Pedagogy and Tools for E-learning Practice

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This paper focuses on explaining how different pedagogies may be used for e-learning practice. In particular, this paper discusses a number of educational paradigms such as behaviourism, cognitivism and contructivism and some of their associated pedagogies like communities of practice and collaborative learning. It explores some basic theoretical and practical aspects regarding the use of Information and Communications Technologies (ICTs) including a review of learning theories, pedagogical approaches and learning tools. This review is important because it may allow pedagogies to be described and related to appropriate theoretical models (i.e. Laurillard's conversational framework, Levy's process support in networked learning, Goodyear's CSALT networked learning model etc) through the use of specific technological tools and resources (i.e. Virtual Learning Environments, blogs, wikis etc) This paper offers an understanding and awareness, from the teachers' perspective, in terms of the different pedagogical processes (e.g. communities of practice, collaborative learning), techniques and tools for developing a pedagogical approach that is more consistent and reflexive with teachers' purposes, values and strategies to teaching and learning using ICTs.

Keywords

Approaches, E-learning, ICTs for Teaching and Learninig, Learning theories, Models, Pedagogy

1. Introduction

The rapid development of e-learning is having significant impact in universities and on other educational and teaching providers. Since around 1993, universities have used Information and Communication Technologies (ICTs) mainly for administrative and academic purposes, but recently universities have started to use ICTs in more profound ways enabling new methods of delivery and new teaching and learning strategies which may change or influence the nature of the teaching and learning experience E-learning as a fundamental part of the student learning experience is no longer the preserve of distance teaching universities [1, 2]. Campus-based universities are investing systematically in e-learning technological tools and resources to support the student learning experience. ICTs may be used in combination with face-to-face teaching activities for creating learning collaborations, extending and strengthening learning communities, providing new ways of communicating and investigating and providing a wide range of educational and research based digital resources.

Drawing upon these pedagogical approaches, university teachers may be able to use effectively their associated mediated tools. This is supported by Conole et al [3] who argue that a more theoretical approach to e-learning is to relate theory with the desired features of learning, and then to map relevant tools and resources.

Therefore, this paper focuses on discussing the different learning theories, pedagogical approaches and learning tools, for outlining the different characteristics amongst them in a way that scaffolds practitioners' practice and engagement with these theoretical ideas. This is particularly useful in the context of e-learning where higher educators and researchers seek a clear understanding of the inherent affordances of technological tools and guidance in how to use and integrate these into their educational practice. This may also provide the opportunity to make the relationship between theory and practice more explicit [3, 4].

The rest of this paper is structured as follows: Firstly, the paper highlights the current research interests in terms of ICTs in higher education for exploring the pedagogical perspectives that teachers bring to bear on their use of ICT tools. Secondly, the paper presents the different educational paradigms (i.e. behaviourism, cognitivism and constructivism) from which key components of learning are distilled. Furthermore, a description of different pedagogies is attempted like communities of practice and collaborative learning that may capture the requirements of a pedagogically driven approach to e-learning. Finally, this paper explores some usable e-learning models that have been proposed and practiced from constructivist and other related perspectives and how these may be applied to e-learning practice. This may enable practitioners to more easily draw on the potential use of these models and their associated tools as there is no research evidence of how such models may be applied to effective e-learning practice.

2. E-learning theory

E-learning is a term used in radically different ways by different people. This could be regarded as unsurprising in an area in which definitions and boundaries are in flux. The definition proposed below by Betham [5] provides a common understanding where ICTs are being used as a mediating device that allows participants to access learning resources for developing their learning experiences

"E-learning is defined as learning facilitated and supported through the use of information and communications technology (ICT)"

[5]

However, many practitioners argue that this is a broad definition as some would limit e-learning more narrowly to the use of ICTs for fully distant and blended learning approaches or networked learning. Blending approaches combine the use of technology in and beyond classroom with face-to-face teaching. The term 'networked learning' is used to describe the different connections afforded by the use of ICTs: connecting learners with learners and learners with tutors and learning communities with their learning resources [6]. For example, a VLE may offer interaction and collaborative activity as well as flexible access to digital and multimedia content. The advantage of using e-learning as a broader definition is that the widest possible range of learning models and procedures can be included for reference [5]. Kaplan-Leiserson [7] explains further the definition with:

"A wide set of applications and processes, such as web-based learning, computer-based learning, virtual classrooms, and digital collaboration. It includes the delivery of content via Internet, intranet/extranet, audio- and video tape, satellite broadcast, interactive TV, CD-ROM, and more."

