit their own opinions.	5	3	7	0	0	0
Collaborative task	Provide additional information to help learners in a group to divide labours, organise cooperation, handle conflict, and make decision.	3	8	3	0	0	1
Communication manner	Provide multiple communicational channels to meet learners' preference of communication (e.g., synchronous or asynchronous, and anonymous or signed).	6	4	3	0	1	1
Engagement	For productive or creative tasks, more instruction may be needed to provide additional support to learners with less experience of this kind of tasks.	7	3	4	0	1	0
Value of error	Provide positive or encouraging feedback to any error or mistakes learners made, especially to the sort of tasks of "learn from mistakes" to encourage learners who are more sensitive to making mistakes to complete it.	8	5	0	2	0	0

Three typical comments about individual recommendations are summarised through discussions in interviews. The first sort of comment is that the recommendations are useful for dealing with the culturally sensitive factors.

Participants expressed that they thought the recommendations are important and could be helpful to deal with the culturally sensitive factors. The comments of this sort of concerns in the interview, for example, are selected as following:

> "*I agree with it (recommendation for learning content), I do think you have to treat cultural sensitive content very carefully and add extra explanations.*" (L4)

> "*It is a good point using 'comprehensible and acceptable images'. I think that 'to avoid or eliminate potentially controversial elements' is pretty useful. Images should be as clear as possible. Yes, I agree with that.*" (D1)

> "*For colours, you have to be very careful. I really agree with that. You assume that everybody knows red, yellow and green that is UK traffic light. It is also the same in football match you show red card. But it is not always the same I know that. That is why I do agree with that because I know colour is really important in terms of culture. You have to be quite careful with that.* " (L1)

> *"I think this one (value of error) is brilliant. And I think that is really important. And supporting students to do that is really good. I also know from my classroom experiences, students from some cultures really have problem with making mistakes. One of the best things you can do, as an educator, is to support students making mistakes and help them learn from this. My suggestion is always to make it fun and enjoyable. You know you can have it to scaffolding in different stages, all kind of different things. If it's fun and enjoyable then students would like to do them.*" (L2)

This sort of comment is the majority, which is shown in the statistical results in the questionnaire as well. There are 215 of the 315 positive feedbacks (score = 5

and 4) in terms of individual recommendations which occupied 68.25% in total (see Figure 7.4).

The second sort of comment is that some factors are culturally sensitive but have a weak impact on the design and development of learning objects; consequently the relevant recommendations would not be considered very much during the design and development of learning objects. The factors considered in this comment mainly refer to the factors of *Number/Data/Time* and *Infrastructure* and their recommendations. Some participants agreed that "number, date, and time" are culturally specific, but thought that students should be used to different forms. A developer's attitude is typical:

> "*I guess a lot of students, especially international students, are used to seeing dates in many different formats anyway. So I wouldn't regard that too much in format. I would probably do it in every showcase in the British standards, like day-month-year rather then in American way month-day-year. Students shouldn't have a problem to understand. They shouldn't expect to learn something exactly in the same format when they come to another country. ... But maybe in terms of doing the date I would put down 12-Jan-2008 rather than 12-01-2008.*" (D4)

For the recommendation of the factor *Infrastructure*, some participants thought differences of infrastructure have less impact on the choice of technology that would be used to develop learning objects even if there are differences in infrastructure between countries. Developers discussed advantage and disadvantage in adopting mainstream technology. A learning object that adopted mainstream technology can be easily integrated into existed learning environments, hence, technically gets high reusability and adaptability. A disadvantage is that the learning object made by mainstream technology may miss some powerful capability offered by present new technology. The following comments were typical.

"*You should, in general, use mainstream technology. But if you only ever do that, you would be restricted to previous technologies, not ones being developed now. If you were only ever to do this, you would only ever been making learning objects of a limited capability, whereas if you adopt present technology you can take advantages what ever been made available to you now. It is a debatable one.*" (D2)

"*We developed a lot of resources. The majority were made in Flash. One of the problems is that, we have worked with teaching staff, before we use new components in new versions of Flash, the staff need the last version of Flash Player in order to for them to run the resource. It is fine. It is free which means you can download it. But you need an administrator right to store it in the university's computers. That is something that caused problems in the past because we sent something over to the members of staff to evaluate, and ask them to have a look the program we built. But they cannot even see it. So that is something we have to take into account.*" (D4)

A lecturer linked mainstream technology to platforms of using learning objects and claimed that there should be flexible ways to develop learning objects.

"*I wasn't sure that I agree with the "adopt mainstream technology" because we've done quite a lot of mobile learning. And that is not kind of mainstream with a lot of infrastructure. It can be quite cheap. And using it can download things very easily. ... I don't think when we looking at learning object design we should always assume that everything is going to be on this great, big supported platform (in the university). And when you look at the new web tool technology which is coming out I think we are going to have much more flexible ways.*

And it is not going to be run on a technology tower in our university. It is going to be in different kind of formats." (L1)

The last sort of comment is that some of the recommendations are seen as too simple. These comments are mainly related to the recommendations of factors in pedagogy dimension. It is understandable because pedagogical design is the most complex part of the design of learning objects and cultural diversity in teaching and learning is most difficult to grasp and describe.

Considering her teaching experience, a lecturer explained the reason why she thought the recommendations of factors *Practical Task* and *Collaborative Task* are simplistic.

"*You cannot just build that in: do you feel challenged? Are you struggling? Nobody wants to put their hands up or click the button saying yes. They would not do it online either. "Open-mind tasks that allow learners to submit their own opinions", that is fine. But you know I have 150 students. I don't want 150 students to submit their opinions because I got to look at them and give them feedback. I want learning objects to support my students either in classroom or at home. And I want them to do things independently.*" (L1)

"*I don't think that 'giving additional information and handling conflict' is going to help students to do group work. All my first year students do group work. Some groups just going well and other groups, you know, you are more or less doing a united nation resolution, negotiation to help them doing that. I don't think that sort of things that online learning objects can really help with. That is why you do need face-to-face; you do need tutors to help students to come to a consensus. For me, that is one thing that computers cannot do.*" (L1)

This raised an important issue about what tutors' roles are in an e-learning system and how they intervene in a learning process to help learners to achieve the learning goal. This is worth doing more research on that, but it is beyond this study.

However, considering the culturally sensitive factor itself, a collaborative task requires a group of learners working together, and is usually a relevant big task. Therefore, this task may be not involved in a learning object very often. However, because of the strong cultural relativity of the task, the *Collaborative Task* is eligible to be one of the culturally sensitive factors in the model.

It is evident that cross-cultural issue is not the only one that affects a decision on the design of a culturally sensitive factor in pedagogy dimension. There are many different aspects that may affect the design decision. The recommendations focus on the one aspect – the cultural influences. Thus, they need to be considered with other aspect synthetically to achieve a desired result.

The last task in the interviews was the practical task to review two learning objects online from a cross-cultural perspective. The next section presents the process and result of the task.

7.3.4 A Practical Task of Using the Cultural Reference Model

The last task of the interview is a practical task. Participants were asked to perform a practical task on the computer to evaluate the usefulness of the cultural reference model. The task is to identify potential cross-cultural problems in two learning objects and suggest possible solutions by referring to a table of the culturally sensitive factors and their recommendations. Participants' performances were observed about what problems they found, and how the table to be referred to help them to do the task. The emphasis is on the process of doing the task.

Participants were offered the learning objects, "*Stakeholders*" and "*Should Sarah smack her child?*", and asked to read them page by page carefully to find out whether there were potential cross-cultural problems in the learning object. If they could not find any cross-cultural problem, they would be suggested to refer to the table and try it again. When a problem was identified, the participant was asked to seek a solution based on the recommendations for the culturally sensitive factors.

Participants were interested in doing the practice. Although many of them had known the learning objects, and some had even been involved in the development of one of learning objects, they had never looked at the learning objects from the angle of different cultures. And they found some potential cross-cultural problems that they had never noticed when they developed or used the learning objects.

In general, all participants pointed out more or less potential cross-cultural problems in the learning objects. All the potential cultural problems that participants identified are within the range of culturally sensitive factors in the four dimensions. Most participants found more or less problems without reading the table in the scene, but mentioned the factors in the table. It may be because the culturally sensitive factors and the recommendations had been given through the questionnaire and were discussed in the interview. They had the ideal about the culturally sensitive factors when doing the task. Few of the participants read the table looking for clues to support them. When seeking solutions for the problems, most participants referred to the recommendations in the table. They felt that it was helpful for them to capture the factors that may be culturally sensitive.

For example, when a developer was searching the culturally sensitive factor "*Prior Knowledge*", he pointed to the term of "Oxfam" in the learning object "*Stakeholders*" and said, "*Yes, of course, this one, we haven't explained that*".

A lecturer noticed the picture of the "Big Ben" used in the learning object "Stakeholders" and said, "*This image, people may not know it refers to the government. You cannot assume that everybody knows that*". She then added, "*For me I found it is very hard to choose images because I don't know what people don't know*" (see Figure 7.5).

