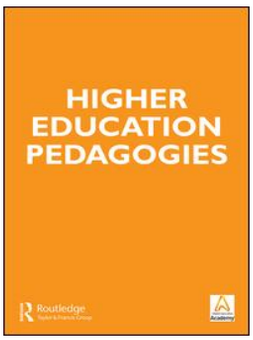

Higher Education Pedagogies

ISSN: (Print) (Online) Journal homepage: https://www.tandfonline.com/loi/rhep20

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To cite this article: Alexandros Chrysikos & Stephen Catterall (2020) Identifying student retention factors of a UK university using the concept of a learning community: a qualitative approach, Higher Education Pedagogies, 5:1, 90-109, DOI: 10.1080/23752696.2020.1788968

To link to this article: https://doi.org/10.1080/23752696.2020.1788968

Published online: 13 Jul 2020.

HIGHER EDUCATION PEDAGOGIES
2020, VOL. 5, NO. 1, 90–109
https://doi.org/10.1080/23752696.2020.1788968

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Identifying student retention factors of a UK university using the concept of a learning community: a qualitative approach

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ABSTRACT

The UK will need a skilled IT work force to maintain its position as a world leader in computing research and development. This study investigated the experience of learning communities amongst first year undergraduate computing students at a UK university. The concept of a learning community was used to examine its influence on student academic and social integration, the issues students need to overcome and the knowledge they need to acquire to become successful. A qualitative approach was employed using the 'unfolding matrix', which was completed during group interviews. The data analysis results revealed that learning communities critically affect students' academic and social integration. Specifically, the importance of student support and guidance from academic staff was considered, as well as student relationships with other students and academic staff. Furthermore, developing a sense of personal awareness and the need to develop an effective academic skill-set to succeed were identified as critical.

ARTICLE HISTORY
Received 28 September 2018
Revised 10 February 2020
Accepted 21 June 2020

KEYWORDS
Learning communities; student retention; academic integration; social integration; unfolding matrix

Introduction

The UK government believes that it will need a future generation which is skilled and passionate about computing if the UK wishes to remain a world leader in research and technology (HMSO, 2014, 2019). Computing departments in UK universities are at the forefront of providing this skilled workforce, but challenges remain in terms of both recruitment and retention. Specifically, previous academic research in UK universities has shown a relationship between student retention, engagement and social and learning experiences (Whittaker, 2008).

The aim of the current study was to examine and map behavioural-related retention factors using the learning community as a lens applied to the first-year undergraduate computing students of a UK university. This was achieved by investigating students' social and learning experiences within the context of the computing department of a middle-ranked UK institution. In this context, the UK learning community, in which students participate as a cohort, was investigated in terms of supporting their development in order to advance an

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environment that assists the progress of good pedagogic practice. The computing learning community of the UK institution studied had the typical characteristics of a UK institution learning community that includes a diverse student population of first-year students including full-time students, home-based daily commuters to campus, those in residence on campus, mature, residential, international and EU students as well as first generation students, and those from black, Asian and minority ethnic groups (BAME). In addition, the chief issues considered were: the relatively low level of retention compared to previous years and the computing departments of other regional universities; the relatively low-level of degree classification; the effectiveness of current UK learning communities and the level of computing students' academic and social engagement.

A qualitative research method was employed to examine student needs for first year computing students by investigating reasons linked to university student retention. Data was collected and amalgamated by applying the 'unfolding matrix', a method that allows data confirmation by sharing previous comments and exposing them to an iterative and constructive dialogical process. Specifically, it focused and expanded on areas that the student participants discussed. After interpreting the qualitative data, the findings were used to answer the study's main research questions. These were: How do students perceive their university experience? To what extent does learning community participation affect social and academic integration? What are the barriers which students need to overcome in order to be retained? What are the characteristics of successful students and how are they achieved?

Literature review

According to Evans (2000) the theoretical models of student retention and transition are strongly influenced by Tinto's student integration theory. The main points of Tinto's student integration theory are social and academic integration in relation to a student's commitment to the institution and external efforts. Students bring to university prior schooling, skills and abilities. When these are combined, they lead to a set of commitments, goals and intentions from and to an institution. Students are aware of what they want to achieve prior to their enrolment in the first academic year. This means that institutions must establish student expectations which in turn will aid student success. It is also important that students can develop social and academic integration skills in both informal and formal ways. Formal academic integration includes researching topics in the library, attending labs and classes, and engagement in various activities related to academic success. Informal academic engagement is equally important and includes student interaction with both staff and the faculty (Evans, 2000; Tinto, 2012).

A definition of a learning community was described by Tinto (1998) to the National Teaching and Learning Forum. This presented the core of learning communities as a 'co-registration or block scheduling that enables students to take courses together'. This was a US perspective where there is frequently a greater choice in the selection of courses and the order in which they are studied. On the other hand, in the UK university degrees are more often single subject based, which effectively means learning communities are already being adopted because in UK learning communities the students participate as a cohort (Whittaker, 2008).