The above definition proposes that ICTs may provide greater opportunities for sharing information between individuals and groups. Benefits for the learner resulting from the use of ICTs by the teachers and the institutions have been discussed by a number of authors such, Brophy [8] and Salmon [9]. Despite the potential to deliver information, ICTs have the

capacity to support a wide range of learning goals and are now integrated into teaching approaches of many higher educational institutions. Laurillard [10] suggests that ICTs have a major role in promoting:

- Self-directed learning and increased student autonomy
- Flexibility and diversity in assessment
- Increased information literacy, ensuring that graduate skills are in tune with those of employers
- Increased productivity and efficiency in higher education.

There is an interest in terms of mapping different technological tools according to their critical affordances. Therefore, Laurillard [10] classified different types of tools which may be used to support e-learning: These are (Narrative, Interactive, Communicative, Adaptive and Productive). Based on this classification, Conole [11] classified further ICT tools according to their usability:

- Narrative – Systems which present material such as text viewers; image viewers, audio and video viewers and electronic whiteboards.
- Interactive – Systems that allow users to interact and then return information based on input, for example, search engines, libraries, gateways and portals
- Communicative – systems that focus on supporting different forms of communication and may be used for a range of functions. These tools may range from asynchronous email, instant messaging and discussion boards to synchronous chat and video conferencing.
- Adaptive – systems that provide some form of formulation where the environment adapts to the users interaction (e.g. Virtual world Models)
- Productive – systems that may be used to process data, such as spreadsheets and databases.

This mapping of tools is important for providing an awareness of how different software may be used for pedagogical driven e-learning practice. For example, a communicative tool like a discussion board may be used for initiating discussions or for explaining students' questions.

2.1 Research areas in E-learning

E-learning research expanded significantly over the last decade. Its growth is due to the impact of the Internet and by national e-learning initiatives and policy drives. There are several research areas for e-learning in higher education which tend to focus primarily on technological aspects, in particular the development and use of multimedia applications and software navigation [12]. Recently, there is a broader base of research because of the impact of the Web and the ways it can be used to support teaching and learning. In particular, there has been an expansion of research exploring the ways in which learning technologies can be used to support communication and collaboration [13], coupled with an increased focus on the associated pedagogical and institutional issues ([14]; [6]). Current research interests in e-learning can be grouped around three main areas: pedagogical, technical and organisational [15].

In higher education there is an increased interest with the pedagogy of e-learning ([16]; [3]), and in particular the development of pedagogical models that can be used as tools for teaching practice, for embedding understandings gained from the various learning theories into the design of learning technologies [10] This also covers some instructional aspects such as understanding effective design principles, and exploration of different models for online courses [17]. However, the pedagogical use of ICTs may be influenced by how

learners use and experience technological tools in their learning activities [18]. For this reason the Joint Infotmation Systems Committee (JISC) is funding an e-learning programme under the e-learning and pedagogy strand. This strand is funding two related themes of work: 'Designing for learning' for exploring the design of learning activities to make effective use of e-learning systems and 'Understanding my learning' for exploring learner participation in and experience of e-learning, taking into account activities such as planning and reflection. Furthermore, under this strand JISC started a project regarding the learner experiences with e-learning. In general the study aimed at describing how learners experience and conceive e-learning as it was perceived that the learner perspective was overlooked in research and development projects [18]. The interpretive framework for this study used a phenomenographic approach in order to describe individual students' approaches in the way they used technology to support their learning. One of the major outcomes of this study was to provide variations in experiences of different modes of e-learning and the implications of these variations. (See also
http://www.jisc.ac.uk/whatwedo/programmes/elearning_pedagogy/elp_learnerxp.aspx)

2.2 Learning theories

There is a wide range of educational schools of thought and learning theories, as modern educational thinkers testify [19]. Many of these theories can be mapped to three broad pedagogical approaches: behaviourism, cognitivism and constructivism. Thus, the educational principles behind conventional learning are not fundamentally different from the principles underpinning e-learning [20] therefore, any of these theories may be applied in e-learning.

2.2.1 Behaviourism

The first of the psychocognitive theories is behaviourism which embodies a model of the learner as a solitary driver for understanding [21] and the acquisition of knowledge as an abstract platonic form. Behaviourism requires subject matter to be analysed as specific associations, expressed as behavioural objectives. This kind of analysis was developed by Gagné [22] into an instructional task analysis system of discriminations, classifications and response sequences.