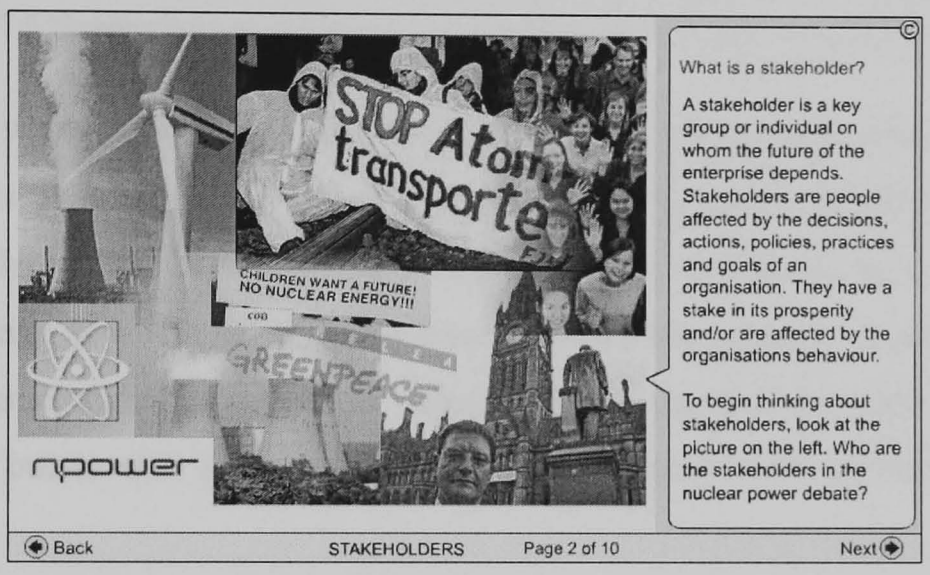

Figure 7.5 A page with images in the learning object "*Stakeholders*"

Overall, the culturally sensitive factors related to accessing issues were identified in the learning objects more than the culturally sensitive factors related to pedagogical issues. All participants pointed out the problems about the images (see Figure 7.5), number formats (see Figure 7.6, the number with a comma to separate a big number which is used as a period in Europe), the learning content (people's opinion about smacking a child), and colour and symbols (see figure 7.7, if you agreed to smack the child, you got a "Yes" and blue tick; it seems that you got a right answer. Otherwise, you got a "No" and a red cross and a wrong answer.) in the learning objects. Some of them found that there was not a clear explanation about why students should type in text in a textbox and there were not clear indications where the text is going and who is going to read it in the learning object "*Should Sarah smack her child?*" (see Figure 7.7). Some participants noticed the warning when clicking the "save" button which may cause unnecessary panic to students who are sensitive about typing in their own opinion (see Figure 7.8).

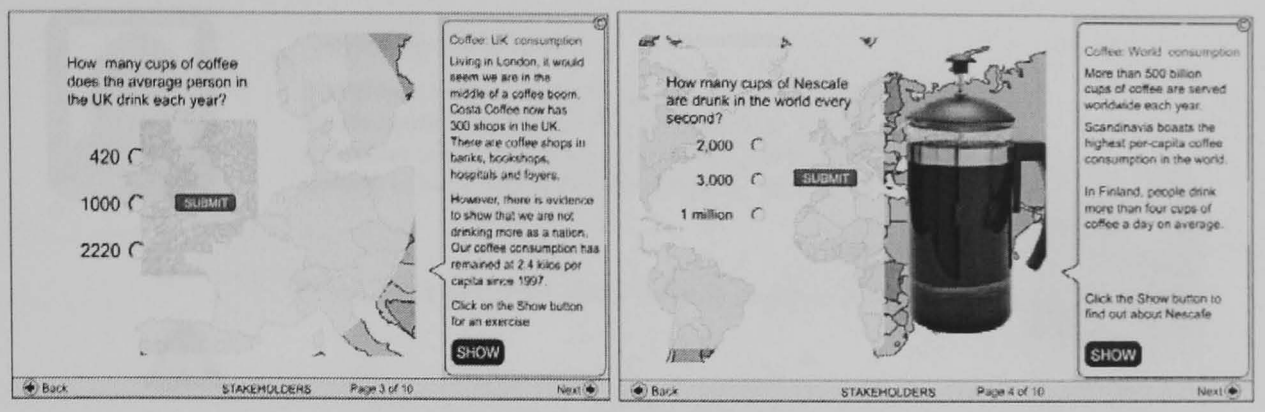

Figure 7.6 Number formats in the two pages in the learning object "*Stakeholders*"

However, when pointing out that something may be culturally sensitive, some participants also expressed that it could be a design issue. In Figure 7.6, for example, the number format showed in the left page is different from the one in the right page in which the numbers were separated by commas. It probably is a cultural issue, using a period to separate a big number in some European countries, but is also an issue of consistency between two screens which is wrong.

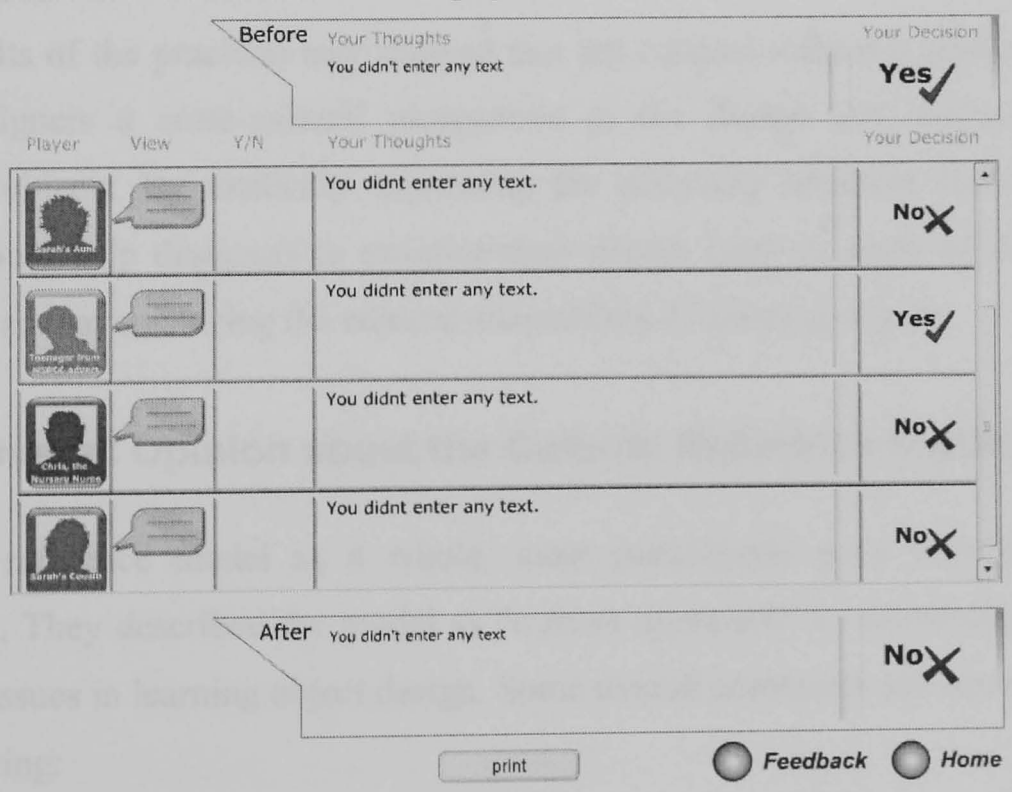

Figure 7.7 Colours and symbols used in learning object "*Should Sarah smack her child?*"

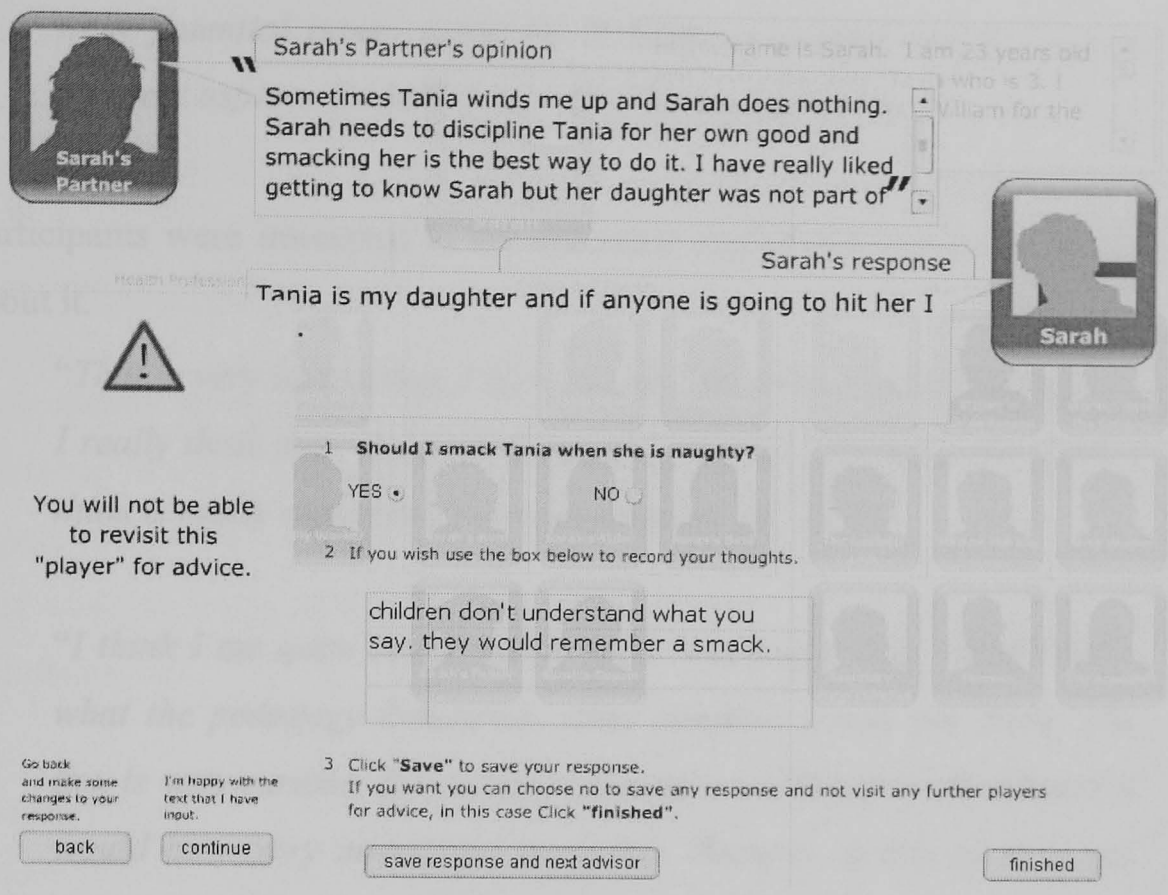

Figure 7.8 A page with a textbox and a warning in the learning object "*Should Sarah smack her child?*"

The results of the practical task showed that the cultural reference model could lend designers a cross-cultural perspective to the design and evaluation of learning objects. By explicitly expressing the culturally sensitive factors, this model could help designers to examine their design from an angle of different cultures, so that enhancing the cultural adaptability of learning objects.