The United Kingdom higher education system can boast over 160 institutions and over two and a quarter million students of whom 1.75 million are undergraduates. Approximately 20% of these students are from outside the UK, and 30% of the overseas students are from the European Union (EU) and 70% from non-EU countries (Universities UK, 2019). In terms of levels of overall participation in higher education in the UK, the Higher Education Initial Participation Rate (HEIPR) estimated that the likelihood of a young person participating in higher education by the age of 30, grew steadily from 42% in 2006–2007 to 49% in 2011–2012, but fell sharply in 2012–2013 before recovering slightly in 2014–2015 to 48% (Gov.uk, 2016).

Related to these vagaries are a number of issues which according to Brand and Millard (2019) are linked to student roles in quality assurance in the UK. The first of these relates to tuition fees. These were initially introduced in 1998 with a maximum annual fee of £1,000 with subsequent treble increases in 2004 and again in 2012 to a maximum of £9,000. This, it is argued, has led students to act as customers or consumers (Freeman, 2016). The challenge with this consumerist notion is that the role is relatively passive (Tomlinson, 2016). However, it can be argued that those interested in a more constructive student role have had to recast the position of students as partners and co-creators to engage them effectively in quality assurance and enhancement processes. As a result, there is a growing potential role of students as influencers in the quality process (Brand & Millard, 2019).

In the growing debate of the last ten to fifteen years regarding the role of students in higher education, it has been suggested that students' actual and potential contribution to the quality process is changing (Nixon, Scullion, & Hearn, 2018). Student engagement starts from year-one of the undergraduate studies and involves interactions with other students and academics. There is nothing automatic about students becoming part of a teaching and learning community the moment students start their journey. Even with well-planned induction and orientation programmes, transition into UK university communities can be complex. Places and spaces provided by UK universities for students including the curricular, physical and virtual can feel intimidating and socially isolating. Students experience the uncertainty of moving from very safe, familiar spaces into new, unknown and precarious spaces. These transitions could also represent significant opportunities for learning, where adaptive and transformative capabilities can develop, affording the ability to exist and succeed within multiple senses of place and space, not exclusively in a university context. In the subsequent sections, issues related to UK universities increasing student heterogeneity, the importance of understanding factors affecting retention and avoiding single solution approaches and generalisations are discussed.

Student retention and transition issues within UK higher education

Learning communities will continue to impact institutional change in the way that administrators, staff, and faculty think about students (Smith, MacGregor, Matthews, & Gabelnick, 2004). In addition, in the coming decades, it is likely that the student population will both expand and become ever more diverse (Higher Education Policy Institute [HEPI], 2013; Higher Education Statistics Agency [HESA], 2014). The rising student population, combined with the current economic environment, will force

institutions to re-think about scaling programmes to meet student expectations and demands. In 2000, Howe and Strauss noted that current education approaches will not be effective for the new generation of students that tends to require more team-based learning, more interaction, more activities, and fewer lectures and learning by memorising information. Furthermore, learning communities will also have to change by developing new and innovative types and offer them to new incoming students. One example, of this is the creations of multicultural learning communities to address an increasing number of minority students leaving institutions after the first academic year (Koch & Pistilli, 2005). Again, this change is already happening with virtual learning communities as described by Buch and Barron (2012). The changing British learner profile is discussed in more detail in the next section of this article.

In the coming years, similar models will see increasing popularity and growth. Many UK universities, as well as international institutions, are interested in creating new opportunities for students in order to satisfy their demands and increase retention rates. Specifically, in the UK, during recent years, the landscape in higher education has become increasingly competitive, which raises difficult questions for students and institutions (HEPI, 2013; HESA 2014; Srhe.ac.uk, 2018). From the students' perspective the economic challenges and rising tuition fees have placed them under greater pressure to make the right choice of institution and course, as well as leaving students searching for the best position in order to successfully enter the graduate employment market (HEPI, 2013). On the other hand, institutions face the challenge of understanding and implementing the expectations of a new demanding student cohort, without additional funds (HESA, 2014). A discussion of retention and transition issues in UK higher education is conducted in the following sections.

Learner profile

A growing number of mature students are pursuing part-time studies via campus-based, work-based, distance-learning and other blended-learning techniques in accordance with the 'non-traditional' type of student concept. This concept is common in political and academic dialogues and is employed to define students without a traditional engagement in higher education for reasons involving socio-economic, ethnicity, nationality, age, and pre-educational background factors. Engagement techniques lead to growing numbers of 'non-traditional' students who may be unprepared for or unfamiliar with traditional university teaching, learning and assessment approaches (Buch & Barron, 2012; Thomas, 2012).