Instructional Systems Design (ISD) may be seen as one of the pedagogies derived from behaviourism by offering guidelines and procedures for the decomposition of complex tasks into learning hierarchies and detailed prescriptions for the design of instructional programs based on such hierarchies. Also Saettler [23] identified the impact of behaviourism on educational technology with areas such as computer-assisted learning and the programmed instruction movement.

2.3.2 Cognitivism

In response, the cognitive theory emerged. Although it accepts behaviouristic concepts, cognitivism views learning as involving the acquisition or reorganisation of the cognitive structures through which, students process and store information [24]. Therefore this approach provided a basis for analysing concepts and procedures of subject matter curricula in terms of information structures, and gave rise to new approaches to pedagogy. However, as in behaviourism knowledge is assumed to be provided by the teaching and learning context and the student's role is to acquire it. Within this broad perspective, particular sub-areas of cognitive research can be highlighted as particularly influential (e.g. metacognitive processes, mental models, schema theory, and information processing theories of problem

solving and reasoning). The influence of cognitive science on instructional design is evidenced by the computer tutors developed by Anderson et al [25] which are based on the 'expertise' view of learning.

2.2.3 Constructivism

Constructivism is a perspective which is becoming influential in shaping emerging practice in the use of ICTs [26]. According to the constructivist theory, knowledge is being actively constructed by the individual and knowing is an adaptive process, which organises the individual's experiential world:

> "Learning is a constructive process in which the learner is building an internal representation of knowledge, a personal interpretation of experience. This representation is constantly open to change, its structure and linkages forming the foundation to which other knowledge structures are appended. Learning is an active process in which meaning is developed on the basis of experience."[27]

The above definition does not consider the learner as a controlled respondent to stimuli as in the behaviourist approach but as "already a scientist" [28] who actively constructs knowing while trying to make sense of the world through personal experiences, goals, curiosities and beliefs. Constructivists therefore, emphasise the need to engage with the connections between concepts and contexts, through participation in authentic activities in contexts which retain complexity [26]. Authentic learning occurs from engaging in real life complexities and occurrences where the individual is an active processor of information through interaction with rich learning environments allowing students to develop, compare, and understand multiple perspectives on an issue

This need for encouraging multiple representations of knowledge from different conceptual and case perspectives suggests that different teaching strategies may be adopted to provide support for learners to develop their capacity for self-management and other skills needed to become 'intentional' lifelong learners. The adoption of these different teaching strategies creates learning environments that Granbinger and Dunlap [29] term Rich Environments for Active Learning (REALs). REALS promote the need for learners to: identify personal learning strengths and weaknesses; set goals; make and implement plans; manage time effectively; develop metacognitive (reflexive) awareness; and revise plans and actions based on that awareness. More broadly, Grabinger and Dunlap suggest that learners need opportunities to evaluate their own learning and learning strategies by focusing to a wide range of issues related to "content, process, and tools and resources" ([29]: 58).

Constructivist perspectives on learning exist across a wide spectrum, embracing more individual –cognitivist and more social constructivist epistemologies [30]. Cobb [31], Duffy and Cunningham [32] distinguish between cognitive constructivism and social constructivism. The former tend to draw insight from Piaget and focus on individual constructions of knowledge discovered in interaction with the environment and the latter strand of constructivism is derived from the Vygotskian approach and views learning as connection with, and appropriation from, the sociocultural context within which individuals are immersed [31]. The importance of social constructivism for e-learning is that it offers the potential for collaboration and provides the learner to obtain alternative perspectives on issues and offer personal insights; in effect, to engage in meaning making and knowledge negotiation [32]. In a setting of collaborative learning, students may criticise their own and other students' contributions, may ask for explanations and may give counter arguments and, in this way, students will stimulate themselves and other students. (McConnell [13] presents a detailed exploration of collaborative learning).On the other hand cognitive constructivists focus on

making learning more relevant, building on student prior knowledge, posing contradictions, and addressing misconceptions. Across both viewpoints, constructivist educational practices and orientations emphasise active, generative learning, with curricula where teachers continue to perform a critical learning function as learning consultants and guides.