7.3.5 Overall Opinion about the Cultural Reference Model

For the reference model as a whole, most participants gave very positive feedback. They described the model as "*a fresh approach*" to examining cross-cultural issues in learning object design. Some overall comments are summarised as following:

> "*I think it is very useful to be able to see these specific issues about cultural problems. I think it is important to have them rise at the early stage of the design or during the evaluation. So you get the idea*

what potential issues might be. It helps to prompt you to look at different aspects. So I think it is a useful model." (L5)

Participants were interested in the reference model and wanted to know more about it.

"*That is very interesting. I have learned something which is great. ... I really think your research is going to take us forward a bit which I think is really important. Do workshops for us.*" (L1)

"*I think I am quite interested. It is like opening a box. I don't know what the pedagogy dimension, what sensitive issues are there. The box is very curious. If you were running a workshop to developers it would be a very interesting workshop. Because of lots of area you said in here we do with processes, we do with scenarios. But what inside of the scenarios people almost don't know. I think that is very interesting.*" (D1)

A developer suggested that the reference model should be put into practice.

"*I would suggest that definitely you should do something practically in terms of looking at the GLO Tool* (This is a developing tool named Generative Learning Object Maker, see website: http://glomaker.co.uk/) *that is being developed. Your model should be built in. I suppose it can be used in the GLO Tool. You've got all the factors here. The descriptions are very useful. I think you need to link them with the GLO Tool. That would be very good. ... So your work could be useful as a developer's toolkit.*" (D3)

In general, the feedback from the participants of the evaluation showed a message that the importance of cultural issues has been recognised by learning object designers, including academic staff and multi-media developers, but it seems that there is a lack of effective approaches to tackle the problems. The

participants expected that the cultural reference model could provide usable guidelines to facilitate improvement of the design and development of learning objects in terms of cultural adaptability and reusability.

7.4 Discussion and Summary

This chapter presented the quantitative and qualitative evaluation of the cultural reference model for the design and development of learning objects through an expert review, semi-structured one to one interviews, and practical tasks. The data analysis showed that the cultural reference model has met its success indicators well.

The first success indicator whether the culturally sensitive factors can cover potential cross-cultural problems in learning object design was evaluated, and the results showed that the participants depended on their experience for their design of learning objects in regard to cross-cultural issues. For example, lecturers who found more culture-related differences between international students in their teaching experience considered cultural issues more when they are engaged in the design of learning objects. In the other words, they would not notice cross-cultural issues if they did not have this kind of experiences. As Gert Hofstede wrote in the Foreword for the book "Globalized E-learning, Cultural Challenges", "how important to e-learning is culture? Very. But in most cases, you do not wish the participants to notice. They want to do a course with as little hassle as possible. That is a course designer's predicament" (Hofstede, 2006, p.vii). There is a similar predicament in a learning object design. Therefore, the culturally sensitive factors identified in this study provide cross-cultural insight into the design and evaluation of learning objects that will help designers to recognise potential cross-cultural problems.

The culturally sensitive factors relate to different aspects of the design and development of learning objects. In this model they are organised into four

dimensions: knowledge dimension, pedagogy dimension, accession dimension, and technology dimension to enable designers focusing on the most relevant factors at different design stages. It seems to achieve this aim. When participants discussed each dimension, they focused on cultural issues that related to the aspect that the dimension refers to. These focuses were also showed by participants doing in practical tasks.

The practical tasks led participants into a real scenario of learning objects to evaluate how the cultural reference model could help them to identify potential cross-cultural problems and to improve the design. Participants found that some design factors appeared in the samples of learning objects may be culturally sensitive and might cause potential cross-cultural problems if they were reused in different cultural environments. The data analysis also showed that most recommendations provide useful suggestions to deal with the culturally sensitive factors. A few recommendations were mention by some participants as too general to be a solution for some particular design problems.

This study did not trace a real process of a learning object design to evaluate the cultural reference model because of feasible issues. However, the expert review, the one-to-one interviews and the practical tasks provided rich and high quality of feedback from both academic tutors and multimedia developers.

8 Conclusion and Further Work

This chapter presents a final discussion of this study including conclusions in first section, a discussion of contribution and limitations in the second and third sections, and suggestions for further work in the last section.

8.1 Conclusions

Cultural sensitivity issues are important in the design and development of learning objects in terms of improving reusability and adaptability in order to provide equivalent rich pedagogy to learners in culturally diverse learning contexts. As learning objects are designed with the intention of reuse, cross-cultural issues that affect teaching and learning in many ways have to be taken into account throughout the process of their design and development. Therefore, this study intended to provide designers with cross-cultural insight and perspectives about the influences of cultural diversity on the design and development of learning objects so that appropriate improvements can be achieved prior to the design completion.

In order to address the problems of cultural adaptability in the design and development of learning objects, this study developed a cultural reference model for learning object design and evaluation that emphasises the influences of cross-cultural issues on instructional design and implementation, and provides a practicable framework consequently allowing learning object designers to adopt appropriate improvements. The cultural reference model consists of four dimensions about culturally sensitive factors, a conceptual framework that maps the cultural dimensions to the design process, and a series of recommendations about dealing with the culturally sensitive factors during the process of the design and development of learning objects.

Dimensions of culturally sensitive factors

The four dimensions (knowledge dimension, pedagogy dimension, access dimension, and technology dimension) contain all aspects of learning object design. There are culturally sensitive factors identified in each dimension, which were described in Chapter 5 (see Figure 5.4). The four dimensions of culturally sensitive factors indicate the cross-cultural issues in learning object design explicitly and consequently lay a foundation that designers can consciously examine in ensuring the cultural adaptability of learning objects they are designing. It is important to have an explicit identification of culturally sensitive factors for learning object design, because cultural issues are often subtle and complex. The four dimensions of culturally sensitive factors will provide designers with cross-cultural insight about influences of cultural diversity on the design of learning objects and improve their cross-cultural awareness about concerns of accommodating culture-related needs to different potential learners using their products.

A framework for mapping the cultural dimensions to the design of learning objects

In order to integrate the concerns of cultural diversity with learning object design, this study developed a conceptual framework that maps the cultural dimensions to the design of learning objects. This framework is based on the instructional design model (Biggs, 2003) and learning object developing stages of development (Boyle, 2006), but focuses on the four dimensions of culturally sensitive factors and their relevance to the design process (see Figure 6.1). This is a novel framework. It allows learning object designers to address cross-cultural issues consciously and consistently, along with the design sequences, by following a series of recommended interventions.

Recommendations

This study recommended interventions in the stages of the design and development of learning objects to respond to each specific concern and

challenge that come from the identified culturally sensitive factors. There are two basic principles discussed in this study for implementing the recommendations:

1. reducing cultural specifics as much as possible in order to maximise the level of acceptability and adaptability of learning objects culturally,
2. highlighting the cultural specifics that are indispensable or unavoidable to a learning object by meticulously designed explanations.

Three different sorts of culturally sensitive factors were categorised by means of their cultural acceptability.

- Avoid culturally unsuitable or unacceptable factors
- Provide explicit explanation for culturally specific factors
- Provide alternative options for culturally preferred factors

For each of the culturally sensitive factors this study provided recommendation about how to deal with them in the design process were built based on those principles.

The cultural reference model

As a cultural reference model, it is dedicated to generating a consistent approach by which the influences of cultural diversity on learning object design can be explicitly addressed throughout the process of the design and development. This model does not only improve designers' insights into cultural diversity that affect learning object design, but also operationalises these insights into manageable ways to respond to the cross-cultural situation. The cultural reference model can be applied to

- design and development new learning objects that are culturally reusable and adaptable
- evaluation of existing learning objects whether they are culturally sound.

In an extension of the research about influences of culturally sensitive factors on learning object design, this study developed a conceptual framework for reuse of learning objects (see Figure 6.4). There are three levels of adaptation of a learning object in different cultural contexts, which are translation and

localization, adaptation, and integration. The first two levels occur in the inside of a learning object to modify it to meet the particular culture-related needs. The third level occurs between learning objects, and a learning object and other learning materials or a learning management system, which all together compose a lesson or a course.

This study has achieved the research objectives proposed in Chapter 1 and contributes a cultural reference model for design and evaluation of learning objects. The effectiveness of the cultural reference model is discussed in next section.

8.2 Discussion

This section discusses some real phenomena which exist in the design and development of learning objects that may cause cross-cultural issues to be neglected or overlooked, and how the cultural reference model can improve the design by providing supports against these problems.

8.2.1 Designers' Cross-Cultural Awareness

The cultural sensitivity issues are important in instructional design, regardless of whether teaching in a classroom, online, or through other blended approaches. The overall aim of culturally sensitive instructional design is to "facilitate the ability of all students to meet high standards, using approaches best suited to the meeting of students' individual needs" (Protheroe and Turner, 2003, p2). Therefore, being aware of cultural variety and diversity that often have an impact on the effectiveness of learning is the prerequisite of developing culturally reusable learning objects. Effective design is possible only if a developer has a reflexive awareness of the cultural meaning underlying the design factors.