Previous research into social transition indicates that it is usual for mature students to have confidence in interactions with their tutors when they seek advice and support for their studies, rather than younger students who tend to prefer gaining support and advice from other students. It has also been observed that mature students tend to be highly motivated and seem to be more concerned about their performance than younger students (Whittaker, 2008). It is frequently observed that first generation students expect to receive constant support and guidance from their tutors. On the other hand, mature students do not generally have such expectations and appear better able to handle issues within the university environment, even without support from peers or university staff (Stephenson & Yorke, 2013).

Furthermore, international and EU students, in addition to making a cultural and social transition, also need to adapt to new educational, learning and assessment techniques. For instance, the concept of plagiarism is difficult for many students in general but seems especially unfamiliar to international and EU students (Whittaker, 2008).

Student population diversity

Support services and academic staff who plan and operate retention strategies need to have a clear understanding of the factors that affect different learner groups. Stereotyping or generalising based on factors such as age, gender, class, educational background, disability, and ethnicity should be avoided. Single targeted solutions for specific student types are not enough and as the student population becomes more diverse an effective solution will become increasingly crucial. Yorke and Longden (2007) research in the first-year student experience identified that any fundamental alterations to improve first year empowerment and engagement needs focus on all students, and not just on the 'non-traditional groups' or those deemed to be 'at risk'.

The changing nature of the university experience

UK universities continuously revise the university experience because bringing higher education to a world audience has created a set of different expectations, needs and goals for a progressively diverse student experience and population (Thomas et al., 2005). Moreover, the 'de-personalisation' generated by large size classes, for instance, and the individual's inadequate support and attention have affected most students, whether 'traditional' or not. (Thomas, 2012). Harvey, Drew, and Smith (2006) mentioned that the factors related to the 'mass experience' of being a first year as opposed to the differentiated experience of subsequent years requires additional research to investigate the transition from first to later academic years. Finally, the integrated use of technology and the technologically empowered learning, for social and academic purposes, have greatly changed the experience of the students (Creanor, Trinder, Gowan, & Howells, 2006).

Academic retention and transition

The literature review has identified issues surrounding academic retention and transition mainly focused on students' need to adapt to learning and teaching styles that differ from their previous experience prior to university. Academic staff expect students to exhibit a new level of independence. However, Lowe and Cook (2003) identified that students' study habits from school endure until the end of the first university semester. This indicates that students do not quickly or effectively bridge the gap between school and university. The volume, pace and level of study is greater than previously experienced or expected, as well as having to negotiate university marking systems, a situation in which grades might well decrease as a result. If the UK wishes to remain a world leader in research and technology (HMSO, 2014, 2019) current retention challenges facing computing departments in UK higher education institutions need to be addressed such as inspiring more students to study computing and improving skill levels to produce highly

employable graduates. There was a significant increase in enrolment numbers in the early years of this century, mirroring a large increase in computing-related jobs within the UK economy, but the overall trend has led to only a modest increase in enrolments, and retention remained disappointingly poor in computing departments (HESA, 2014; Srhe.ac.uk, 2018). Therefore, it is important to understand students' study perspectives, the experiences students have whilst engaging in their learning and whether the social and learning experiences of computing students are adequate to meet their academic and non-academic needs.

The current study therefore explores a range of issues in retention within the context of first year undergraduate computing students of a middle-ranked UK institution. It considers aspects that reflect discipline characteristics, such as the nature of the content, and of the computing student and staff communities. Specifically, four types (student-type, residential, classroom and curricular) were engaged in the current study. This is evidenced by the participants' answers in the Data Analysis section. Before presenting the results, though, the Research Methodology applied is explained in the following section.

Research methodology

In this study, a qualitative approach was employed which is a methodology usually conducted in the context of a programme evaluation (Patton, 2014). Specifically, this was achieved by conducting focus group interviews and employing a dialogical technique known as the 'unfolding matrix', which is explained in the next section. The completed matrix resulted in a document consisting of raw data that was analysed to extract concepts, relationships and categories (Padilla, 1994).

Data sample

The participants were male and female full-time students who participated in a learning community within first-year computing courses during the academic year 2014–2015. The data collection involved 10 focus groups with eight participants in each group. Specifically, there were 80 full-time students in total, of which 60 were male and 20 were female. The age group range spanned from 17 to 40 years old, of which 3 were mature students in the 30–40 age range and the remaining 77 in the 17–20 years age range. Furthermore, 60 were home students of which 20 were BAME students and the remaining 20 international and EU students. Finally, of the 80 in the study 50 students were in residence on campus and 30 home-based daily commuters. The data sample in terms of age, gender, and mode of study could be classed as representative of the whole cohort. The only mode of study not included is part-time students. This is a group with unique characteristics that could form the basis of a future study. In addition, the participants' progress was monitored until the completion of studies. Therefore, the conclusions on the 'success' and 'retention' of students are based on the fact that the participant students 'successfully' managed to complete their studies.

