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Challenges Encountered in Creating Personalised Learning Activities to Suit Students Learning Preferences

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Learning Management Systems and Instructional Design:

Best Practices in Online Education

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Chapter 14
Challenges Encountered in Creating Personalised Learning Activities to Suit Students Learning Preferences

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ABSTRACT

This book chapter reviews some of the challenges encountered by educators in creating personalised e-learning activities to suit students learning preferences. Technology-enhanced learning (TEL) alternatively known as e-learning has not yet reached its full potential in higher education. There are still many potential uses as yet undiscovered and other discovered uses which are not yet realisable by many educators. TEL is still predominantly used for e-dissemination and e-administration. This chapter reviews the potential use of TEL to provide personalised learning activities to suit individual students learning preferences. In particular the challenges encountered by educators when trying to implement personalised learning activities based on individual students learning preferences.

INTRODUCTION

The challenges encountered by educators who have attempted to create personalised e-learning activities to suit individual students learning preferences are many and varied. This chapter reviews some of the issues encountered when attempting to personalise e-learning activities based on students learning preferences. Educational hypermedia systems are computer based systems which enable learners access to a range of learning activities including: audio, video, graphical and text files. The use of adaptive educational hypermedia systems enables the creation of personalised e-learning activities as an alternative teaching methodology to the traditional teaching approach of "one size fits all" (Brusilovsky, 2003, p. 377). The objective of adaptive educational hypermedia systems is to

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tailor web content to suit learners' prior knowledge, perceived needs, and interests based on their previous engagement with the system. The one size fits all (Bajraktarevic, Hall, & Fullick, 2003; Chen, 2009; Hwang, Chu, Shih, Huang, & Tsai, 2010) approach to higher education is possibly not the best teaching methodology to apply, but it is the easiest to achieve. "For almost three decades the concept of adaptation of computer education has been an important topic" (Burgos, Tattersall, & Koper, 2006, p. 54) still the use of personalised e-learning is not realisable by non-technical educators. Non-technical authors who do not have the technical expertise to use sophisticated authoring tools, require lightweight authoring tools to create effective e-learning activities (Chiu & Yu, 2002). "Adaptation is a quite complex process taking into account several stakeholders and inputs: User, teacher and set of rules" (Burgos, Tattersall, & Koper, 2007, p. 168). The complexity involved in authoring adaptive personalisation has prevented it from being used by many educators. Bennet and Bennet (2008) suggest that learning is a very private occurrence which is dependent on various individual traits of each learner. The use of adaptive educational hypermedia systems would enable educators to match online educational activities to the various individual traits of each learner; but not all educators have sufficient technical competence to achieve this aim.

The vast majority of university students belong to the 'net generation' who regularly engage with gaming technologies which provide instant feedback on scores achieved and enable online interactive gaming with other gamers from all over the globe. Learners from the 'net generation' expect more from e-learning than e-dissemination and e-administration (Littlejohn, 2009) they expect an online collaborative supportive environment (McGinnis, Bustard, Black, & Charles, 2008). The dominant use of e-learning platforms is for the transferral of information with the expectation that learners would passively absorb the expected learning outcomes and teachers would continue to pass on information regardless of students learning preferences (Capauno, Miranda, & Ritrovato, 2009). The use of e-learning systems to transfer knowledge for learners to passively absorb cannot compete with the interactive learning experience achieved by engaging with gaming environments. Personalised learning activities would provide learners with a more interactive learning experience. "The growing complexity and constant change of knowledge require a new approach to learning" (Chatti, Jarke, & Specht, 2010, p. 84).

"Being at home is not just a nice feeling; it tells us when we are in a place that 'gathers' our world together" (Kolb, 2000, p. 124). Personalised e-learning may possibly afford the learner the opportunity to feel that all the learning activities necessary for the required knowledge acquisition are held together in the same place, i.e. their learning portal. Learners work and feel at their best when they are in a comfort zone "places – including virtual places – are loci of 'our' actions and expectations and norms" (Kolb, 2000, p. 126).

Many educators consider that the syllabi defines the required learning outcomes, and plan the course content accordingly, without necessarily taking into consideration the personal learning requirements of each individual learner. Bajraktarevic, Hall and Fullick (2003) in a paper discussing a hypermedia system which facilitates both global and sequential learning styles concluded "the findings suggest that students benefit from the learning material being adapted to suit their learning preferences" (Bajraktarevic et al., 2003, p. 51).

Mulryan-Kyne (2010) discusses the challenges encountered when teaching to large classes and suggests that more active classroom activities may improve the quality of learning. The personalisation of e-learning activities to student individual students learning preferences may be a relevant solution to dealing with large classes.

This chapter outlines some of the challenges encountered by educators who try to personalise learning activities to suit the learning needs of individual students based on their learning preferences. Issues, controversies and problems

associated with the creation of personalised learning activities to suit students learning preferences will be discussed later in this chapter.

BACKGROUND

The one size fits all approach to teaching in higher education still exists is some instances. "Because Web and Internet environments have become an important platform for the delivery and sharing of instructional activities and experiences, the term 'personalisation' has emerged, based on the theories related with individual differences" (Yalcinalp & Gulbahar, 2010, p. 883). The one size fits all approach does not cater for students' individual differences. Research into the use of personalised e-learning materials has been ongoing for over thirty years; yet personalised learning activities are still not available for use by many students. Some success conducted in small lab experiments has been reported (Armani, 2005) but the creation of personalised learning activities are still not easily achievable by all.

An activity is a learning resource which has been created with a view to helping students to grasp a specific concept. In some instances more than one activity is required to assist learners' comprehension of basic units of understanding or threshold concepts. Figure 1 illustrates a selection of alternative teaching approaches for students to access to assist their understanding of basic concepts.

Therefore, a number of basic activities specifically selected to complement each other and assist students understanding of certain threshold concepts, would be selected. Learners should be encouraged to critically evaluate and conduct informal conversations around concepts in shared group activity to improve engagement, reflection and critical thinking skills (Kolb, 2000).