However, having this kind of knowledge is a huge challenge in reality faced by designers of learning objects because the designers are normally either multi-

media developers or academic tutors, and not culture experts. The evaluation data from the interview provides practical evidence that the participants were all reporting a limited knowledge of cross-cultural issues, and most of them were unlikely to consider cultural issues during their design processes.

Prior researches in influence of culture on the design of e-learning materials have suggested some principles for designers to construct and implement culturally sensitive online material (e.g., McLoughlin & Oliver, 2000; Collis, 1999, Bentley, et al., 2005). Other suggestions emphasized the addressing of the target audiences of learning materials being designed (e.g., Wang & Reeves, 2006; Henderson, 1994). However they are insufficient for the design of reusable learning objects that are expected to be reused by learners from different cultures. The uncertainty in target learners and their cultures of a learning object leads to complexity in the design to accommodate the different needs of learners; and the designers consciously or unconsciously see their students as the only target group of learners so as to develop the learning objects relying on their understanding of the culture of those students.

This study suggests that to be aware of cultural diversity is prerequisite to design and development of learning objects that are culturally reusable and adaptable. It is necessary to have a guideline about the influences of culture on the design of learning objects for designers to improve the design of learning objects culturally. The range of culturally sensitive factors defined in the cultural reference model will provide designers with a referential basis to examine the cultural adaptability of the learning objects being developed. According to the cultural reference model, designers will be able to review the design factors to determine whether they are culturally sensitive and to improve their design by following the recommendations, without having special knowledge of cross-culture.

8.2.2 Impact of Designers' Roles

Design of a learning object is a co-operative process in which academic tutors are responsible for the analysis of learning needs and instructional design and multi-media developers design and implement the software. Hence, the cross-cultural issues they might meet in the design and development of learning objects may be in different areas or aspects. This co-operative design process does not mean that the academic tutors and multi-media developers work in a completely separate way, but they do pay more attention to their own aspects of the learning objects being developed even when considering cultural issues. Therefore, they need cross-cultural references on the different aspects to enable them to review their design in the relevant stages. The evaluation data in this study shows that there are some differences between academic tutors and multimedia developers in terms of their feedback to the four dimensions of culturally sensitive factors and attitudes towards dealing with cultural issues in learning objects (e.g., Figure 7.1 and Figure 7.2). These provide practical evidence to support the argument.

To organise the culturally sensitive factors into the four dimensions, knowledge, access, pedagogy, and technology dimensions, enables the cultural reference model to meet the needs of both academic tutors and multi-media developers and map the culturally sensitive factors to the process of the design and development of learning objects, because each dimension focuses on one aspect of the design of learning objects. Academic tutors and multi-media developers will be able to examine cross-cultural elements of their parts of the work by referring to the culturally sensitive factors and the recommendations in associated dimensions and do not have to wait for the final evaluation after completely finishing the development.

Cross-cultural teaching design requires designers to be aware of cultural differences first before considering teaching methods, according to Biggs's

(2003) cross cultural teaching ladder (see Figure 6.3). Cultural issues have to be taken into account throughout the process of designing reusable learning objects. Because of the differences of responsibility between academic tutors and multi-media developers in the design of learning objects, they have different concerns and may require specific support to deal with the cultural issues. The knowledge dimension and pedagogy dimension are aimed at cultural issues related to instructional design that are in the charge of academic tutors. The access dimension and technology dimension are aimed at cultural issues related to the design of accessibility and implementation of a learning object that are in the charge of multi-media developers. Therefore, the cultural reference model supports both tutors and developers in their design processes.

The design of learning objects is an iterative process. Considering cultural issues is also a continuous process throughout the whole design process. Therefore, the cultural reference model enables tutors and developers to examine the culturally sensitive factors overlapping the four dimensions and throughout the whole process from the beginning of the design to the evaluation of the product.

8.2.3 Limitation of Users' and Peers' Review

A popular approach to evaluating a learning object is to put it in use by students who can examine the usability and pedagogical effectiveness of the learning object. It also could provide feedback related to cross-cultural issues if the students had different cultural backgrounds. In a similar way peer review is another common approach to evaluation of learning objects. The participants who took part in the evaluation of the cultural reference model in this study mentioned that they have used the same approaches to evaluate the learning objects they developed.

However, there are limitations in using these kind of approaches to examine potential cultural problems depending on students' and peers' cultural realization.

On the one hand, students' feedback and peers' reviews are limited by their own cultural background and their experiences in teaching and learning in a cross-cultural environment. They cannot find all potential cultural problems. On the other hand, international students would prefer those more congruent with their cultural expectations rather than those similar to their home culture. According to Bentley, et al. (2005), there is an important distinction between students who use e-learning resources in their home country and those who physically travel to another country to take classes. International students expect instruction delivered abroad to be different from what they would receive studying in their own country. They are likely to be actively seeking new kinds of learning experiences. Therefore, significant differences could be expected to exist in the feedback of viewing a learning object between students studying abroad and those who are in their home country.

Considering international students' cultural expectations, some potential cultural problems may not be found through their review, especially if designers have no idea what factors might be culturally sensitive. This may be the reason that why even though the learning objects chosen as examples in this study had been evaluated through the approach of users' review, some potential cultural problems were still identified by the participants using the cultural reference model in the interview (see Chapter 6.3.4). Therefore, a cross-cultural insight is necessary for designers to evaluate learning objects in terms of cultural adaptability, so that all culturally sensitive factors can be examined. The cultural reference model provides such insight for the evaluation of learning objects.

8.3 Limitation of the study

Limitation of this study is that the cultural reference model did not cover all factors that may have impacts on reusability and adaptability of learning objects, even though it has related to a wide range of aspects of cross-cultural issues. Some culturally sensitive factors may be excluded. In addition, there is limitation in the recommendations developed in the cultural reference model. Some

recommendations may be too simple, or ambiguous, especially for the culturally sensitive factors in the pedagogy dimension.

The cultural reference model dealt with issues that are tentative and subtle. Firstly, cross-cultural issues are complex and often subtle. There is a lack of direction of theory to cross-cultural research in e-learning, because "the limited theoretical underpinnings used in online education research largely ignore culture as a significant factor" (Wang & Reeves, 2006, p.6). Secondly, the influences of culture on learning object design relate to many aspects, such as learning style, attitude towards online learning, learning activities, learning contents, and learning technology. Each individual learning object may only involve some of the culturally sensitive factors and also may differ with other. This complexity and uncertainty brought to this study a big challenge to build the cultural reference model. Thirdly, the concept learning objects has been studied and practised for less then10 years. Many researches, such as study of design theory and developing approach, need to be down. The tentativeness of knowledge raises the difficulty of this study.

Nevertheless, the aims of this study have been achieved. The cultural reference model provides a novel approach to explicitly represent the complex and subtle cross-cultural issues and their influences on learning object design, and provides recommendations to enhance the cultural adaptability and reusability of learning objects, despite the limitation remain.

8.4 Further work

Research on culturally reusable learning objects remains to be done both in depth and in breadth. In the particular topic of facilitating the design and development of learning objects that are culturally sound, further research work that can be carried out as an extension of this study is envisaged in the following directions:

- From model to tool

In order to effectively apply the cultural reference model in the practice of the design and development of learning objects, it is necessary to transform the reference model into a developing tool to enhance the effectivity and efficiency of the design process. The Teaching and Learning Research Institute (LTRI) has developed the first version of an authoring tool, Generative Learning Object Maker (GLO Maker), for facilitating the development and adaptation of learning objects (http://glomaker.co.uk). The main functions of the tool are (1) to create new objects based on pedagogical patterns and (2) easily and quickly adapt existing learning objects. The tool explicitly expresses pedagogical options and operations to enable designers or teachers to think in terms of executable pedagogical design. There is a possibility to combine the cultural reference model and the development tool by mapping the culturally sensitive factors and their recommendations onto the pedagogical choice points in the tool. It will improve the design process and enhance reusability and adaptability of learning objects culturally if the combination succeeds.

- Extension of the culturally sensitive factors and amelioration of the recommendations

More empirical studies are needed in different cultural environments to investigate influences of culture on the design and reuse of learning objects. These studies will contribute to a more comprehensive and deeper understanding of cultural diversity, so that the range of culturally sensitive factors could be extended, and appropriate improvement on the recommendations could be made.

- Metadata and portfolio for social-cultural needs and preferences

It is always a big challenge of learning object design to meet learners' divers needs. The IMS (2004) "AccessForAll" specification proposes an adaptability model for e-learning resources and services, which attempts to

match resources and services to users' needs and preferences. Considering cultural adaptability, questions are about whether learners' culture-related needs and preferences can be defined in a specification. Can the cultural characteristics of a learning object be described in its metadata? This study argues that culturally reusable and adaptable learning objects can be achieved by designing for the culturally sensitive factors. These factors refer to users' culture-related needs and preferences. By assigning values of a particular culture, the culturally sensitive factors will compose a user's cultural profile. The culturally sensitive factors identified in the cultural reference model could be a start point for searching answers to the questions.

- Cultural impacts on adopting and adapting learning objects in a target learning context

A large amount of learning context will be involved when using learning objects to build an e-learning course. Concerns about cultural adaptability will be growing along with the complexity of context of the course. More cross-national researches are required to understand and compare the effects of learning objects across different cultures. Future studies are also needed to develop directive models and guidelines for adapting learning objects to a particular cultural environment easily and properly.

As learning objects continue to evolve and new uses/reuses are found for them in worldwide online education and training, cross-cultural issues need to be addressed seriously in the domain of both design and use/reuse of learning objects. This opens up more research questions for culturally effective design and reuse of learning objects.