The study sample represented all computing courses of the Department of Informatics of the university studied. Furthermore, there were no variations identified in different modules within the courses. The research was advertised during classes and via email. A

session was then organised in which the participants were given a detailed description of the research topic followed by a 'question and answer' session. In addition, the focus group interviews process was explained before a student decided to participate. Furthermore, clarification was given when it was required by a student.

Focus group interview process

The focus groups adopted the iterative process associated with the 'unfolding matrix', with each focus group lasting approximately 40 minutes. Before every focus group, the participants were provided with an Interview Consent Form in which they gave permission for the use of the information they provided. The data was analysed, coded, theme-grouped and developed into assertions. It is also important to clarify that the 'unfolding matrix' process of sharing previous comments amongst the participant students did not lead to any sort of bias. On the contrary, it enhanced the results' significance as it gave the opportunity to every participant to critically reflect on other students' comments. This was achieved through the initiation of constructive dialogues and arguments that were originated by students themselves. As a result, this added extra value to comments identified by them through an iterative process and helped reveal new areas of interest that otherwise might be difficult to identify.

Through this process a series of areas of interest were addressed by the participants. Those were the areas that attracted most comments and initiated most dialogue. Therefore, when the process was completed the 'unfolding matrix' unveiled several 'Experiences' that the participants highlighted. The data analysis was only focused on those 'Experiences' which are presented and analysed in the Data Analysis section. Furthermore, a detailed discussion of the application of the 'unfolding matrix' is provided in the Application of the 'unfolding matrix' section.

The 'unfolding matrix'

Padilla (1991) was the first to describe the 'unfolding matrix' as a qualitative data collection technique that is used to assess heuristic knowledge. In this process heuristic knowledge becomes critical. Heuristic knowledge is established in 'rule of thumb' experiences which have not been tested in any new context, which in the current case is the university environment. These consist of pieces of information which are learnt from a mentor or experiences specific to a certain environment, for example, a given university campus (Padilla, 1991, p. 82). This is why, the current study is focused on behavioural-related retention factors. Padilla (1993) detailed this method as related to conducting 'dialogical research' to place the researcher and the participants 'in a partnership to achieve greater understanding about a situation'. Dialogical research is derived from Freire's (1970) work, where it was stated that the best method for learning involved a student assuming the role of a teacher and the teacher assuming the role of a student. Through conversation it is possible to discover how to accomplish a given task or the meaning behind something. Padilla (1993) noted that it is via this dialogue that participants can discuss the experiences they had while participating in something. According to Padilla (1994), by the time the matrix is completed, it evolves into a data set itself, which can then be subjected to 'conventional data coding and analysis to develop

Experiences	Duration	Intensity	Learning Community Related	Additional Environmental Factors	Past Knowledge Used	New Knowledge Gained	Characteristics Used	Characteristics Gained

Figure 1. The 'unfolding matrix' template (Padilla, 1991).

grounded concepts, typologies, or taxonomies'. The use of the 'unfolding matrix' offers the opportunity for a researcher to cover several objectives that are critical to qualitative research.

As a first objective, the 'unfolding matrix' sets boundaries 'for the data to be collected by clearly specifying a domain of relevant data for each data vector' (Padilla, 1994). This is critical because without specific boundaries a researcher cannot know what data to gather in order to understand the phenomena. As Padilla (2009) mentioned, 'data collection without sensible limits is highly inefficient and may lead to data collection that is irrelevant'. Through the early limitation of topics, the researcher is assured that the data collected can be used to answer research questions and provide explanations that will improve knowledge about specific phenomena.

As a second objective Padilla (1994) noted that data is gathered in a highly structured manner. Specifically:

- the data entered into the matrix is automatically processed
- if one follows a vector down across all the examples given for the cover term, one could find an exhaustive definition of that vector's cover term
- equally taking every phenomenon defined across the rows is an exhaustive explanation of the phenomenon
- in order to enter data into one of the cells, it firstly needs to fit into that cell, and when failing to fit into an appropriate cell, a new data vector is created to accommodate it. Therefore, a level of pre-coding is achieved. This does not mean that this is the final coding schema, but simply an indication of what the final schema could encompass
- a further analysis of the matrix can then reveal the final set of relationships and constructs, which can then be used to answer the research questions that are set by the researcher (see Figure 1: The 'unfolding matrix' template).

The 'unfolding matrix' was chosen for the current research because it offers a thorough process for exploration of the first-year computing students' reasons for dropping out of university. In addition, it is a tested process that has proved useful for its clarity in presenting results. The interpretation is less confusing which leads to safer outcomes. Furthermore, via students' conversation on each other's comments the probability of discovering a hidden meaning is higher. The subsequent section provides an analysis of the 'unfolding matrix' application in the current study.

Application of the 'unfolding matrix'

The 'unfolding matrix' was used in the interviews as a pre-set table to be completed during the conversation. The research questions were used to initiate and set the boundaries. The answers were then categorised using the 'unfolding matrix'. Figure 1 represents the 'unfolding matrix' template employed in this study.