Figure 2 illustrates three different teaching approaches which can be used to assist learners' understanding of threshold concepts. Individual learning may be sufficient for some learners to grasp an understanding of threshold concepts. Asynchronous group discussions may suit the learning preferences of other learners. Asynchronous group discussions enable learners to read online the submissions of their peers. Learners do not need to respond immediately; they have time to reflect, review and perform further research, if

Figure 1. Sample units of learning to assist understanding of new concepts

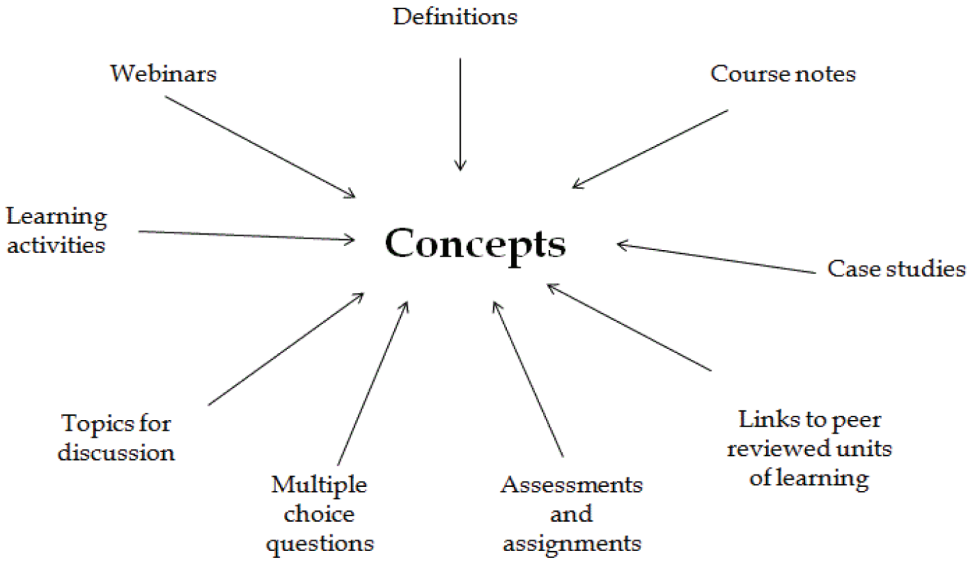
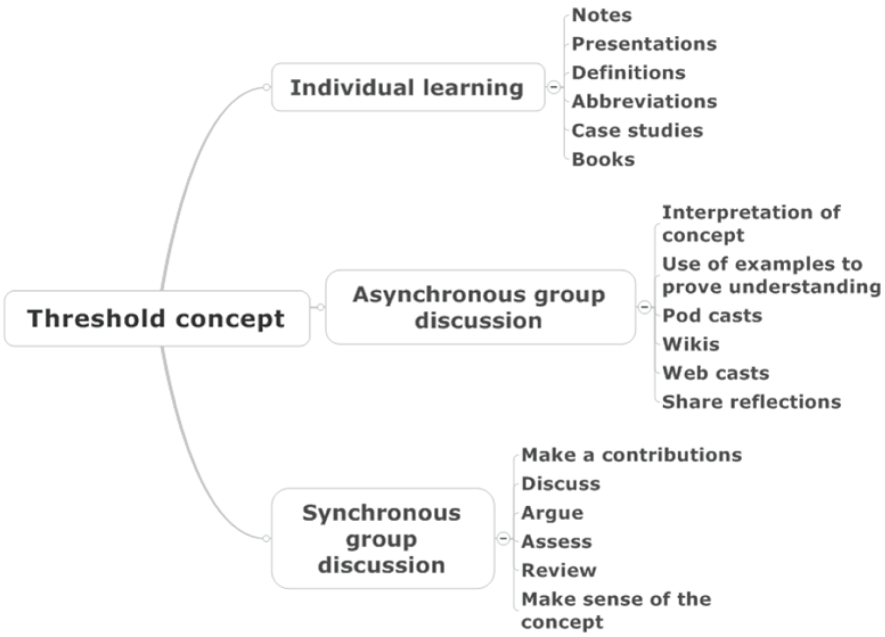


Figure 2. Threshold concept



necessary, before making their own contribution to the discussion. Synchronous group discussions enable learners to engage with their peers in real time, by responding immediately to the contributions of their peers.

E-learning is the opportunity to learn facilitated through the use of technology. Various approaches, facilitated through the use of e-learning, can be applied to assist learners understanding of threshold concepts. Similarly, technology-enhanced learning (TEL) is the use of technology to improve the learning experience. Virtual learning environments (VLE) employ the use of the World Wide Web to facilitate interaction amongst learners to enhance the learning experience. Web-based learning environments (WBLE) (Arora, Raisinghani, Thompson, & Leseane, 2011) is another term in use for e-learning and information communication technology (ICT) enabling environments. E-learning activities are activities presented in electronic format to learners for use through the World Wide Web. The creation of personalised e-learning activities would not be possible without the use of the World Wide Web and broadband access.

This research concentrates on the use of e-learning in educational environments, such as, universities, higher education and third level educational providers. Universities, higher education and third level institutions provide learning environments for students leading to the award of certificates, diplomas, higher diplomas, degrees and higher degrees. Irrespective of which institution is providing the educational services, learning is a cognitive process which turns data into information and subsequently knowledge, providing the process is successful. Kolb (2000) suggests learners need to develop an ability to evaluate information for themselves and develop their cognitive ability to deal with information overload. Personalised learning activities achieved through the use of e-learning could assist students in higher education from suffering from information overload and help them to focus their attention on the important concepts and benefit from a positive learning experience.

Learning Management Systems (LMS)

Learning management systems (LMS) are information systems which enable educators to store learning activities for students to access any time regardless of time or place providing internet access and appropriate technological equipment are available. Ubiquitous computing enables learners to benefit from the growing availability of educational technologies (El-Bishouty, Ogata, Rahman, & Yano, 2010). Shishehchi, Banihashem, Zin, & Noah (2012, p. 115) state "the most beneficial feature of e-learning system is its independence to classroom and platform". The ubiquitous nature of e-learning and LMSs is one of the major advantages e-learning has over traditional teaching methods, where both the teacher and students had to be available in the one place at the same time to facilitate and benefit from the learning experience respectively. "According to the principles of education, the optimal method of teaching is the method that most closely matches students' learning styles" (Terregrossa, Englander, & Englander, 2009, p. 401). Achieving the optimal method of teaching is a continuous challenge to educators; if the optimal method of teaching is to closely match students' learning styles, then this requirement may be met through the successful provision of personalised learning activities. "Internet-based instruction seems to create a new learning manner for students, and also brings new challenges to teachers' authority and pedagogical practices" (Lee, Chang, & Tsai, 2009, p. 1827). Traditional pedagogical practices require reviewing with respect to the prolific variety of uses of technology in education, hence the recent spate of studies on e-pedagogy.