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Appendix A

Culturally Sensitive Factors and Recommendations

Knowledge Dimension

Factors	Descriptions	Recommendations
Learning Content	The topic to be taught in the learning object Culturally sensitive issues included in the learning object, e.g., race, class, religion, gender, etc.	Try to avert the culturally sensitive content; If it is necessary, be careful with the expression of the content and add extra explanation of context or condition for why it is used.
Prior Knowledge	The knowledge related to the topic that learners should have beforehand in learning through the learning object Special knowledge involved in the learning object that may be not familiar to learners in other cultures	Try to avoid the culturally special prior knowledge; Add extra explanation of the knowledge if it is necessary.

Pedagogy Dimension

Factors	Descriptions	Recommendations
Orientation	To introduce learners into the learning process in a proper way, e.g., quick introduction or extended introduction Groups of potential learners differ in motivation of attending the learning and may need different type of introductions to attract or engage them in the learning.	Provide options of a quick introduction and an extended introduction to meet needs of different learners.
Elaboration	To interpret or explain a concept with proper language, e.g., academic language or plain language, and examples Language involves differences in acceptable tone and style of communication; Examples may contain particular social cultural contexts.	Avoid using either extreme enigmatic academic language nor too informal language; Choose commonly acceptable examples to elaborate concepts.
Learner control	To guide learners to accomplish a learning task in a proper way, e.g., to outline the path and ways or only direct orientation and aims Cultural differences in perception of appropriate allocation of responsibilities between learners and teachers.	Provide multiple ways that enable learners to control their own learning paces (e.g., ordinal, jump forward and back, etc.).
Feedback	To respond to learners' actions in a proper way which may be a extrinsic answer, analytic algorithm, or opening a further task Groups of potential learners prefer or expect different feedback which may affect their performance of learning emotionally.	Some extra explanation or direction may be needed to support different learning styles (i.e., lack experienced learners need additional instruction especially at a position where two or more directions are available).
Motivation and Stimulation	To elicit learners' performance of learning by employing different ways, e.g., encouraging, praising, or urging Cultures differ on meaning of success in academic and manner of stimulation.	Build positive or inspiring atmosphere that is effective for most cultures.
Practical task	To require learners to apply the new knowledge by generating questions on the topic that may be closed or open-ended Learners' experiences differ in terms of performance of practical tasks.	Provide optional additional directions to open-end tasks to support learners with less experience or feeling challenge; Provide optional open-mind tasks that allow learners to submit their own opinions.
Collaborative task	To require learners working together to achieve a learning goal which may relate to collaborative manner, group size, division of labour and teaching support	Provide additional information to help learners in a group to divide labours, organise cooperation, handle conflict, and make decision.

	Egalitarianism, non-critical acceptance of ideas, or presentations of thoughts are different in the Western and the Eastern culture.	
Communica-tion manner	To create channels for learners to communicate with each other which may need to be synchronous or asynchronous, and anonymous or signed There are cultural differences in preferences for the manners of communication.	Provide multiple communicational channels to meet learners' preference of communication (e.g., synchronous or asynchronous, and anonymous or signed).
Engagement	To engage learners in a productive or creative task which may need to provide extra explanation or support Learners have different experiences for the learning task that are creative, contributed, or productive.	For productive or creative tasks, more instruction may be needed to provide additional support to learners with less experience of this kind of tasks.
Value of error	To consider the difficulty of practical tasks and to refrain from depression or frustration and promote learning progresses Cultural differences on the value of errors in learning.	Provide positive or encouraging feedback to any error or mistakes learners made, especially to the sort of tasks of "learn from mistakes" to encourage learners who are more sensitive to making mistakes to complete it.

Access Dimension

Factors	Descriptions	Recommendations
Language/ Text	Text that represents the learning content (includes language in video and audio files) Special jargon, slang, adage, etc.	Use plain language and avoid to use jargon or slang, in some culture academic language is preferred.
Image	Images or pictures that visually describe the learning content (include images in animation and video files) Difficult or impossible to understand or comprehend in other cultures Containing potentially controversial elements,	Use comprehensible and acceptable images, Avoid or eliminate images containing potentially controversial elements, Add necessary explanation in images to reduce confusion.
Symbol	A symbol that cannot be misinterpreted by target users Causing potential misinterpretation	Use the metric system to describe data as possible, or supply explicit measure unit (e.g., date: 01-Jan-2000).
Number, Date, Time	Number, date, time format Using a comma or period to separate the whole part of a number from the decimal part (6.5 or 6,5); day-month-year or month-day-year or year-month-day; 12 hour clock (9pm) or 24 hour clock (21:00)	Avoid or eliminate symbols that may cause potential misinterpretation.
Colours	Colours used in the interface Special meaning of colours for particular cultures	Do not use only colours to convey information to learners (e.g., red means error or green means right), Use colours with relevant text messages.
Navigation	Navigation patterns that direct learning through the LO on the structural level Selection of navigation tools: including Section buttons, Previous/Next buttons, Back/Forward buttons, Map, Index, Menu, and hypertext links	Provide different navigation tools (e.g., index, site map, etc.) to prevent learners from becoming lost.
Holistic Structure	HCI design with holistic consideration of how to organise components of an interface Organisation of components of an interface, e.g., functional or thematic structure	Simplicity, with clear metaphors, limited choices, and restricted amounts of data.

Technology Dimension

Factors	Descriptions	Recommendations
Infrastructure	Software and hardware equipments needed for running the learning object Special software or hardware that are out of main stream and not used commonly	Adopt mainstream and fully developed technology to minimize technical barriers to reuse of the learning objects.
Experiences or Skills	Technological knowledge and skills that are prerequisite to use the learning object Special knowledge or skills that learners may not have it generally	Avoid complex operation techniques and add online help (e.g., pop-up windows) if necessary to guide learners who have less experience or skills.

Appendix B

Questionnaire for Expert Review in the Evaluation

Questionnaire

Please indicate your working position by clicking the appropriate:

- ☐ Learning object developer
- ☐ Academic lecturer

This questionnaire is composed two sections:

1. Culturally sensitive factors and
2. Recommendations for dealing with the culturally sensitive factors.

Each section includes 21 selections.

Section 1:

The following table lists the possible culturally sensitive factors that may be involved in learning object design. In your experience of the design and/or use of learning objects, do you think they are culturally sensitive or not?

Please read the descriptions of each factor and rank the answers in all the following factors using the scaling system. The scale indicates the degree of cultural sensitivity of a factor (i.e., if a factor was culturally inappropriate how much damage it would cause to learning through the learning objects) and includes marks in 0 to 5. Click the drop-down boxes to select your answers.

"5" – most strongly sensitive,

"4" – strongly sensitive

"3" – sensitive

"2" – less sensitive

"1" – least sensitive

"0" – not sensitive

Factors	Description and Cultural Sensitivity	Score
Culturally sensitive factors related to knowledge domain		
Learning Content	The topic to be taught in the learning object Culturally sensitive issues included in the learning object, e.g., race, class, religion, gender, etc.	
Prior Knowledge	The knowledge related to the topic that learners should have beforehand in learning through the learning object Special knowledge involved in the learning object that may be not familiar to learners in other cultures	
Culturally sensitive factors related to accessibility of learning objects		
Language/ Text	Text that represents the learning content (includes language in video and audio files) Special jargon, slang, adage, etc.	
Image	Images or pictures that visually describe the learning content (include images in animation and video files) Difficult or impossible to understand or comprehend in other cultures Containing potentially controversial elements,	
Symbol	A symbol that cannot be misinterpreted by target users Causing potential misinterpretation	
Number, Date, Time	Number, date, time format Using a comma or period to separate the whole part of a number from the decimal part (6.5 or 6,5); day-month-year or month-day-year or year-month-day; 12 hour clock (9pm) or 24 hour clock (21:00)	
Colours	Colours used in the interface Special meaning of colours for particular cultures	
Navigation	Navigation patterns that direct learning through the LO on the structural level Selection of navigation tools: including Section buttons, Previous/Next buttons, Back/Forward buttons, Map, Index, Menu, and hypertext links	
Holistic Structure	HCI design with holistic consideration of how to organise components of an interface Organisation of components of an interface, e.g., functional or thematic structure	
Culturally sensitive factors related to technology		
Infrastructure	Software and hardware equipments needed for running the learning object Special software or hardware that are out of main stream and not used commonly	
Experiences or Skills	Technologic knowledge and skills that are prerequisite to use the learning object Special knowledge or skills that learners may not have it generally	

Factors	Description and Cultural Sensitivity	Score
Culturally sensitive factors related to pedagogical design		
Orientation	To introduce learners into the learning process in a proper way, e.g., quick introduction or extended introduction Groups of potential learners differ in motivation of attending the learning and may need different type of introductions to attract or engage them in the learning.	
Elaboration	To interpret or explain a concept with proper language, e.g., academic language or plain language, and examples Language involves differences in acceptable tone and style of communication; Examples may contain particular social cultural contexts.	
Learner control	To guide learners to accomplish a learning task in a proper way, e.g., to outline the path and ways or only direct orientation and aims Cultural differences in perception of appropriate allocation of responsibilities between learners and teachers.	
Feedback	To respond to learners' actions in a proper way which may be a extrinsic answer, analytic algorithm, or opening a further task Groups of potential learners prefer or expect different feedback which may affect their performance of learning emotionally.	
Motivation and Stimulation	To elicit learners' performance of learning by employing different ways, e.g., encouraging, praising, or urging Cultures differ on meaning of success in academic and manners of stimulation.	
Practical task	To require learners to apply the new knowledge by generating questions on the topic that may be closed or open-ended Learners' experiences differ in terms of performance of practical tasks.	
Collaborative task	To require learners working together to achieve a learning goal which may relate to collaborative manner, group size, division of labour and teaching support Egalitarianism, non-critical acceptance of ideas, or presentations of thoughts are different in the Western and the Eastern culture.	
Communication manner	To create channels for learners to communicate with each other which may need to be synchronous or asynchronous, and anonymous or signed There are cultural differences in preferences for the manners of communication.	
Engagement	To engage learners in a productive or creative task which may need to provide extra explanation or support Learners have different experiences for the learning task that are creative, contributed, or productive.	
Value of error	To consider the difficulty of practical tasks and to refrain from depression or frustration and promote learning progresses Cultural differences on the value of errors in learning.	