2.2.3.1 Communities of practice

The accounts of community facilitated by technology have been supported by many researchers with social and situated views of learning and the idea of communities of practice in Computer Supportive Collaborative Learning (CSCL). Accounts of situated learning [33] have had a particular influence for e-learning. Lave and Wenger [33] argues that issues of education should be addressed primarily in terms of identities and modes of belonging, and secondarily in terms of skills and information. This view may consider pedagogy for e-learning not just in terms of procedures and techniques for supporting the construction of knowledge but in terms of their effects on the formation of identities. Therefore, the essence of a community of practice is that, through a joint engagement in a particular activity, learners form identities and develop and share practices [17]. A community of practice has been defined by Lave and Wenger [33] using three aspects:

- What is about – as a joint enterprise as it is understood and continually renegotiated by its members
- How it functions – as a mutual engagement that binds members together into a social entity.
- What capability it has produced – the shared repertoire of communal resources members have developed over time, e.g. routines, sensibilities, artifacts and vocabulary.

Lave and Wenger's [33] approach accounts for both aspects of situated learning: meaning is given both to the situated activities and to the process of social identification that determines the learner's activity. However, it is not a description of learning, or of how people learn together. It provides certain guidelines for design principles that address the key question of motivation.

There are two different ways in which the individual may be motivated by other members of the community. First, to become a legitimate participant of a community that provides:

"A way to speak about the relations between newcomers and old timers, and about activities, identities, artifacts, and communities of knowledge and practice."[33]: 29)

Learning in this case is the learning of the practice that constitutes the community. This kind of learning involves the process of becoming part of a community by reaching demonstrated levels of expertise that are required to move towards complete participation in the practices of a community. A second way is that of a community of learners, for whom the practice is learning per se. This broad community provides people with opportunities to improve employment prospects and the skills and information needed for continuous intellectual development and to participate in community life.

3. E-learning practice, pedagogy and tools

Numerous models for e-learning have been proposed and practiced, in UK's higher education setting, from constructivist and other related perspectives, as reviewed by Mayes and de Freitas [17]. These are Laurillards' conversational framework [10], Goodyear's

CSALT networked learning model [6], Levy's framework for process support in networked learning [30] Mayes and Fowler conseptualisation cycle ([34]), Salmon's e-tivities [35], Collis and Moonen's flexible learning approach [16] and Kolb's experiential learning cycle [36]. Each model has a particular focus and emphasis, and is associated with a particular set of theoretical perspectives. Each, therefore, has particular strengths and thus may be used to encourage specific aspects of e-learning. However, there is little evidence of how these models are applied to effective pedagogically driven e-learning ([3]; [37]; [38]); and the representation of the key characteristics embodied in these different models implies that there is the possibility for a better application to e-learning tools and activities [3];[39].

These models may be reflected in actual practice by using a number of different approaches. For example, the networked learning approach may be used to create collaboration processes and interaction by introducing online discussions. This may require from the learner to create explanations that might involve other learners to create alternative positions, wherein the process of social negotiation may occur [6]. Also an important context of thinking about the networked learning approach is in relation to knowledge-sharing activities [13].For example, a group based task may help less able students in particular skill areas to enhance their skills by receiving assistance from more able peers.

3.1Virtual Learning Environments

Another example may be the use of VLEs such as WebCT Blackboard or Moodle. These systems are designed to integrate and build on established networked technologies that are used as separately teaching and learning tools [40] which include conferencing software, e-mail, online resources, search engines, multimedia databases, video conferencing, shared whiteboards and interactive simulations [41]. In fact, VLEs as coined by Britain and Liber [41] are now commonly used in higher education for:

- Flexibility of time and place
- Coping with increased student numbers
- Sharing and re-use of resources
- Collaborative work
- Student-centered learning
- Reducing the administration burden

VLEs may include tools that provide a more collaborative flavor to the learner experience. These tools may be characterised as social software. Social software can be broadly defined as 'software that supports group interaction' [42]. The most common type is likely to be discussion boards. However, applications like weblogs, wikis, tagging and social bookmarking have seen a recent increase in educational practice and are regarded as parts of the Web2.0 concept.

3.2 Weblogs

Weblogs are updatable personal websites, often used as personal journal, consisting of brief paragraphs of opinions, information and links, called posts [43]. The social aspect of blogs may be seen in the ability for students to comment on postings, to post links and information to other blogs. Linking is a major aspect of blogging as it may deepen the conversational nature and also the sense of immediacy [43]. An important context for thinking about blogs is in relation to community development. White [44] argued that teachers may start thinking about strategic approaches to blogs as a medium for community development. That is, in

terms of (1) technology and design: the impact of blogging tools on the community and (2) the social architecture: locus of control, power, identity, interaction processes and the role of subject matter. Furthermore, White [44] distinguishes blog based communities in three main patterns: The blog centric community, the central connecting topic community and the boundaried community.