"Pedagogy is about formulating a theory of effectiveness of learning in a given context" (Kumar, 2007, p. 945). E-pedagogy is about formulating a theory of effectiveness of learning in an environment which uses technology, the World Wide Web and broadband access. Personalised e-learning is the tailoring of e-learning to match the needs of individual learners. This chapter particularly focuses on the tailoring of e-learning resources to suit students learning preferences.

This book chapter reviews the challenges encountered in creating personalised learning activities to suit students' learning preferences. As students' individual characteristics are recognised as contributing to their different approaches to learning, so too, educators have got different approaches to teaching. Arora, Raisinghani, Thompson, & Leseane (2011) comment that educators employ different teaching methodologies similar to the way that students learning approaches and learning preferences also differ. Invariably, there are mismatches between educators and learners teaching and learning approaches. A certain amount of educators can hold the attention of a class and have a positive impact on the learning experience of many students. Some educators can only effectively connect with a selection of learners, while other educators have difficulty in connecting with, and effectively engaging any learners.

Personalised e-learning activities refer to e-learning resources which have been specifically selected to suit particular students learning requirements. Should the provision of personalised e-learning activities be made available to all learners then possibly the negative impact on the students learning experience by educators who do not have the ability to connect with and positively engage with their students could be reduced.

Instructional Design

The terms instructional design and learning design can be used by different people to mean the same thing. The importance is not in the term used but that the teaching methods selected are suitable to achieve the intended learning outcomes. Chang (2010) suggests the importance of taking students' learning preferences and perceptions into account when designing active learning en-

vironments. Educators should encourage student feedback of their use of instructional and learning design approaches to establish the success of their instructional methods. Parrish (2009) suggests instructional designers be mindful of their own difficulties in understanding specific topics and take this into account when designing learning experiences to enhance students knowledge. This approach would enable students benefit from the instructional designer's experience in overcoming difficulties in understanding. A sound pedagogical approach and appropriate use of instructional design techniques are required to ensure adaptive content based on information from the learner model is useful to learners (Cheung, Lam, Szeto, & Yau, 2008).

Smyth (2011) suggests that the learning design focus should be on learners and their needs more so than on the technological affordances available in virtual learning environments. It is all too easy for educators to become engrossed in using the technological affordances of e-learning systems and lose sight of the pedagogical implications of using the technologies in certain ways. Instructional designers need to familiarise themselves with the efficient use of e-learning systems, the appropriate use of the various functionalities and affordances facilitated by e-learning systems and the ability to match these skills to the desired learning outcomes. Ideally, educators should employ some form of evaluation to their teaching strategies to gauge the effectiveness of various teaching strategies to achieve particular learning objectives.

Educators could benefit from the opportunity to experiment with different types of instructional design and activities to form an appreciation and awareness of the various teaching and learning effects which can be achieved (Talanquer, Novodvorsky, & Tomanek, 2010). But before educators can effectively engage with and constructively use learning activities, authoring tools to facilitate their creation must be freely available, web-based, effective, efficient and easy to use.

Personalised Learning Activities

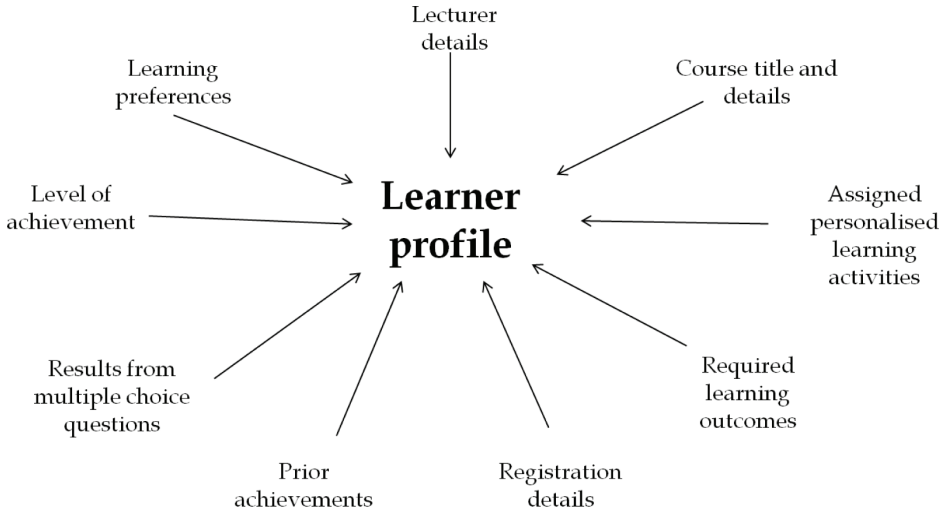
Kolb (2000) states that access to information is not a problem, accessing relevant information is the issue which learners have to resolve, as information overload is a problem. "The creation of personalized learning experiences is considered as a necessity to cope with the over-whelming amount of available learning material" (Arapi, Moumoutzis, Mylonakis, & Christodoulakis, 2007, p. 96). In a study based on enhancing arithmetic skills and problem solving skills, Schoppek and Tulis (2010) found that "results show that even a moderate amount of individualized practice was associated with large improvements of arithmetic skills and problem solving, even after a follow-up period of 3 months" (Schoppek & Tulis, 2010, p. 239). This study was conducted with nine third grade classes. It would be interesting to see if a similar study was conducted with students in Higher Education, would such large improvements in skills and problem solving abilities be noted.

Peter Brusolivsky (2004, p. 104) in a paper discussing Knowledge Tree "an architecture for adaptive e-learning based on distributed reusable intelligent learning activities" proposes "a significant amount of work and cooperation between several research groups will be required to turn the proposed architectures into the common practice of E-Learning" (Brusilovsky, 2004, p. 111). To date, even withstanding a significant amount of work and cooperation between several research groups, adaptive e-learning based on distributed reusable intelligent learning activities, is still not common practice in e-learning.