In the first vector of the 'unfolding matrix' in Figure 1, the authors decided to avoid the negative term 'barriers' and used the more generic word 'experiences' instead, with the caveat that experiences could be both positive and negative. Negative experiences (barriers) that have been overcome were signs that a student tackled difficulty and persevered. Positive experiences indicated potential growth in heuristic knowledge. All participants were encouraged to remember that their experiences could be positive or negative and that if the experiences contributed to their, or their peers' overall success, they could be included.

The participants were asked about the intensity and length of their experiences to determine if an experience was present for more than a short period of time. Padilla (2009) noted that barriers that continue to be noticeable for students, which cannot be overcome, could ultimately lead to that student dropping out of their academic studies. Tinto (2012) mentioned that negative experiences could prevent a student's ability to integrate academically or socially, depending on the nature of the experience, whilst a positive experience that has been present for a long period, could lead to student success. Through positive experiences, it is therefore possible to eliminate barriers and aid student integration into the campus community. In this study, whilst length of time was provided by participants, intensity was a difficult concept to grasp. While students were able to describe their experiences in-depth and offer responses to those provided by previous participants, 'Intensity' was left blank in the matrix as it was proved too ill-defined to quantify.

The Past Knowledge Used and New Knowledge Gained vectors allowed the authors to comprehend what heuristic knowledge was applied in overcoming a barrier. Discussion of environmental factors related to their experiences and helped participants describe what effect any surroundings had on their positive experiences. These vectors also helped with comprehending new things that had been learned and could be used in similar situations in the future.

Characteristics Used and Characteristics Gained were the final two vectors in the matrix. The participants were asked not to discuss these aspects during the focus group interviews as this would require students' knowledge about factors for successful students as outlined by Padilla, Treviño, Gonzalez, and Treviño (1997) and Sedlacek's (2004) non-cognitive variables and the characteristics associated with this work.

During the focus group interviews, the empty 'unfolding matrix' was given to each of the participants on A3-printed sheets. Through this approach participating students were able to independently and objectively provide an exhaustive list of experiences without influencing each other. Once each participant student felt that all important experiences that contributed to their success at university were recorded, they were able to discuss these amongst themselves in order to complete the empty cells of the 'unfolding matrix'. The authors served as the moderators of each group as well as the persons completing the matrix during the discussion.

When it appeared that the entire 'unfolding matrix' was complete, together with commenting on existing experiences and exemplars, the participants were invited to

list further experiences not already mentioned. These were placed in the remaining cells on the matrix (Learning Community Related and Additional Environmental Factors). The participants had the ability to clarify, comment on or rephrase the 'unfolding matrix' notes in order to ensure an accurate depiction of their experiences was recorded. Once the matrix was finalised, all notes were transferred into an electronic spreadsheet using different bolding, shadings, italicisation or a combination of the three to differentiate comments, titles and distinct notes.

The aim was to develop a set of assertions or substantial findings via the data analysis. To achieve this, the authors and the participants developed codes representing the various commonalities among the data in the 'unfolding matrix'. Then, the codes were grouped into themes in a form of data reduction. Those themes were then shaped into assertions, which represent the most important findings of the study. Furthermore, it is critical to state that the matrix was completed by applying pre-defined categories for the column headings (as shown in Figure 1), and none of the interviews resulted in an additional 'unfolding' of the matrix.

The completed 'unfolding matrix' was reviewed by the authors several times. This process offered the opportunity to reach a satisfactory level of valid coding, and themes developing with the data and experiences provided by the participants. The authors then checked the themes and searched for any overlaps. This analysis resulted in a set of assertions, each one supported by the various themes derived from the data set. The results of these analyses are the five assertions presented in the following section.

Data analysis

The students shared a common experience as participants in a learning community environment while in the first semester of their first academic year. In that context, they formed learning communities with specific key features. The learning communities established were academically oriented communities such as lecture sessions, tutorial and laboratory exercise sessions, and help sessions. Those involved student-to-student and student-to-academic tutor interactions. Other learning communities established were socially oriented such as study groups formed with classmates, roommates, student societies, and student accommodation communities. In all cases, groups could involve students from the same course or another, as well as students from the same year and/or second/third year of study. Most of the participants described positive experiences that could only be developed while engaging within a learning community designed environment. It is important to acknowledge that the experiences of those who did not participate in a learning community are not described in this study.

The first assertion identified was that UK university learning communities help first-year undergraduate computing students to become academically and socially integrated into a university. The participants experienced four specific and repeated interactions that had direct impact on their success. The first type is the academic interaction. Most of the participants mentioned that their interaction with members of academic staff assisted in making academic tutors friendlier towards them:

> I developed relationships with my academic tutors (lecturers, senior lecturers etc.) from my learning community by going in their offices and asking for guidance and help for my

> assignments. In the beginning, it was intimidating, but after a while I realised that seeking help from my academic tutors assists me with my social and academic life.

