

Developing Research Designs and Methodologies for Investigating Learning in Postgraduate e-Learning Contexts

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There are currently diverse approaches to researching learning in e-Learning contexts, as is to be expected in an emergent field of practice. Current approaches focus on return on investment, technologies and implementation, the comparative effectiveness of different environments, student participation and perceptions, course design, evaluation and delivery, and online collaboration and community building.

In this paper, we have chosen some reports of such approaches, which we analyse for their worth in making particular aspects of learning explicit. Using these examples as a frame of reference, we then propose our own approach to meeting the challenges of researching learning in e-Learning contexts: an approach that derives from a biologically based generative view of learning.

We outline the core tenets and characteristic features of such a research approach, including the nature of the research designs and methodologies that might derive from it, and describe how it is being enacted to study learning in a postgraduate e-Learning subject. We conclude by foreshadowing some implications of these kinds of research designs and methodologies for student learning online and in higher education generally.

Introduction

e-Learning¹ is a complex and diverse field, currently experiencing significant and sustained growth within higher education (Alexander, 2001; Dutton & Loader, 2002; Hogarth, Day & Dawson, 2004; Levine, 2003). This is due to a number of factors, including:

- Reductions in public funding (Hogarth et al, 2004) leading to the need for educational institutions to operate as enterprises if they are to remain viable (Levine, 2003);
- A growing demand for education that is more flexible, partly due to an increase in part-time and remote students (Oblinger, 1999);
- Many more students choosing to undertake higher education (Oblinger, 1999);

¹ There is no single agreed definition of e-Learning. For the purposes of this paper the term of e-Learning will encompass the use of computer-based technology to mediate learning, including such things as email, discussion boards and other online electronic environments and including a range of online media.

- The impact of new and emerging technologies (Dutton & Loader, 2002; Levine, 2003); and
- Increasing competition from new providers of post-secondary education (Hogarth et al, 2004)

Many see e-Learning as having the “capacity to increase levels of equity and access for existing students, while others see new technologies as capable of reducing the costs of delivery of programs and courses” (Oliver, 2001, p.407). Conversely, some have expressed caution that the “expectations for technology to transform education are disproportionately high” (Hara and Kling, 1999, p.4).

Whatever the opinion taken, it is clear that e-Learning is becoming widely used within the education and training industries. A survey in December 2001 found that 23% (or 3.7 million) of Australians aged 14 years and over were using the Internet for educational services (DCITA, 2004), a finding that has obvious implications for student expectations of higher education in Australia in the short term. This trend echoes international data, with the global online learning market estimated to be \$70 billion in 2000 (Kelly, 2000, cited in Morrison, 2003).

Diverse research studies are currently being undertaken with a view to enhancing this field of practice. Of primary interest to researchers appears to be: return on investment, technologies and implementation, the comparative effectiveness of different environments, student participation and perceptions, course design, evaluation and delivery, and online collaboration and community building.

In effect, “much of the literature on e-Learning is merely a description what the teacher could do or has done online, while the student experience of those activities goes largely undocumented” (Alexander, 2001, p.14). Furthermore, most studies in this area have focused principally on technological – rather than learning – issues, such as barriers to the use of technology (Hara and Kling, 1999) and problems that have been encountered in e-Learning practice (Peters, 2001).

This lack of research into participant learning is due to the fact that research into e-Learning is still in its relative infancy. While research has begun to create a picture of what occurs in e-Learning courses and other related issues, there are yet to be many fine-grained learning studies in online environments.

In this paper, we have selected six studies that focus on participant learning and attempt to analyse their worth in making aspects of learning explicit. We utilised a variation of document analysis, the “collection, review, interrogation, and analysis of various forms of text as a primary source of research data” (O’Leary, 2004, p.177), to examine the ways in which these researchers collect and analyse data, how they position technology and discussion, the value they place on student learning experiences and finally the apparent nature of their underlying theories of learning.

These examples will then be used as a frame of reference to propose our own approach to meeting the challenges of researching learning in e-Learning contexts: an approach that derives from a biologically based generative view of learning (after Edelman, 1992; Plotkin, 1994, 1997, 2002, 2004; Schaverien & Cosgrove, 1999, 2000).

The core tenets and characteristic features of such a research approach will be described, including the nature of the research design and methodology that might derive from it, as we outline how it is being enacted in a study of learning in one postgraduate e-Learning subject.

We conclude by foreshadowing some implications of this kind of research design and methodology for student learning online and in higher education more generally.

In essence the purpose of this paper is to examine a data set of six diverse and somewhat representative papers for insights they might provide to the development of a methodology for investigating participant learning in e-Learning context. This methodology is currently being applied to one study of postgraduate e-Learning².

Six Studies of e-Learning in Higher Education

We begin by considering six studies of e-Learning in higher education. The first three can be viewed as ‘coarse grained’ in the way they approach the investigation of learning, they concentrate particular aspects of a participant’s experience, such as participation, attributes and approaches, rather than learning itself. In contrast, the second three papers are of ‘finer grain’: they appear to conceive learning in a more complex and diverse way, focusing more clearly on learners and their learning. Table 1 summarises the six papers, describing their purpose, and their methods of data collection and analysis. Within each set of three papers, we now consider similarities and differences with respect to how they position technology and discussion, and how they value student learning experiences.