Learner Model

Knauf, Sakurai, Takada, & Tsuruta (2010) recommend the storage of data on each learner should be maintained in a user learner profile or learner model. Figure 3 indicates some of the necessary data to be stored in the learner profile, to ensure individual students can be appropriately identified,

Figure 3. Learner profile



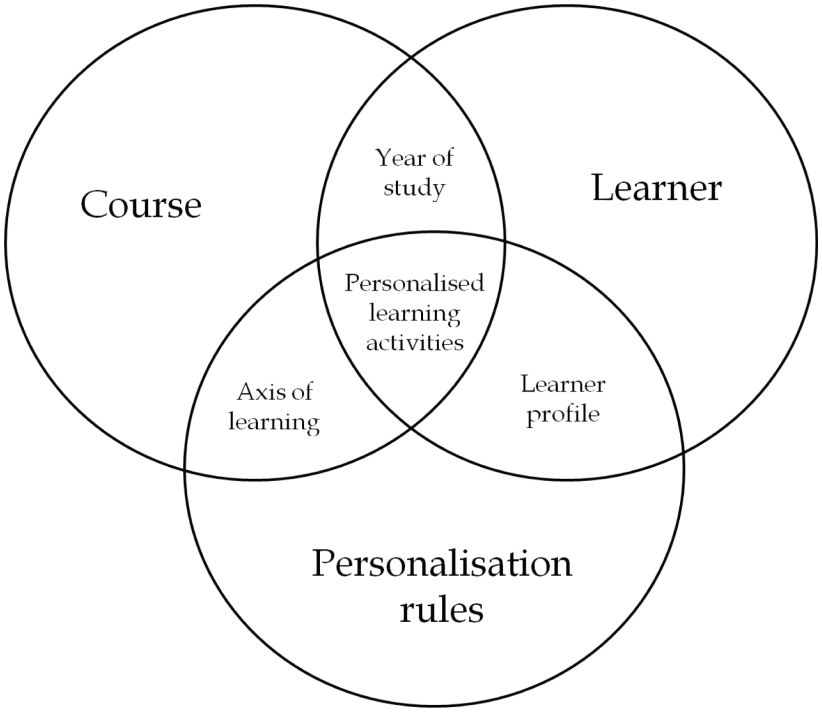
linked to the relevant course of study, and provided with appropriate personalised learning activities.

The population and maintaining of metadata stored in the learner model is essential to enable the adaptation or matching functionality of the adaptive system (Brusilovsky & Millan, 2007). The metadata stored in the learner model would then be used in determining suitable learning resources to facilitate matching of student learning preferences and other characteristics to suitable learning activities. "Studies on log files are essential for personalization purposes, since they implicitly capture user intentions and preferences in a particular instant of time" (Agosti, Crivellari, Di Nunzio, & Gabrielli, 2010, p. 234). A learner model is required for each student to enable interoperability and to overcome the incompatibility issues created by proprietary solutions for achieving personalisation (Muñoz-Merino, Kloos, Muñoz-Organero, Wolpers, & Friedrich, 2010).

"The use of the Web to deliver open, distance, and flexible learning has opened up the potential for social interaction and adaptive learning, but the usability, expressivity, and interoperability of the available tools leave much to be desired" (Griffiths, Beauvoir, Liber, & Barrett-Baxendale, 2009, p. 201). Interoperability should not be an issue with which learners have to concern themselves, portability must be seamless to the learner if effective use of technology-enhanced learning is to be achieved (Bovey & Dunand, 2006). Figure 4 shows how details relating to the course, learner and personalisation rules need to be linked to facilitate the selection of personalised learning activities to suit individual students learning requirements.

A learner model is required to record learners knowledge to facilitate adaptive selection of interactive content for individual students (Brusilovsky et al., 2008). Paireekreng & Wong (2010) observe that prior knowledge on each learner is required before an effective user profile can be created, and used to achieve personalisation. Liang, Zhao, & Zeng (2007) successfully employed the use of "a bahavior matrix and weight matrix to compute the user's interest in each leaf topic in the topic ontology" (Liang et al., 2007, p. 417) by using data mining methods to precisely ascertain user behaviour while reading material contained in an e-learning system. The use of a learner model, is to enable the personalised learning system, to automatically select appropriate learning resources, based on the metadata con-

Figure 4. Course, learner and personalisation rules combined to achieve personalised learning activities