In addition, most of the participant students indicated that their academic tutors and academic advisors provided important help for their academic progress:

> The academic advisor is there to help me. He is always keen to give me information on important matters.

The second type of interaction is social. It was mainly described by the participants as interactions with their roommates, non-learning community and learning community friends. Some of these interactions were of an academic kind, such as through study groups, many of which resulted in good friendships being formed and in social interaction through joining student societies of mutual interest. This is important because the participants did not present their experiences as simply being only social or exclusively academic. Specifically, almost all students, especially BAME, international and EU and female students, agreed with the following statement:

> I live in the same floor as students from my learning community. It is great having friends who are in the same class with me. I also joined societies and met new friends who helped me expand my interactions within the university.

The third type of interaction that supports this assertion is related to academic guidance and support programmes. More than half of the participants mentioned that:

> My personal academic tutor provides advice and guidance about the classes. Also, he gives me information about university life and student societies

The majority of international and EU and BAME students did not mention, but positively agreed with this statement highlighting its importance for them. The students have also related helpful instances where they need to interact with someone in a professional manner. Therefore, the fourth kind of interaction is professional, because it involves interactions with members of university administration, employers, and co-workers in professional settings.

Apart from gaining a good sense of campus life and developing necessary relationships, a theme identified throughout the data is the students' desire to better understand themselves in relation to other work experiences, and other cultures. Accordingly, the second assertion derived from the data is that first year computing students need to develop a sense of personal awareness to succeed. The majority of the participants, from which all BAME and international and EU students indicated that:

> … I joined this university because I wanted to meet other people and make new friends, apart from those who are from the city I live. I have not regretted making this choice.

Most participants identified the importance of getting to know themselves, as well as becoming integrated in the institution's environment. According to the concept of the learning curve, which is the rate of a person's progress in gaining experience or new skills, university students must not only be able to make acquaintances and have a better sense of what is their aim in university, but also learn to achieve their targets on their own (Yelle, 1979). From this notion is derived the third assertion. The transition through university is related to the need of first-year undergraduate

computing students to become more independent, to learn how to learn on their own, and develop intrinsic motivation. Most male and female students, as well as more than half of the BAME and international and EU students endorsed the following sentence.

> I always try to do my best when I do my university work. My housemate is from the same course and that helps me a lot. She is a very good student and motivates me to constantly improve.

All participants identified the importance of developing academic skills as critical towards their academic success. Therefore, the fourth assertion is that students need to cultivate an effective academic attitude skill set to succeed. Also, this skill set needs to be customised to reflect each student's individual abilities and strengths. For instance, the trial and error method applied by some of the participants indicated that the study environment significantly affects students. Additionally, it differs between students. Half of the participants, especially the home-based commuters, agreed with the following statement:

> I know from high school that I need a quiet room to study. Knowing that helps my productivity when I do university work.

A finding of particular interest is the interaction between participants who met and developed relationships with other successful second, final or postgraduate students. They mentioned that whenever they were given the opportunity to hold a discussion with students from these cohorts their motivation increased. Therefore, the fifth assertion is that first-year undergraduate computing students need to actively interact with other successful students. Half of the participants, including all mature students, highlighted that:

> …. the help and guidance I got from second and final year students helped me feel more confident about my studies, and my ability to succeed in university.

It is also important to mention that only a few of the international and EU students made such a comment. However, they all agreed with that statement when they read it in the 'unfolding matrix' table.

Answering the study's main research questions

The aim of this study was to examine the appropriate conditions for success for first-year undergraduate computing students who enter a UK university and participate in learning communities. The subsequent research questions were addressed: How do students perceive their university experience? To what extent does learning community participation affect social and academic integration? What are the barriers which students need to overcome in order to be retained? What are the characteristics of successful students and how are they achieved? In the following sections, the authors define how these questions were answered by this study.

How do students perceive their university experience?

The elements and characteristics that were shared by the participants, in conjunction with the positive views of their academic experiences, signify that student participation in the learning communities of the university studied is one of the factors that strongly assisted in their success in academic activities. Additionally, the most notable student experience for successful university experience was being involved in a learning community but was also related to living near other students who were also participating in the same or another learning community.

Moreover, the participants identified, and characterized as significant, experiences that occurred as part of their learning community experience. These were: attending help-sessions, developing student-academic tutor relationships, participating in academic guidance and support programmes, and seeking support from their personal academic tutors. Although all these experiences were critical factors for students' success and the last two appeared to be the most impactful.

To what extent does learning community participation affect social and academic integration?