Three Coarse Grained Papers

The first three studies included for discussion in this paper, are arguably coarse in the way they investigate learning. In the three studies presented here, a focus on participation, student attitudes and approaches is clear. Similarities and differences in how they position technology and discussion and their valuation of student learning experiences will now be considered.

² At the time of submission for paper refereeing we were prevented from providing an indication of the results of this Honours investigation for two reasons. First, we were still in the data collection stage, and as such not ready to describe and analyse fully what occurred. Secondly, one ethical issue of the study, outside the confines of this paper, is the dual roles created by one of us being both research supervisor and subject lecturer. To prevent this duality impacting upon our findings, we decided not to discuss any data until after formal reporting of student results to the university administration. We anticipate that we will be able to provide some indication of results at the time of presentation.

Table 1: Overview of the Six Studies

	<i>Study</i>	<i>Research Approach</i>	<i>Purpose</i>	<i>Context/Participants</i>	<i>Data Sources</i>	<i>Analysis</i>
<i>Coarse</i>	Dennen (2005)	Naturalistic case study	To examine the nature of the discussion.	Nine subjects delivered online, in eight universities.	Interviews, surveys, course materials, and observation.	Data analysis occurred first for each individual subject, followed by comparative analysis of all nine, with no underpinning theory identified.
	Cuneo and Hamish (2002).	Student survey.	To measure the apparent 'depth' of learning based upon the approach to study taken.	Range of subjects at one Canadian University.	Student surveys conducted over three consecutive years.	Students were classified within a framework of six approaches to studying, including deep or surface learners (after Ramsden, 1979, cited in Cuneo and Hamish, 2002) and predictions about their learning behaviours were made.
	Daley et al (2001).	Participatory action research to develop a case study.	To determine if a link exists between a student's attitude and perception of technology and their resulting learning.	Online activities involving students from five universities located in the United States, England and Australia.	Field notes, course materials, student created metaphors of learning through technology and communication.	Data was first reviewed for "overarching themes that depicted connections between learning and technology" (p.129). Data was then further categorised using the Dimensions of Learning Framework (Marzano and Pickering, 1997, cited in Daley et al, 2001) Finally, student metaphors were analysed for their depiction of students attitudes and perceptions.
<i>Fine</i>	Gilbert and Driscoll (2002).	Case study.	Gain understanding of conditions that promoted "knowledge building in collaborative learning communities" (p.59).	A subject integrating constructivist principles and involving twenty graduate students at an American university.	Surveys, student journals and course materials.	Data analysis concentrated on six students, selected as representative of the whole group, in terms of assignment completion and course satisfaction. A "time ordered metamatrix" (p.68) was used to detect patterns and common themes.
	Overbaugh (2002).	Analysis of posts for evidence of cognitive engagement patterns.	To "find and examine patterns of student discourse... to begin to identify ways to make the electronic mailing list an effective learning medium" (Overbaugh, 2002, p.119).	Undergraduate instructional technology subject.	All posts to the mailing list during one semester.	Messages were placed into eighteen categories, based upon the work on classroom language by Bellack, Kliebard, Human and Smith (1966, cited in Overbaugh, 2002). Initial analysis lead to the development of a secondary method of categorisation related to cognitive effort. The three categories – low, medium and high – were "based on the degree of thought, or cognitive engagement, required to formulate the postings" (Overbaugh, 2002, p.125).
	Tisdell et al (2004).	Participatory action research.	The study, undertaken by students and two of their lecturers, investigated the nature of the students' learning experience.	Adult Education Online Master's Program, undertaken by a cohort of eight at a University in America's Midwest.	Online discussion and course materials.	Both the study and course were based upon social constructivist theory. Analysis was developed from Carr and Kemmis's (1986, cited in Tisdell et al, 2004) "action research cycle of planning, acting, observing, reflecting...[therefore the] generation of data analysis and telling of [their] data story was ongoing" (p.119).

Positioning of Technology

Dennen (2005) and Cuneo and Hamish (2002) do not directly consider the enabling technologies involved in their e-Learning contexts. Daley et al (2001), however, place technology at the centre of their study, examining its connection to learning. They attempt to develop a better understanding of “what factors in a technology-enhanced environment fostered learning, what factors created barriers to learning, what learning processes students used, and finally, how students’ thinking and learning patterns developed throughout the course of their technological learning experience” (Daley et al, 2001, p.127).

This central positioning of technology, by Daley et al (2001) yields two extremes of opinion present in the attitudes and perceptions of technology held by the participants: those who viewed technology positively and those who viewed it negatively. Each of the learning dimensions that form the basis of their analysis is discussed exclusively in these terms, for example “students who demonstrated a positive attitude about the on-line learning experience developed the ability to extend and refine their knowledge by abstracting, comparing and analysing different perspectives” (Daley et al, 2001, p.134).