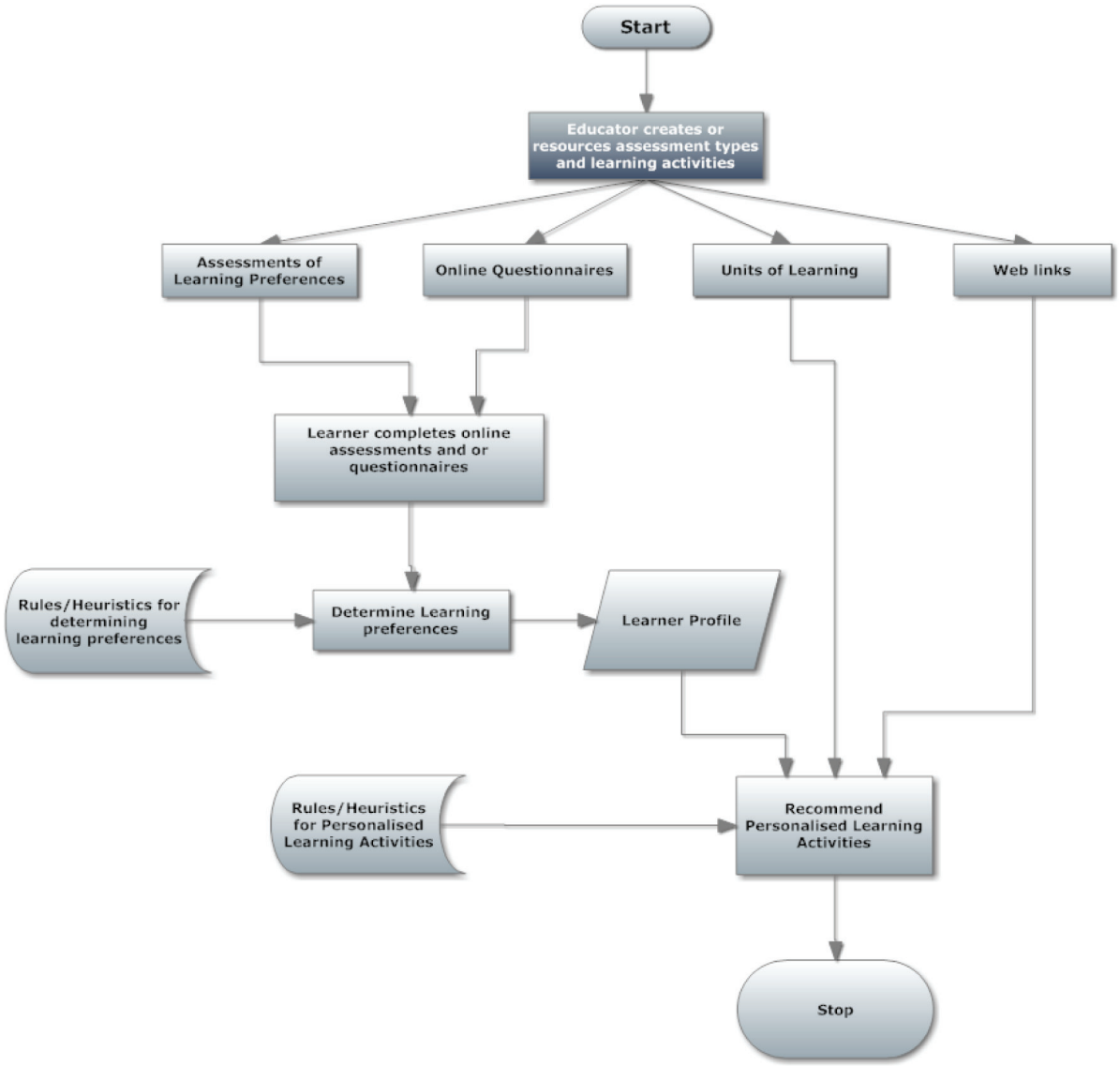
tained in the learner model (Capauno et al., 2009). Kritikou, Stavroulaki, Darra, & Demestichas (2009) stress the importance of discovering users learning preferences, without causing any inconvenience to the users. Takata (2010) set up a pedagogical model for personalised e-learning, to support weaker students and inadvertently found, that the stronger students could possibly also benefit, from engagement with the pedagogical model.

Students Learning Preferences

Learning theories are a combination of principles, rules and techniques, which have been formed through: speculation, research and hypothetical testing on how knowledge acquisition occurs. In Pange and Pange's (2011) paper on learning theories they suggest "in contrast to traditional learning, where there is a pre-established lesson plan, online learners should be given the chance to determine the learning agenda according to their personal needs" (Pange & Pange, 2011, p. 62). Armstrong and Weidner (2011) propose that the use of personalised learning activities, to match specific learners needs, are necessary in the provision of continuing education for athletic trainers, and other health care professionals, to assist them in providing high quality care for patients.

There is still controversy around the best approach to adopt for determining students personal learning needs. Due to the fact that traditional uses of e-learning failed to improve students' performance, Chatti, Jarke, & Specht (2010) recommend that new designs for technology-enhanced learning models should be devised to address the needs of 21st century learners, through the provision of personalised learning, tailored to suit the individual characteristics of learners. Provision of personalised learning activities to suit students' individual learning needs is not easily accomplished. Figure 5 depicts a process

Figure 5. Process to recommend personalised learning activities based on learning preferences



to recommend personalised learning activities to students based on individual learning preferences. Initially, educators create or resource assessment types and learning activities. The learners engage with the assessments and online questionnaires, the results of which are stored in the learner profile. Information from the learner profile is used in conjunction with the rules to achieve personalisation, to match individual students learning requirements with learning activities.

The application of e-learning in higher education gives learners more control over their learning experience by allowing them to select the type of learning methods most suited to their individual learning needs. The use of personalised e-learning activities to suit students learning preferences may perhaps further improve the learning experience. Pange & Pange (2011) claim that efficient use can be made of e-learning when learners are presented with educational resources

which suit their learning styles. Some authors use the term learning styles interchangeably with learning preferences in their research.

ISSUES, CONTROVERSIES AND PROBLEMS IN AUTHORING PERSONALISED LEARNING ACTIVITIES

As shown in the introduction and background sections of this book chapter, the uses of personalised learning activities possibly have the potential to improve students' learning experiences. But, the realisation of personalised learning activities for use by many learners is not as yet easily achievable by non-technical authors. Some of the issues, controversies and problems encountered in trying to achieve personalised learning activities to suit all students learning preferences are discussed in this section.

Issues

Ocak (2010) in an article which explains why faculty members are not using technology-enhanced learning to enhance traditional teaching methods as a form of blended learning concluded by saying "the results suggest that teaching blended courses in higher education is a serious and complex issue to address" (Ocak, 2010, p. 10). If faculty members, find the introduction of blended learning too serious and complex an issue to address in higher education, the introduction of personalised learning activities, to suit individual students learning preferences, would pose even more serious, and complex challenges for faculty members to address.

Hwang, Chu, Shih, Huang and Tsai (2010) conducted a study on a context-aware learning environment and observed that "teaching burdens might be increased by the students' insufficient knowledge of how to use the new technology" (Hwang et al., 2010, p. 62). This is an interesting observation and one that could have a big impact on the adoption of personalised e-learning. In a study conducted by O'Donnell (2008) lecturers mentioned time constraints affecting their use of e-learning platforms. The use of authoring tools to create personalised learning activities would also adversely impact on lecturers' time. The use of tools to gauge students learning preferences take more time and effort to administer and implement than many educators are willing to devote to this singular activity (Pitts, 2009). In addition, the use of personalised learning activities would impact on class time because lecturers would have to train students in the effective use of the system to access the personalised learning activities as lecturers currently have to do when utilising e-learning platforms with students. Class time is taken up with training students in the use of learning management systems, checking that all students can log in successfully, ensuring all students can access the units of learning, participate in discussion boards and so forth. As well as developing a competence in using an e-learning platform or learning management system students would also have to achieve competence in using the system which delivers personalised learning activities. If the use of personalised learning activities is to be realised, the effective use of such activities would have to be seamless to the learners by avoiding complex information technology issues and conflicts which may not be easily resolved and may deter potential learners from engaging with the learning activities.