Other culturally sensitive factors: [Enter Your Comments Here]

Section 2:

The following table presents the recommendations to each of the possible culturally sensitive factors displayed in section 1. The recommendations are proposed to solve the potential cross-cultural problems caused by the culturally sensitive factors during the process of the design and development of learning objects. In your experience of the design and/or use of learning objects, what do you think about the usability of these solutions?

Please read the recommendations of each factor and rank the answers in all the factors using the following scaling system. The scale includes marks in 0 to 5. Click the drop-down boxes to select your answers.

"5" – most strongly usable and adoptable,

"4" – strongly usable and adoptable

"3" – usable and adoptable

"2" – less usable and adoptable

"1" – least usable and adoptable

"0" – not usable and adoptable

Factors	Recommendations	Score
Culturally sensitive factors in the knowledge dimension		
Learning Content	Try to avert the culturally sensitive content; If it is necessary, be careful with the expression of the content and add extra explanation of context or condition for why it is used.	
Prior Knowledge	Try to avoid the culturally special prior knowledge; Add extra explanation of the knowledge if it is necessary.	
Culturally sensitive factors in the access dimension		
Language	Use plain language and avoid to use jargon or slang, in some culture academic language is preferred.	
Image	Use comprehensible and acceptable images, Avoid or eliminate images containing potentially controversial elements, Add necessary explanation in images to reduce confusion.	
Number, Date, Time	Use the metric system to describe data as possible, or supply explicit measure unit (e.g., date: 01-Jan-2000).	
Symbol	Avoid or eliminate symbols that may cause potential misinterpretation.	
Colours	Do not use only colours to convey information to learners (e.g., red means error or green means right), Use colours with relevant text messages.	
Navigation	Provide different navigation tools (e.g., index, site map, etc.) to prevent learners from becoming lost.	
Holistic Structure	Simplicity, with clear metaphors, limited choices, and restricted amounts of data.	
Culturally sensitive factors in the technology dimension		
Infrastructure	Adopt mainstream and fully developed technology to minimize technical barriers to reuse of the learning objects.	
Experiences or Skills	Avoid complex operation techniques and add online help (e.g., pop-up windows) if necessary to guide learners who have less experience or skills.	

Continue…

Factors	Recommendations	Score
Culturally sensitive factors in the pedagogy dimension		
Orientation	Provide options of a quick introduction and an extended introduction to meet needs of different learners.	
Elaboration	Avoid using either extreme enigmatic academic language nor too informal language; Choose commonly acceptable examples to elaborate concepts.	
Learner control	Provide multiple ways that enable learners to control their own learning paces (e.g., ordinal, jump forward and back, etc.).	
Feedback	Some extra explanation or direction may be needed to support different learning styles (i.e., lack experienced learners need additional instruction especially at a position where two or more directions are available).	
Motivation and Stimulation	Build positive or inspiring atmosphere that is effective for most cultures.	
Practical task	Provide optional additional directions to open-end tasks to support learners with less experience or feeling challenge; Provide optional open-mind tasks that allow learners to submit their own opinions.	
Collaborative task	Provide additional information to help learners in a group to divide labours, organise cooperation, handle conflict, and make decision.	
Communication manner	Provide multiple communicational channels to meet learners' preference of communication (e.g., synchronous or asynchronous, and anonymous or signed).	
Engagement	For productive or creative tasks, more instruction may be needed to provide additional support to learners with less experience of this kind of tasks.	
Value of error	Provide positive or encouraging feedback to any error or mistakes learners made, especially to the sort of tasks of "learn from mistakes" to encourage learners who are more sensitive to making mistakes to complete it.	

Any suggestions: [Enter Your Comments Here]

Appendix C

Data Collection from the Questionnaire for Expert Review in the Evaluation

Section 1: Scores of Culturally Sensitive Factors

	L1	L2	L3	L4	L5	L6	L7	L8	L9	D1	D2	D3	D4	D5	D6
Learning Content	5	3	3	5	3	5	4	1	5	3	4	5	3	3	3
Prior Knowledge	3	3	3	4	4	4	3	2	3	3	4	4	4	3	3
Language/Text	5	4	4	5	4	5	3	4	2	4	5	3	3	2	4
Image	4	4	5	5	2	5	3	3	3	4	3	5	3	3	1
Symbol	3	4	2	4	3	4	3	5	4	4	5	5	4	3	3
Number, Date,Time	4	2	1	4	1	3	2	1	3	1	4	2	3	0	2
Colours	4	2	3	3	2	5	1	4	3	2	2	0	3	1	0
Navigation	4	2	2	2	1	4	2	3	2	2	2	1	3	3	0
Holistic Structure	4	3	4	2	1	4	2	4	2	3	2	1	4	2	0
Infrastructure	3	3	0	3	0	4	5	4	2	4	3	2	3	2	0
Experiences or Skills	5	3	2	3	1	5	5	3	3	4	3	4	4	2	3
Orientation	2	4	3	3	1	5	4	3	4	2	3	3	4	3	3
Elaboration	3	4	4	4	4	5	3	2	3	2	4	3	3	3	3
Learner control	4	4	3	3	2	5	4	3.5	3	4	3	3	4	3	1
Feedback	4	5	4	3	3	5	2	5	4	4	3	4	3	5	3
Motivation and Stimulation	4	5	3	4	3	5	3	4	3	3	2	3	4	2	4
Practical task	3	4	4	3	3	3	4	2	2	4	3	4	3	2	0
Collaborative task	4	4	4	3	4	5	3	5	3	2	3	4	3	2	3
Communication manner	4	5	3	3	3	4	2	5	3	3	3	3	3	3	2
Engagement	4	3	4	3	3	4	2	5	3	4	2	2	2	2	2
Value of error	4	4	5	3	3	5	3	4	2	2	2	3	2	2	0

Section 2: Scores of Recommendations

	L1	L2	L3	L4	L5	L6	L7	L8	L9	D1	D2	D3	D4	D5	D6
Learning Content	2	4	5	5	4	5	5	4	4	3	5	3	5	2	3
Prior Knowledge	5	4	4	4	2	4	4	2	4	4	5	2	5	4	3
Language/Text	4	5	4	5	4	5	3	5	4	5	5	4	5	5	4
Image	2	5	5	5	4	5	4	3	4	4	4	4	5	2	4
Number, Date,Time	5	5	1	3	4	3	4	1	3	1	4	5	5	3	4
Symbol	2	3	1	3	4	5	4	4	4	5	5	4	5	3	4
Colours	5	2	3	3	4	4	5	5	4	5	4	4	5	5	0
Navigation	5	4	3	2	3	5	3	4	5	5	3	4	3	5	3
Holistic Structure	0	3	3	2	2	4	5	4	5	5	4	5	5	5	4
Infrastructure	1	3	3	2	2	4	3	5	4	5	3	5	5	5	4
Experiences or Skills	1	3	3	3	2	4	3	4	5	5	3	4	4	5	4
Orientation	5	5	3	4	3	4	2	4	4	4	3	4	5	5	4
Elaboration	4	4	3	5	4	5	3	5	5	3	4	5	5	5	5
Learner control	5	4	3	3	2	5	3	3	5	5	4	4	5	5	4
Feedback	5	5	4	3	1	5	3	3	4	5	4	4	5	5	3
Motivation and Stimulation	3	5	3	4	1	5	5	2	5	5	4	5	5	5	3
Practical task	3	5	3	3	4	5	3	4	4	5	5	3	3	5	3
Collaborative task	3	4	4	4	3	4	4	5	4	4	4	5	5	3	0
Communication manner	1	4	3	3	4	5	4	5	5	5	4	5	5	3	0
Engagement	1	5	3	3	4	5	5	5	4	4	5	5	3	5	3
Value of error	5	5	4	5	2	5	4	4	5	4	4	5	5	5	2

Appendix D

Interview Questions in the Evaluation

Interview Questions for Developers

Question 1:
Do you usually consider cross-cultural issues or cultural diversity of learners during your design process?
If Yes: What are the reasons that draw your attention to the cross-cultural issues?
If No: Why not? Is it because it is difficult to identify culturally sensitive factors or because you don't know about other cultures? Or is there any other reason?

Question 2:
How do you recognise which factors or design elements that are culturally sensitive in learning objects?
Do you find it easy or difficult to identify these factors or elements? Why?

Question 3:
In your experience of designing learning objects, what are the difficulties you have encountered when dealing with cross-cultural issues or cultural diversity of learners?

Question 4:
What aspects do you think could be the most important issues for the design and development of learning objects that are culturally sensitive?

Interview Questions for Lecturers

Question 1:
Do you usually consider cross-cultural issues or cultural diversity of learners when you involve in learning object design and/or use learning objects in your teaching practice?
If Yes: What are the reasons that draw your attention to the cross-cultural issues?
If No: Why not? Is it because it is difficult to identify culturally sensitive factors or because you don't know about other cultures? Or is there any other reason?

Question 2:
How do you recognise which factors or design elements that are culturally sensitive in learning objects?
Do you find it easy or difficult to identify these factors or elements? Why?

Question 3:
In your experience of designing/using learning objects, what are the difficulties you have encountered when dealing with cross-cultural issues or cultural diversity of learners?