The main difference between these kinds of blog based communities is based on locus of control power and identity. For example, in blog centric communities the power is firmly held by the blog owners as they can set the rules and norms of engagement. The topic centric blog community's power and identity is distributed across the community because there is no technological platform as each blogger may select their own tool. In boundaried communities, blogs and blog readers are hosted on a single site or platform. Learners may become members of the community where are offered the opportunity to create a blog. Often boundaried communities have other social software tools such as discussion boards, instant messaging and wikis. Power in boundaried communities is held partly by the owner of the platform, who may impose rules but also is exercised by bloggers in terms of the frequency of posting and interest as measured by how many comments a blogger gets. An interesting point made by White [44] is that blog communities may take the form of a network since they are not bounded by the technology and may grow beyond the ability of an individual to keep track of the network. With the perspective of social architecture including the roles and forms of interaction within each type of blog communities, teachers may be able to design their blog community while taking into consideration the role of content or subject matter, their role as facilitators and the role of the technology. In essence, the view of online communities provided by White [44] may form pedagogical approaches for designing and nurturing blog communities.

3.3 Wikis

Wiki software allows learners to easily upload content and easily edited by anyone who is allowed access [42]; [43]. One of the well-known examples is the online encyclopedia Wikipedia (http://www.wikiepedia.org). The principle behind the operation of Wikipedia is that a wiki may be regarded as a collaborative tool that may facilitate both the needs of a large group but also may be used as an asynchronous social tool for the particular needs of small groups [42]. Flexibility, ease of use and open access are some of the many reasons why wikis are useful for group working.

Social bookmarking and tagging are relatively recent additions to the existing social software available [42]. Fundamentally, social bookmarking allows users to store bookmarked links in a format accessible via the internet rather than storing bookmarks in a particular computer. The social aspect of social bookmarking is apparent when tagging is added to the particular functionality [43]. For example, when students add a bookmark to their list, a keyword (a tag) is also added to the link. This has a major importance for education because learners may search their peers bookmarks through keywords (tags) defined by students themselves. The basic principle that this functionality implies is that searching by keywords assigned by other members of the community means that students are able to search in a social context since students are able to share perspectives rather than simply searching information in a webpage [42].

A major long-term development in the use of ICTs is to use tools that afford the creation of knowledge networks. Scardamalia and Bereiter [45] developed a tool specifically aimed at supporting learners to pool ideas and reflecting to these by developing supportive arguments. In the form of notes, learners contribute different perceptions, models, theories,

evidence and reference material in a shared space called Knowledge Forum. Through this space students develop a collective responsibility for the solution of knowledge problems, and the facilitator is assisting students to grow into that responsibility. The learning activity includes the development of ideas and explanations which are then are shared with a group of peers. Then, refinement of these ideas is important as new ideas develop. In this way, Knowledge Forum has a potential for supporting collaborative learning and creative problem solving as it supports the structuring of arguments, it does embody constructivist practice and it may be characterised as precursor to other educational social tools.

4. Conclusions

The paper has showed how educational theories and pedagogical models relate to the use of e-learning tools regarding teaching and learning practice. However, these assumptions have certain implications in terms of the teacher and the learner. One of the purposes of using pedagogically driven e-learning tools is the focus on the role of the teacher in terms of stimulating students to take active control over technological tools and learning processes. As such, every member of the community may be seen both a learner and a tutor. Unfamiliarity of using e-learning tools may prevent both learners and teachers from active participation because the process of criticising and challenging may be apparent from other members of the community. For example, unfamiliarity with the social constructivist approach to learning may create barriers. Teachers and students may not be positive to posting their ideas and opinions for experiencing a phenomenon from a different perspective and for negotiating its meaning with other peers. Therefore, it is important for both students and teachers to be explicitly informed of the nature of theoretical frameworks but also how these frameworks inform the pedagogical use of technological tools.

Establishing an online community through the use of a blog or a wiki is, by itself, not enough. Teachers' understandings of how to use these tools is a critical affordance because they may change the way students and teachers collaborate and negotiate meanings and ideas within a cognitive or social context. Furthermore, technological tools for e-learning are increasingly assisting teachers to change some of their approaches to teaching, and these changes may require teachers to rethink their teaching and learning strategies. Therefore, teachers and institutions may have to address issues which require certain decisions regarding how the use of e-learning tools may be used for a sound pedagogical e-learning practice.

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