In a study conducted by Saeed, Yang and Suku (2009) they observe "a major obstacle in the practice of web-based instruction is the limited understanding of learners' characteristics and perceptions about technology use" (Saeed et al., 2009, p. 98). More research is required on determining criteria for ascertaining learners' characteristics and establishing learners' perceptions on the effects technology has on their educational experience. The provision of pedagogically proven techniques which can determine learners'

characteristics may assist educators in web based instruction. In addition, educators perhaps should consider learners' perceptions about the use of technology in education and incorporate some learner feedback in their approach to web based instruction.

Luik (2011, p. 128) states "most boys and girls interact differently with educational software and have different preferences for the design of educational software", this is another issue which could be addressed by the creation of personalised learning activities to suit learning preferences of individual students. Luik's research concluded by saying that further research was required in this area, further research on gender preferences could complement and augment ongoing research into personalised e-learning.

Controversies

In a paper based on data mining web usage to ascertain users needs by Eirinaki and Vazirgiannis (2003) they state "many of the methods used in user profiling raise some privacy issues concerning the disclosure of the user's personal data, therefore they are not recommended" (Eirinaki & Vazirgiannis, 2003, p. 21). With the prolific use of the World Wide Web many data mining methods are applied to harvest information on users. Much of the information harvested is of a personal nature which could be interpreted as an invasion of privacy. Privacy issues are controversial in adaptive hypermedia systems but in adaptive educational hypermedia systems, data harvested and stored in user profiles would only be accessible and used by the adaptive authoring tool which determines the personalised learning activities and controlled by the educators in charge of the course of study. Each educational institution will have guidelines in place on the correct storage and use of student information.

"A personalized e-learning service provides learning content to fit learners' individual differences" (Liu & Yu, 2011, p. 107). Recently there have been some controversial discussions on the perceived usefulness of determining students differing learning characteristics, styles or dimensions as they are perceived to change over time. What specific learning characteristic, dimension or style should be used in determining personalisation? The GRAPPLE projects ambition was to address several learning characteristics as follows: The GRAPPLE project aimed at delivering to learners a TEL environment that automatically adapts to personal preferences, prior knowledge, skills and competences, learning goals and the personal or social context in which the learning takes place (Glahn, Steiner, De Bra, Docq, & O'Donnell, 2010; Glahn et al., 2011; Glahn, Steiner, Verpoorten, F., & Mazzola, 2010; Steiner et al., 2010). Some would argue that this was a very ambitious project and that too many dimensions were available for consideration and selection. To stress this point the following quote from Arora et al. was chosen "however, it is rigorously debated what these dimensions are, if they are fixed or changeable, and which scale gives the most accurate purview into the various learning dimensions of students" (Arora et al., 2011, p. 29).

Crawford & Earley (2011) while running a pilot for a personalised course leading to a professional qualification discovered "the only barriers to learning related to individual's learning styles and preferences" (Crawford & Earley, 2011, p. 105). Controversial research discussions have taken place for years on how best to determine individual learners learning styles and preferences and no one clear solution has as yet emerged.

Hsu, Lin, Ching, and Dwyer (2009) conducted a study on navigational path preferences of sixty-eight undergraduate students and concluded that "navigational mode might not be a critical factor for consideration while designing web-based instruction" (Hsu et al., 2009, p. 282). If this is not a critical factor for consideration in designing personalised learning activities to suit learners' navigational preferences then it is one less learner dimension for educator authors to consider. It

would be interesting to see if other researchers who investigated similar studies came to the same conclusion.

Analysis from research conducted by McQueen and Webber (2009) stated "that first- and second-year students were united in their greater preference for explicitly exam-focused lessons within a socio-emotionally safe learning environment" (McQueen & Webber, 2009, p. 241). True learning and acquisition of knowledge should not be based on examination focused learning but on a broader understanding and appreciation of the underlying concepts of the specific subjects on the syllabi.

Findings from a study of one hundred and thirty-two students undertaken by Clayton, Blumberg and Auld "indicated that most students preferred traditional learning environments" (Clayton, Blumberg, & Auld, 2010, p. 349). In contrast findings from a study of three hundred and twenty students undertaken by O'Donnell and Sharp were that 82% of students agreed that using technology in higher education effectively enhances the learning experience of students (O' Donnell & Sharp, 2012) these findings are consistent with those found by McLoughlin (2000). In addition, in a study of two hundred and twenty-three students and forty-one lecturers conducted by O'Donnell (2008) 77% of students and 61% of lecturers agreed that using an e-learning platform as a form of blended learning improves the learning experience of students more than using traditional teaching methods alone. Students' preferences for traditional learning environments over non-traditional learning environments pose interesting research questions and require further research.

Problems

Shishehchi, Banihashem, Zin and Noah (2012) observe that the biggest problem with e-learning systems is that all learners are presented with the same learning material. This is a problem associated with e-learning systems but it was also a problem associated with traditional teaching methodologies, the educator would arrive in the lecture theatre and deliver the same lecture to all of the students present. Each individual student would make their own sense of the information being transferred dependent on their prior knowledge, motivational levels and various other influential factors. The traditional lecture theatre scenario was that the lecturer would be active in delivering the lecture, and the students would passively absorb the information and turn it into useful knowledge. Some are of the opinion that personalising e-learning activities to suit individual students learning preferences would enhance the learning experience. Some studies suggest that students do benefit from engagement with personalised learning activities, but these are small scale studies, undertaken with specific groups of students, by educators who are particularly well versed in personalised learning activities, and have proficient expertise in ICT. "Adaptive technologies in the field of education have proven so far their effectiveness only in small lab experiments, thus they are still waiting for being presented to the large community of educators" (Armani, 2005, p. 36). Despite years of research, authoring tools for creating personalised learning activities which are effective, efficient, and easy to use by many educators are still not freely available on the web, for use by the large community of educators. Many commercially available e-learning authoring tools also lack the functionality to create personalised learning activities.