The participants' learning community involvement had a positive effect on their integration, both academically and socially. They were able to evolve relationships across a spectrum of people at the university, involving staff members, their academic tutors, other students, and their learning community peers. Moreover, they pointed-out that their involvement in student societies and help sessions aided their academic and social development. Many of them also confirmed that they encouraged other students to participate in the learning communities of the university studied.

The students consistently specified examples of how their participation in learning communities of the university studied helped them to develop new friendships, learn academic success skills, and become involved in campus activities and societies. The participation in a learning community can be interpreted as a catalyst for establishing the necessary conditions that promote academic and social integration. Furthermore, they indicated benefits gained from these relationships, such as experiences that were connected to their continuous academic progress, and finally success at the university.

What are the barriers which students must overcome in order to be retained?

Academic success was desired by most of the participant students. Nevertheless, it cannot occur without overcoming obstacles. The following points were identified by the first-year undergraduate computing students who were interviewed in the current study. The greatest challenge for all students included a lack of skills that would lead to academic success. Specifically, they frequently identified lack of study techniques or that the skills used while in school did not benefit them in university. Therefore, they had to go through periods of trial and error regarding study methodologies. Even though it was not detected as an important barrier to success, having strong academic skills is critical to doing well in university level coursework (Pascarella & Terenzini, 2005). If they had failed to obtain such academic skills, there is a high possibility they would have failed at university.

Another set of experiences presented as a possible barrier to success included dealing with academic tutors. Specifically, participants mentioned experiences regarding academic tutors who were intimidating, having accents that were difficult to understand, not being good as lecturers especially in large classes, and it being a challenge to cooperate with them in the classrooms.

These barriers though were not insurmountable. The participants addressed methods to overcome them. For instance, one of the students mentioned that a student needs to approach the academic tutor and ask questions even if the academic tutor is not approachable. The experience of encountering a barrier and successfully overcoming it is exactly what Padilla (1999/2000) defined as a necessary means for student success. The participants also seem to have employed various non-cognitive variables in overcoming these barriers and becoming successful students (Sedlacek, 2004). Specifically, having realistic self-appraisal and knowing when to look for assistance or other methods to complete a task and acquire knowledge to be successful.

What are the characteristics of successful students and how are they achieved?

The participants mentioned skill sets that were developed while in school and which could or could not be productive after they entered university. Some of them, though, clearly stated that they would need support and guidance while in university. Overall, it was identified that the participants' pre-university knowledge did not offer a great deal towards university success. However, when it came to knowledge acquired at university, the participants managed to acquire enough knowledge after they started participating in various academic and social experiences.

The participants determined that learning how to develop relationships could be a key element for academic success. Those relationships extended from normal friendships with classmates and other students to developing relationships with their academic tutors. Furthermore, they identified it was critical to convene and collaborate with other students who were successful in computing careers.

Most of the characteristics acquired by the participants appeared to be related to development and maintenance of support systems. They understood that to be successful they needed to cultivate their individual awareness (Padilla et al., 1997). For instance, meet and interact with other individuals (students and academic tutors), develop their motivation and individual learning methods.

Implications and recommendations for practice

This section provides an analysis of the student retention implications, as well as recommendations for practice, arising from the findings outlined in this study.

Study time variability and standardisation

According to the data analysis, students identified issues such as their courses not being challenging enough, significant workload variation between term 1 and term 2, or that they had less work to do than they expected. However, only a minority of students wanted a more challenging course with extra work. The qualitative approach taken in this

study could provide a method for institutions to identify their students' overall academic and social engagement and to promote a dialogue with them with a view to identifying potential changes to course delivery. An implementation of effective monitoring of study patterns could be considered by institutions to support interventions designed to improve student retention, for instance through student consent for learning analytics data collection.

Improving student guidance and information provision

A third of students in the sample stated that if they had known more about their academic experience before enrolment, they would have made a different course choice. Specifically, they did not have the opportunity to identify the unique differences amongst the provided computing courses. For instance, details about the mathematics and/or programming modules content and level of difficulty/expectations in assignments. If they had the chance to have a detailed explanation from academic tutors about the modules content, as well as view anonymised assignment samples from previous year students, it would give them an in depth and breadth information for each module in each course. Students feel it is very important that they can have the opportunity to compare courses based on realistic information before making their final course choice (Business Innovation & Skills [BIS], 2011). In 2012, the introduction of Key Information Set (KIS), a comparable set of standardised information about UK undergraduate courses, was intended to help students compare courses based on key pieces of information, supporting students to make informed choices (Higher Education Funding Council for England [HEFCE], 2013). However, the information in KIS about student experience is limited (Unistats, 2014). Students, though, can access student satisfaction scores from the National Student Survey (NSS) but still they do not have the opportunity to compare differences in academic experience. This indicates an area where further research could be undertaken.