Question 4:
What aspects do you think could be the most important issues for the design and development of learning objects that are culturally sound?

Appendix E

Questionnaire Used in BUU in the Cast Study

Questionnaire

This questionnaire aims to find out something about your views on the online learning materials.
Your responses will be used to help assess how the use of online learning materials has developed in higher education.
This questionnaire is anonymous and does not have any impact on the result of the module you are taking

Choose the most appropriate response and tick each item, or write your answer.
Gender: male ☐ female ☐
Age: 18-19 ☐ 20-21 ☐ 22-23 ☐ 24+ ☐

1. Are the online learning materials helpful for you to understand the topic better?
   a) Very helpful
   b) Helpful
   c) Not very helpful

2. Which part of the online learning materials do you feel is most helpful for you?
   a) Description of concept
   b) Animated explanation
   c) Question test

3. Do you think that you can follow the instruction of the online learning materials to study independently?
   a) yes
   b) basically
   c) no

4. The examples that are used in online learning materials are?
   a) very interesting
   b) ordinary
   c) too simple

5. These online learning materials
   a) attract me very much
   b) can guide me to finish it
   c) are just like an electronic text book

6. The degree of the question tests are
   a) too hard
   b) normal
   c) too simple

7. What kind of example do you like which is used in the online learning materials?
   a) familiar or daily
   b) academic or scientific
   c) applicative

8. The online learning materials should have a direction that can tell me what I need to do next on the end of each section.
   a) necessary
   b) indifferent
   c) unnecessary

9. What kind of language do you prefer to be used to explain complex concepts in the online learning materials?
   a) plain language
   b) academic language
   c) between plain and academic language

10. Which answer is your expectation when you seek a solution for a question?
    a) an accurate answer of the problem
    b) an approach to solve the problem
    c) several possible ways to achieve the aim.

11. What is the most important element of the interface of online learning materials in your opinion?
    a) strike the eye
    b) a lot of details
    c) stress the main point
    d) others

12. What do you think about the interface of the online learning materials?
    a) very good
    b) can accepted
    c) not very good

13. What is your prefer background of surface for the online learning materials?
    a) single color background
    b) bright and colorful background
    c) background with pattern or pictures
    d) others

14. Concerned the contents in the online learning materials, what may be the main reason that causes you to lose interest when using them?
    a) lack of appropriate examples
    b) too many questions have to answer
    c) a lot of content in one section
    d) others

15. What expression of the contents in the online learning materials do you feel easy for understanding?
    a) diagram, picture
    b) written text
    c) animated explanation

16. What do you wish to acquire from the online learning materials?
    a) as many as possible topics
    b) better understanding for important concepts
    c) help for doing coursework
    d) others _____

17. How long time do you spend on Internet per week generally?
    a) _____ hours, and _____ hours of them for learning.

18. What might be the problem do you think when you learn online alone?
    a) lack of instruction from lecturers
    b) lack of interaction with peers
    c) lack of enough skills of computer
    d) others _____

19. Please arrange in significant order for the three parts of online learning materials.
    (1) clear explanation of concepts
    (2) rich examples
    (3) interacted exercises
    a) order _____

20. What is the most useful for your study?
    a) lecture
    b) textbook
    c) experiments in lab
    d) others _____

Appendix F

Data Collection from the Questionnaire in the Case Study

SEX	AGE	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9
2	3	a	c	b	b	b	a	a	a	a
2	2	a	a	a	a	b	b	a	a	a
1	2	b	b	a	a	a	b	c	a	b
1	2	b	a	b	b	b	b	a	a	a
1	2	b	b	a	b	b	b	a	a	a
1	2	c	a	c	b	a	b	b	b	c
1	2	a	b	a	a	a	b	a	a	a
1	2	a	b	c	a	c	b	c	a	a
1	3	a	c	b	a	b	b	c	a	a
1	2	b	c	a	a	a	b	c	a	c
1	2	b	c	b	a	b	b	a	a	a
2	2	b	b	a	b	b	a	a	c	c
1	3	a	a	c	b	c	b	a	a	a
1	3	b	b	a	b	c	b	c	a	a
1	2	a	b	c	b	b	b	a	a	b
1	2	b	b	c	b	c	a	a	a	c
1	1	b	b	b	b	b	b	a	a	a
1	2	b	c	b	a	b	b	c	a	c
1	2	b	c	b	b	b	b	c	a	c
2	1	c	c	b	c	c	b	a	a	a
2	2	b	b	b	b	b	b	a	a	a
1	2	b	b	a	b	b	b	c	a	a
2	2	b	b	b	b	b	b	c	a	c
2	2	a	a	c	b	c	b	b	a	c
1	2	b	b	b	b	c	b	c	a	a
1	2	c	b	a	c	c	c	a	c	a
1	2	b	b	a	b	b	b	c	a	a
2	2	b	a	b	b	b	b	c	a	b
1	2	a	b	b	b	c	b	b	a	c
1	1	a	b	b	b	b	b	a	a	a
1	2	a	c	b	b	b	a	c	a	a
1	1	c	b	c	b	b	a	c	a	c
2	2	b	c	b	b	b	b	c	a	c
1	1	a	b	b	b	b	c	c	c	a
1	1	a	b	b	b	b	c	c	c	b
1	2	b	a	b	a	b	b	b	a	c
1	1	b	a	c	b	c	b	a	a	a
1	1	a	a	b	b	c	b	a	a	a
1	1	a	b	b	b	b	b	c	a	a
1	2	b	c	a	b	b	b	a	a	a
1	2	a	b	b	b	b	b	b	a	a
1	1	a	b	b	c	c	b	c	a	a
1	2	a	b	b	b	c	a	a	a	a

1	2	b	b	a	b	b	b	c	a	c
1	2	b	b	b	a	a	b	c	a	c
1	3	a	a	a	b	b	b	b	a	b
2	3	b	c	a	b	b	b	a	b	c
2	3	b	b	c	b	b	b	c	a	a
1	2	b	a	a	b	b	b	a	a	a
2	2	a	a	b	b	c	c	c	b	c
2	2	b	c	a	b	b	b	c	a	a
2	2	c	b	b	b	b	b	c	a	a
1	2	a	b	a	b	c	b	c	b	a
1	3	b	b	a	b	a	a	b	a	a
2	2	b	b	a	b	b	b	a	a	a
2	2	a	c	a	b	b	b	b	b	a
1	2	c	b	c	b	c	a	a	b	c
1	1	b	b	c	b	b	b	a	a	c
1	2	b	b	b	b	b	b	a	b	b
2	2	a	c	c	b	b	b	b	b	b
1	2	b	b	b	b	b	b	c	a	a
2	2	b	b	b	b	b	a	c	a	c
2	2	b	b	b	b	b	a	a	a	c
2	2	b	b	c	b	b	b	a	a	c
2	2	b	b	b	a	b	b	a	a	a
2	2	a	c	b	b	b	b	a	a	a
1	2	a	b	b	b	c	b	a	a	c
1	2	b	b	b	b	b	a	a	a	a
1	2	c	c	c	b	c	b	c	b	a
1	2	b	b	b	b	b	b	c	a	a
2	2	b	b	a	b	b	b	c	a	c
2	2	a	b	c	b	b	a	a	a	a
2	2	b	b	a	b	c	b	c	a	a
2	2	b	b	a	a	b	b	a	a	c
2	2	b	b	b	b	b	b	c	a	a
2	2	b	b	b	a	c	b	a	a	c
2	2	b	b	a	b	b	b	b	a	a
1	2	b	b	a	a	a	b	c	c	a
1	2	b	c	a	a	c	b	c	a	c
2	2	b	b	c	b	c	b	c	a	c
2	2	b	b	a	a	c	b	a	b	c
1	2	a	b	a	b	b	a	a	a	c
1	2	b	b	b	b	b	b	a	a	a
2	2	a	b	b	b	b	a	a	a	a
2	2	b	a	a	b	c	b	c	a	a
2	2	a	b	b	b	c	b	c	a	c
2	2	b	b	c	b	b	b	a	a	a
2	2	a	b	c	b	b	b	c	a	b
2	2	b	b	a	b	b	b	c	a	c
1	3	b	a	a	a	a	b	a	a	a
2	4	b	a	a	b	b	c	a	b	a
1	3	b	b	b	b	b	b	a	a	c
2	3	b	b	a	a	a	b	b	a	a

1	3	b	a	b	b	b	b	c	a	c
2	3	b	b	b	b	b	b	a	a	a
2	3	b	b	b	b	b	b	b	a	a
1	3	b	c	a	b	b	b	c	a	c
2	3	b	b	a	a	b	b	a	a	c
1	3	b	b	a	a	b	b	c	a	c
1	3	b	b	a	a	a	b	c	a	a
2	3	b	b	a	b	b	b	c	a	c
2	2	a	b	b	b	c	b	c	a	a
2	2	a	b	a	b	c	b	a	b	a
2	3	a	b	c	b	b	b	a	a	c
1	3	b	b	b	a	b	b	a	a	b
1	3	b	b	a	b	b	b	a	a	a
2	3	b	b	c	b	b	b	a	a	a
2	3	b	c	b	b	b	c	a	b	a
1	3	b	b	b	b	b	a	c	b	a
1	2	b	a	a	b	c	a	c	a	a
2	2	b	b	b	b	b	b	c	a	a
1	3	b	b	a	b	b	b	c	a	a
1	2	b	b	a	b	c	b	a	c	a
2	3	b	b	a	b	b	b	b	b	b
1	2	a	c	b	b	c	c	c	a	c
1	3	b	c	a	b	b	b	a	a	a
1	2	c	c	a	b	c	b	a	a	a
2	2	b	b	b	b	b	b	c	a	a
2	2	b	b	b	a	b	b	a	a	a
1	2	b	b	b	b	b	b	c	a	a
2	2	b	b	b	b	c	b	a	a	a
2	2	b	b	a	b	b	b	a	a	a
1	3	a	a	b	b	c	b	a	a	a
1	2	b	b	a	b	b	b	a	a	a
1	2	b	b	b	a	c	c	a	b	a
1	2	b	a	c	a	c	b	b	a	a
2	2	c	c	b	c	a	a	a	a	b
1	2	b	c	a	a	a	b	a	a	c
1	2	b	b	a	b	b	b	a	a	a
1	2	b	c	a	b	b	b	c	a	a
2	2	a	a	c	b	c	b	c	a	c
2	3	b	c	a	b	c	b	c	a	a
2	2	a	b	c	b	b	b	c	a	c
1	2	b	b	b	b	b	b	a	a	c
1	2	c	b	c	b	c	b	a	a	a
1	2	b	b	b	b	c	b	c	b	c
1	2	b	c	a	b	c	a	a	a	a
2	2	b	c	b	b	b	b	c	a	c
2	2	a	b	a	b	c	b	a	b	c