"Several successful applications and pedagogical frameworks exist, but mass employment of adaptive educational hypermedia in education to achieve personalisation is still lacking. We believe that authoring difficulties are the main problem that remains" (De Bra, Aroyo, & Cristea, 2004, p. 24). The next step in this research is to establish educators' opinions on the need for personalised

learning and if there was a suitable authoring tool would they use it to create personalised learning activities.

"The IMS Learning Design specification brings many pedagogical benefits when compared with earlier open specifications for eLearning. It is not, however, easy for teachers to understand and work with" (Griffiths & Blat, 2005, p. 1). The majority of educators are already pressed for time and therefore will be reluctant to spend time with learning design specifications which are difficult to understand and work with. It has long been recognised that students learning preferences differ (Arora et al., 2011) the problem for educators and learning designers is how best to address the problems of learning design specifications to further improve the learning experience of students through the use of personalised learning activities based on students learning preferences. Dunn, Craig, Favre, Markus, Pedota, Sookdeo, Stock and Terry (2010) suggest that even though educators acknowledge students learning differences, there is very little knowledge of the extent to which educators implement strategies, to accommodate individual learner characteristics.

In a paper based on "initiating student-teacher contact via personalized responses to one-minute papers" Lucas (2010, p. 39) argues that this approach takes more time, but the time commitment made was worth the effort. Unfortunately, not all educators would have the time to commit to personalising responses for individual students. Additionally, not all educators would believe this approach to be deserving of their time. Some educators timetabled with eighteen to twenty four contact hours with students per week would find it difficult to find the time to invent personalised responses to all students or to engage with an authoring tool to invent the personalised responses to students on the educators' behalf.

The creation of personalised learning activities is a complex process. Some existing authoring tools require the assistance of technical experts to instantiate the adaptation rules to match the learners' requirements to the learning activities. The requirement of a technical expert to assist in the creation of personalised learning activities would inhibit some non-technical authors from using these authoring tools. Many educators create learning activities while off campus or during the summer break where technical experts may not be available to assist.

An interesting outcome from a research study based on cultural differences influencing students acceptance of Web technologies was "students from different cultural contexts do perceive and utilize Web 2.0 applications differently for learning purposes" (Yoo & David Huang, 2011, p. 250). The personalisation of learning activities to suit students learning preferences from different cultures is another challenging dimension for educators to consider when determining criteria for adaptation rules for personalisation which requires further research. The use of colloquialisms and certain symbols will mean different things to people from different cultural backgrounds and may influence the context of personalised learning activities.

Problems and Pedagogical Concerns

Some problems identified by Carlson & Jesseman (2011) in their research on graduate student preferences were "the least desirable aspects of web-enhanced learning that were identified pertained to the strain of the time commitment and lack of instructor technological savvy" (Carlson & Jesseman, 2011, p. 133). The difficulty in authoring for student preferences is a well recognised fact in this research area, and one that still deserves further investigation. The time commitment required to support individual student preferences is simply not available to the majority of educators due to large class sizes and other academic and research commitments. Furthermore, the technical expertise required to design personalised learning activities based on student preferences, is extremely specific, and the vast majority of educators, simply would not have the level of expertise required.

One of Carlson & Jesseman's conclusions was simply that "Web-enhanced courses should be taught by instructors who can effectively use the technology required to administer them" (Carlson & Jesseman, 2011, p. 134). Few educators have the ICT expertise required to create effective online learning activities. Not all educators have the technical competence to set up and manage web-enhanced learning courses, fewer still have the technical competence to create and manage the use of personalised learning activities.

Web-based instruction (WBI) is another name for teaching which is facilitated through the use of the World Wide Web. Clewley, Chen, & Liu (2011) conducted a study to test how learners cognitive styles impacted on or influenced their learning preferences and found that "learner's cognitive style tend to determine their preferences for the design of the WBI programs" (Clewley et al., 2011, p. 275). To effectively facilitate personalisation based on students learning preferences, authors need to understand and effectively gauge the different factors which influence individual students learning preferences. Chen & Xiaohui (2011, p. 179) write "cognitive style has been identified as one of the most pertinent factors that affect students' learning preferences." Further investigation is required into the perceived effect and influences learners cognitive styles have on their learning preferences.

Solutions and Recommendations

Using technology-enhanced learning to enhance traditional teaching methods as a form of blended learning is a serious and complex issue for faculty members to address (Ocak, 2010). As suggested by Ocak, using blended learning is a serious and complex issue; the seriousness is necessary to ensure suitability to purpose and the required learning outcomes are achieved. But the complexity could be reduced by educators in the same discipline teaming up to develop an e-learning presence in the form of blended learning, this would reduce individuals workload, benefit the learners through peer review of learning resources and faculty members could benefit from involvement in a supportive e-learning authoring environment. Should faculty members become comfortable with using blended learning courses then the authoring of personalised learning activities will just be another step in the process to effectively using technology-enhanced learning.

Teaching burdens (Hwang et al., 2010) and time constraints (O'Donnell, 2008) may deter educators from using e-learning environments, but the use of e-packs may alleviate teaching burdens and time constraints on educators. E-packs contain e-learning resources which save educators the necessity of creating their own e-learning resources. The learning activities contained in e-packs can be used according to each pedagogues teaching philosophy. E-packs contain a variety of learning activities from which pedagogues can select the ones most appropriate to their teaching requirements. Some time initially spent learning how to effectively use an e-learning environment and e-packs would pay off in the long term. Time to teach students how to use e-learning environments is also a factor for consideration but the 'net generation' are so familiar with technology this should not be an issue.

Should the development of authoring tools to create personalised learning activities, to suit university students learning preferences be realised, such authoring tools could also be used to create personalised learning activities for other learners, including the aged in society (Jones, 2011). Personalised learning activities could also be used for training purposes in work environments, lifelong learning and at various different levels of education.