Whilst the students' perspective provides a valuable insight into levels of engagement as they affect the students themselves, they may for example view issues in terms of the actions others may take to resolve a situation rather than how they may do things differently. Therefore, the reported areas represent only the students' expressions of the factors influencing their view of their studies. The key points which emerged from the participant first-year undergraduate computing students at the UK institution studied were:

- They expressed more satisfaction with organised courses where requirements are clearly explained by their academic tutors. Furthermore, they prefer expectations to be explicitly identified and academic tutors to support them in meeting these expectations.
- They believe that when they participate in small to medium study groups their academic experience is improved.
- They expressed that actively interacting with successful students from the second and final year helps them feel more confident about their studies, and their ability to succeed in university.

- They indicated how their participation in learning communities of the university studied helped them to develop new friendships, learn academic success skills, and become involved in campus activities and societies. They indicated benefits gained from these relationships, such as experiences that were connected to their continuous academic progress, and finally success at the university.
- They expressed the need to cultivate an effective academic attitude skill set to succeed. This skill set needs to be customised to reflect each student's individual abilities and strengths.
- They indicated that the transition through university is related to the need of first year undergraduate computing students to become more independent, to learn how to learn on their own, and develop intrinsic motivation.
- They value good teaching support during tutorial and laboratory exercise sessions and non-academic staff were found to be providing good support.
- They expect their course to be less lecture-oriented and more tutorial and laboratory exercise-oriented when comparing themselves to students in other disciplines.

Students' expressed a desire for more supervised teaching hours and felt that the amount of supervised study was connected to their sense of engagement. As such, increasing supervised study hours may lead to students feeling more satisfied. The computing department studied might not be providing teaching experiences that best meet the needs of all their students and these areas need to be addressed in terms of course structure and delivery.

Conclusion

There are several limitations that must be taken into consideration in this study. Firstly, this research was conducted at a single UK university, therefore, the findings may not be generalised, although they may be relevant. Secondly, as there was a qualitative research focus on the experiences of first-year undergraduate computing students, the voices of non-computing students were not heard in sufficient depth and breadth. The third limitation concerns the potential inaccuracy of the experiences addressed by the focus group interviewees. If the same study was to be conducted with different students would the results be reproducible? It is difficult to determine the extent to which these experiences are shared for all computing students at the university studied.

The data analysis provided indicative findings and only students that have been retained have been sampled. While the results of this study cannot be generalised as they are focused only on the first-year undergraduate computing students at the selected university, the consistency of issues between students increases confidence in the commonality of issues raised, and suggests further research with a larger sample across UK universities would have significant merit. A wider use of the 'unfolding matrix' within UK universities would facilitate richer data collection and an increased response rate. It could also help with understanding how students' behaviour and choices impact on students' level of engagement.

A direction for future research would be an in-depth exploration of the experiences of men and women at the examined UK university. Addressing gender variations might involve exploring staff-student interactions, students' motivation, as well as future

career opportunities, as this needs to be better understood. Similarly, it would also be important to assess variations based on ethnicity, age range, and socio-economic background. It could also be useful to conduct a follow up research focusing on students who do not engage in learning communities. Why do they not engage? What do they use instead? Moreover, future studies should include UK university learning communities from more, if not all, departments, with greater student representation, investigating perceptions of academic success. Such research would involve a larger sample collected from several different UK universities. Furthermore, including learning communities from other non-computing subject areas within the UK will add extra value to the current study.

Many universities use exit interviews to establish reasons behind students dropping out, however these would normally only capture students who withdraw officially. Some of the factors behind students requesting formal withdrawal could be explored through conducting and analysing exit interviews held directly with students or through a survey of programme leaders charged with conducting the exit interviews.

Student profiles could also be considered, for example, membership of a low-participation group. A study of different 'choice points' during the student journey could be undertaken. Examples of such choice points are whether a student was accepted via the clearing process, whether they had initially chosen to study a different subject or had chosen a place at a significantly different geographical location.

In addition, a study could be conducted to investigate the individual pastoral support programmes within computing departments to examine the potential for providing improved guidance and information provision to students (Tryfona, Tryfonas, Levy, & Hughes, 2013). The increasing opportunities for technology to support computing courses in education is a further area for work. Research should be conducted to examine alternative learning and teaching methodologies, as well as new technologies, for example, cloud computing or big data, that could lead to the development of new early-intervention and retention systems. For instance, using learning analytics departments could develop appropriate mechanisms to collate and utilise data on students.

The main findings of this study suggest that through continuous improvement of UK university learning communities it could be possible to inspire more students who wish to study computing courses and at the same time contribute to their professional development. Effectively, computing students' participation in UK university learning communities through help sessions, classes and student accommodation could continue to provide novel and innovative offerings for first-year computing students. Those offerings could include an enhanced academic success skill programmes, academic guidance and support and promote peer tutoring by providing opportunities to interact with other successful computing students. As key features for successful retention, those approaches may encourage students to work together, increase their sense of belonging, and actively participate in their course.

Disclosure statement

No potential conflict of interest was reported by the authors.

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