Q10	Q11	Q12	Q13	Q14	Q15	Q16	Q17	Q18	Q19	Q20
c	d	b	c	d	b	c	4/1	a	123	b
b	a	b	b	a	c	b	10/2	a	123	a
a	a	a	c	b	b	a	10/8	b	213	b
a	c	b	c	a	b	b	2/1	a	123	c
b	a	b	b	a	a	b	20/10	d	123	a
b	b	b	b	a	b	b	20/60	c	2	a
a	a	a	b	a	c	a	3/2	a	231	c
c	a	b	c	a	c	b	4/2	c	213	b
a	c	b	a	a	a	b	10/3	a	231	c
c	a	b	c	c	a	b	30/5	c	123	b
c	b	b	d	a	b	a	5/2	a	213	a
c	b	c	a	c	b	b	2/1	a	123	d
c	c	c	c	a	a	a	10/1	c	2	a
c	c	b	a	b	a	b	60/0	b	123	b
b	b	a	b	a	a	b	10/8	a	1	a
c	c	b	c	a	c	b	1/1	b	123	b
b	b	b	c	c	c	b	10/0	a	132	a
c	c	b	c	c	c	b	2/1	d	123	b
c	c	b	c	a	a	b	1/0	a	123	c
c	a	c	d	c	a	b	5/1	d	321	c
a	a	b	b	b	a	b	6/3	a	123	a
a	c	b	a	a	a	b	1/0.5	a	213	b
c	c	b	c	a	c	b	5/3	c	123	a
a	c	b	c	c	c	a	5/1	c	3	b
a	c	b	c	a	c	a	10/5	a	123	a
c	c	b	c	a	c	a		a	123	a
a	a	b	b	a	c	b		b		a
c	c	b	c	a	a	b	5/3	c	123	b
c	b	b	b	a	c	b	0/0	c	123	a
c	c	b	b	a	b	b	1/1	c	123	b
b	c	a	c	b	a	b		a	2	b
c	a	b	c	c	c	c	100	c	123	c
c	c	c	c	a	c	b		a	213	b
a	b	a	c	a	c	b	4/1	a	123	a
a	c	a	c	a	b	c	0/0	b	123	b
a	c	a	c	a	b	c	0/0	a	123	c
b	b	b	c	c	c	a	10/2	a	123	a
a	a	c	b	b	a	a	168/0	b	213	d
c	c	b	a	a	c	b	5/2	b	123	a
c	a	b	b	b	c	c	24/0	a	231	a
c	a	b	b	b	c	a	10/0	a	2	b
a	b	b	a	b	c	a		a	123	a
c	b	b	c	a	c	b	10/1	a	231	b
c	b	c	d	a	c	c	0/0	d	123	a
c	c	b	b	a	c	b	6/4	d	123	d
c	b	a	c	a	c	a	7/2	c	213	a
b	b	b	b	b	b	b	56/0	b	2	b

c	c	b	c	a	c	b	2/1	b	231	a
b	c	b	c	a	c	b	3/1	a	321	a
a	a	b	b	a	c	a	6/2	a	123	b
b	d	c	b	b	a	a	0/0	b	2	a
c	c	b	c	c	a	b		b	213	c
a	a	b	c	a	c	b	4/1	a	213	c
c	c	b	c	b	c	b	100/0	d	123	b
a	a	b	c	c	c	b	2/1	a	132	c
a	a	b	a	a	c	b	10/2	c	123	c
b	a	b	b	b	c	b	10/5	a	123	b
c	b	b	b	b	c	c	120/0	c	231	a
c	c	b	c	a	c	b	100/20	a	321	b
c	c	b	b	b	c	b	4/0	c	2	c
b	c	b	c	b	b	b	30/0	c	3	b
c	c	b	a	a	a	b	35/35	b	321	b
b	c	b	a	a	b	a	12	a	231	c
a	b	b	c	c	c	b	20/4	a	123	c
c	a	b	a	c	c	b	5/1	b	123	c
c	b	b	c	a	c	b	10/2	a	213	c
c	b	b	c	b	a	b	4/0.5	c	123	b
a	a	b	a	c	c	c	6/0	c	123	c
a	c	b	b	c	a	b	30/	b	123	b
c	a	c	a	c	c	b	5/0	a	213	a
c	a	b	b	a	c	b	1/0	b	213	b
c	c	b	c	a	a	a	10/1	a	123	c
c	a	b	b	a	c	b	1/0	b	213	b
c	c	b	c	a	a	a	10/1	a	123	c
c	c	b	b	a	a	b	2/0	a	123	a
c	d	b	d	a	c	b	5/1.5	b	123	a
c	b	b	c	a	a	a	1/1	d	123	c
b	c	b	d	a	c	b	8/2	a	213	a
c	c	b	a	c	a	b		a	123	b
a	c	b	b	a	a	b	8/2	a	123	a
b	b	b	b	b	c	c	30/5	a	231	a
c	b	b	c	b	a	b	10/0	c	213	a
b	a	b	a	a	a	b	7/1	c	123	a
c	b	b	b	c	c	b	10/1	a	123	a
b	c	b	c	a	c	c	2/0.5	c	213	b
b	b	b	c	b	c	b	1/1	c	123	c
b	c	b	b	a	c	b	5/5	a	123	c
a	c	b	c	a	c	a	1/1	b	213	b
c	a	c	c	c	c	b	6/2	a	231	b
a	c	b	b	c	c	b	5/0	c	231	b
b	c	b	c	a	a	b	4/0	a	231	c
c	b	b	c	a	a	b	10/2	a	213	a
a	b	b	b	c	a	a	25/0	a	213	a
c	a	b	b	c	b	b	5/0	a	2	b
c	c	b	c	a	c	b	4/1	c	213	b
c	b	b	b	c	c	b	10/4	a	321	c
b	c	a	a	a	c	a		d	123	b

c	b	a	b	a	c	b	4/2	a	123	a
b	c	b	d	b	b	b	10/5	b	132	a
c	b	b	c	c	a	b	20/10	a	2	b
c	b	c	c	a	c	b	0	c	213	c
c	c	b	a	a	a	a	5/3	b	123	b
b	a	b	c	a	c	c	5/1	b	1	c
b	c	b	c	a	c	b	10/5	b	123	c
b	c	b	c	c	a	a	8/2	a	231	a
b	a	c	b	a	c	a	5/1	b	2	a
a	c	b	b	b	c	a	4/0.5	b	321	c
c	a	a	b	b	a	a	20/2	a	123	b
c	c	b	a	a	a	a	10/2	a	123	b
b	c	b	c	c	c	b	4/2	a	213	a
b	c	b	a	b	b	a	4/2	a	123	b
b	c	b	c	b	c	b	5/2	a	123	a
c	d	b	d	b	c	b	42/8	a	123	b
a	a	b	c	c	c	b	5/1	b	213	c
a	a	b	a	a	c	b	70/10	a	3	c
a	d	c	c	b	a	b	100/2	c	123	b
b	b	b	b	b	b	b	2/0.5	b	2	b
c	d	b	a	d	a	b	30/10	d	123	a
a	b	b	a	a	a	b	3/2	a	231	d
a	c	b	c	b	c	b	28/10	d	123	c
a	b	b	a	a	c	b	12/2	b	123	a
a	a	a	b	d	c	b	50/8	a	231	c
c	b	b	c	a	c	a		c	2	a
c	a	b	b	c	c	b	25/5	a	132	a
c	c	b	c	c	c	b	3/1.5	b	123	c
c	c	b	c	a	c	b	16/3	c	123	a
c	a	c	c	b	c	b	2/1	c	123	b
c	b	b	b	c	c	b	80/10	a	132	a
c	b	b	c	a	c	b	30/20	b	123	a
a	b	b	b	c	b	b	5/2	b	213	b
c	c	a	a	a	b	c	3/2	b	123	b
a	c	a	c	b	b	b	4/2	b	312	b
a	b	a	c	a	c	a	7/4	c	123	b
b	c	b	d	a	c	b	3/2	a	123	c
b	c	b	a	a	c	b	8/2	a	213	b
c	c	b	c	a	c	b	6/2	a	123	a
c	c	b	c	a	a	b	5/2	b	231	a
c	c	c	c	a	c	b	5/2	a	123	a
c	c	b	c	b	c	b	10/3	a	213	a
a	c	c	d	d	a	a	15/10	d	213	d
c	a	b	a	a	a	b	5/3	a	321	c
c	c	b	d	a	a	b	15/5	a	123	d
c	c	b	c	a	c	b	8/4	a	123	a
c	c	b	b	c	c	b	6/1	c	321	b