Mulryan-Kyne (2010) discussed the challenges encountered when dealing with large classes of students and proposed that more active classroom activities may improve the quality of learning experienced by the students. Doumas, Kane, Navarro, & Roman (2011) suggest that web-based

personalised feedback would be a solution for universities to enhance the learning experiences of large classes of first year students. The personalisation of e-learning activities to suit individual students learning preferences may be a relevant solution to dealing with large classes such as the ones mentioned by Mulryan-Kyne.

The findings of research conducted by Prajapati, Dunne, Bartlett, & Cubbidge (2011, p. 76) concluded that "the majority of optometry students have balanced learning styles" and therefore "current teaching methods do not need to be altered to suit varying learning style preferences as balanced learning styles can easily adapt to any teaching style" (Prajapati et al., 2011, p. 76). This is a very interesting observation which requires investigations amongst other cohorts of students perhaps in different disciplines to establish if the same conclusions would be drawn in other disciplines.

FUTURE RESEARCH DIRECTIONS

The next step in this research is to establish educators' opinions on the need for personalised learning, and find out from educators, if a suitable authoring tool was made available, would they use it to create personalised learning activities. Based on educators' opinions and requirements the opportunity is then available to design, develop and implement freely available web based authoring tools which enable non-technical authors to create personalised learning activities to suit students' learning preferences. Such authoring tools would have to be evaluated to determine effectiveness, efficiency and usability to form part of a feedback loop to improve the creation process and suitability to purpose.

Some problems mentioned earlier and identified by Carlson & Jesseman (2011) in their research on graduate student preferences were "the least desirable aspects of web-enhanced learning that were identified pertained to the strain of the time commitment and lack of instructor technological savvy" (Carlson & Jesseman, 2011, p. 133). The time commitment required, could not be expected of educators; who are already pressed for time, between their teaching load, and management expectations of research to be undertaken, and findings to be disseminated through publications. The difficulties encountered and time commitment required, in authoring for individual student learning preferences, require further investigation.

Clewley, Chen, & Liu (2011) conducted a study and found that learners cognitive styles impacted on or influenced their learning preferences, Chen & Xiaohui (2011) suggest that cognitive style has been identified as one of the most pertinent impact factors on learning preferences. Further investigation is required into the perceived effect and influences cognitive styles have on learning preferences.

Students' preferences for traditional learning environments over non-traditional learning environments pose interesting research questions and require further research. Future research studies on learners' views on the use of technologies in their educational experience would further inform the knowledge of learning designers and educators who propose to design personalised learning activities. In addition, further research into how educators themselves perceive personalised learning activities could be integrated into their teaching approaches would be interesting to the general area of learning design and personalised e-learning.

CONCLUSION

Developing personalised e-learning activities which have been specifically selected to suit particular students learning requirements are not easily achieved. They are complex activities to design both pedagogically and technologically. Chiu & Yu (2002) suggested that non-technical authors who do not possess sufficient technical competence to use sophisticated authoring tools

require the use of lightweight authoring tools to create effective e-learning activities. Lightweight authoring tools could also be required by non-technical authors to create personalised e-learning activities because adaptation is quite a complex process (Burgos et al., 2007). The complexity involved in achieving adaptation to such a level that personalised e-learning is achievable by non-technical authors has not yet reduced to such a level that personalised e-learning is commonly used in e-learning practice.

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KEY TERMS AND DEFINITIONS

Activity: A unit of learning which has been created with a view to helping students understanding of a specified topic or threshold concept.

Adaptive Educational Hypermedia Systems (AEHS): Systems which tailor web based educational content to suit learners prior knowledge, perceived needs, and interests based on their previous engagement with the system.

E-Administration: Electronic administration in the context of higher education refers to the electronic handling of administrative tasks. These tasks would previously have been conducted face to face with transaction details recorded in paper based storage systems. The goals of e-administration in higher education are: to improve efficiency in handling administrative tasks; facilitate ubiquitous access by students and academics to universities from anywhere in the world; and to maintain student records in electronic format as opposed to paper based storage systems. E-administration provides university administrators the opportunity to electronically communicate with students who are present or absent from the university, to inform students of registration dates, examination dates, course fees, time tables, and so forth. E-administration provides students with ubiquitous access to universities computer systems to enable: course registration; examination registration; payment of course and examination fees online; and so forth.

E-Dissemination: Electronic dissemination in the context of higher education refers to the dissemination of course requirements and materials by electronic means. Traditionally, academics would inform students of course details and requirements by word of mouth, alternatively through paper based handouts. By using e-dissemination, academics can inform students of course details and requirements electronically. Academics can also disseminate course notes, presentations, web-links, past examination papers and assignments online. E-dissemination allows students ubiquitous access to course materials for downloading, saving or printing.

E-Learning: Learning which is faciliated through the use of technology.

E-Learning Platform: A set of technological tools form part of an e-learning platform which allow: a) students to: (i) manage their online environment by registering themselves onto a module, (ii) maintain private document space (add, delete, edit) (iii) change their password, (iv) upload assignments, (v) work in group, and (vi) add members to thier groups or remove members from their groups. b) academics to manage: (i) a cohort of students part-taking in their course (add/remove students, communicate with all or individual students) (ii) a set of notes and course materials, and (iii) interaction with students, using various social media tools, for example: email, chat and video conferencing. c) administrators to: (i) backup/restore all or part of a course, (ii) assist in the creation of new courses, and (iii) manage the installation of new or updated tools.

Learning Management Systems (LMS): Information systems which enable educators to store course guidelines, course material and learning activities for students to access any time regardless of place providing internet access and appropriate technological equipment are available. Learning management systems are also known commonly as course management systems (CMS) and, increasingly, as virtual learning environments (VLE).

Learning Theories: A combination of principles, rules and techniques which have been formed through: speculation, research and hypothetical testing on how knowledge acquisition occurs.

Personalised E-Learning: The tailoring of electronic learning resources to match the needs of individual learners.

Personalised E-Learning Activities: The tailoring of electronic learning resources to match the needs of individual learners.

Technology-Enhanced Learning (TEL): The use of technology to improve the learning experience.

Threshold Concept: Introduction of a new and previously unexplored view of something which may transform the learners understanding and ability to progress in the subject area.

Virtual Learning Environments (VLE): Virtual learning environments employ the use of the World Wide Web to facilitate interaction amongst learners to enhance the learning experience. Much of the literature refers to VLE as a synonym to LMS.