Discussion Purpose

All three studies treated the effectiveness of discussion boards in promoting discussion of ideas related to course content and objectives. Unlike the finer-grained studies that will be discussed later, none of these studies analysed the use of asynchronous discussion for group work or community building.

Valuing of Student Experience

Neither Daley et al (2001) nor Cuneo and Hamish (2002) gave much consideration to the role of the instructor or their actions. However, Dennen (2005) had a clear focus on instructor expectations, action, presence and other related issues, while students were only discussed in terms of “how the integration of discussion activities with the rest of the course activities and requirements impact[ed on]...learner motivation and participation” (Dennen, 2005, p.127).

None of these three studies appeared to provide a precise description of what researchers considered to be learning. Dennen’s (2005) findings concentrate on student participation, Cuneo and Hamish (2002) on student approaches to participation, and Daley et al (2001) on how students’ attitudes and perceptions of technology influenced learning.

Three Fine Grained Papers

The remaining three studies that will be considered provide a finer grained view of learning. Here, researchers seemed to be trying to get closer to the meaning of learning than those already discussed.

Positioning of Technology

All three studies acknowledged a relationship between technology and learning. Tisdell et al (2004) for example noted that technology is simply the delivery format or medium in

which learning occurred and while it both “helped and hindered [their] learning and knowledge construction processes...[it was not]...the primary learning in itself” (p.120).

Discussion Purpose

Across the three studies the purposes of the online interactions varied. Gilbert and Driscoll (2002) wished to allow collaborative group work and the formation of a community of learners to occur. Overbaugh (2002) aimed to encourage students to have ‘meaningful’ discussion to aid learning of subject content, allow students to share ideas and question their own beliefs. For Tisdell et al (2004), online discussion provided an opportunity for a combination of all of these purposes.

Valuing of Student Experience

The tension between instructor and participant purpose or use can be seen clearly in two of the studies – Overbaugh (2002) and to a lesser extent in Gilbert and Driscoll (2002). Obvious overtones of this tension exist in the case of Overbaugh (2002), where the discussion apparently failed to operate in practice as the instructor had planned. Appearing unwilling to relinquish control and follow the direction that the participants wished to take, this researcher risked creating an impression of not valuing the learning that occurred throughout the semester, as it was not consistent with his planned purpose. Another interesting example of his relatively low valuation of the students’ own uses of the discussion, is the fact that a student response to a discussion topic posted by the instructor, regardless of content, was classified as requiring a ‘high’ level of cognitive engagement, while ideas inquiry/response between two students was classified as ‘low’.

Also, in the case of Gilbert and Driscoll (2002), the instructors believed that the main activities of the subject would prove to be authentic tasks for all members and therefore provide an effective learning experience. This was not the case for all students, however, with the researchers concluding that some students did not learn as effectively as they might have, had the planned authenticity been present.

Views of Learning

While all six studies speculated as to whether or not learning occurred, none provided a clear picture of how they might characterise learning in practice. It is our view that if e-Learning research and development is to mature, a clear understanding of what constitutes learning is required. It is therefore important to try to understand in what respects each of these six studies fell short of that.

Dennen (2005) stated that “generating true learning as opposed to a collection of loosely affiliated posted messages on a class discussion board can be challenging” (Dennen, 2005, p.127), however ‘true learning’ is never explored. A brief discussion of creating a learning dialogue, which appeared to be aligned in this study with learning, implied that “there needed to be evidence of two discussants who were communicating in response to each other” (Dennen, 2005, p.136) for dialogue to be present, but Dennen did not discuss how learning is present within these exchanges.

Cuneo and Hamish (2002) appeared to align engaging in certain behaviours with learning using a particular approach. However they did not explicitly state that if certain behaviours were present this may be considered to be learning. Whilst these approaches were categorised, possible learning that results from them was discussed only in very broad terms of behaviours, for example one of their conclusion regarding ‘surface learners’ was that they tended to “skim read and memorise”(Cuneo and Hamish, 2002, p.15).

Similarly, Daley et al (2001) classified students rather than looking at their learning. Although they stated, “Some groups demonstrated high levels of learning and thinking – some groups learned through simply taking in information” (p.136) no explanation or justification was given for this. They saw a cause-and-effect relationship between student’s attitudes and perceptions of technology and learning. On the basis of their findings, they argued for two types of students, learners (who see technology as ‘good’) and those who did not learn (who see technology as ‘bad’).

Gilbert and Driscoll (2002) saw learning in terms of collaboration and community building. Overbaugh (2002) concentrated solely on classifying learning in terms of an individual student’s patterns of cognitive engagement and did not consider learning more broadly for example, as a social phenomenon. By contrast, Tisdell et al (2004) presented a picture of the social learning processes of the whole cohort, but did not consider individual learning.

So, it is possible, in all six studies to make inferences about what is meant by learning – though this is more straightforward in some studies than in others. However, in doing so, three particular difficulties are apparent:

1. These studies’ learning frameworks appear problematic due to their narrowness (for example, some exclude individual learning whilst others exclude social or group learning);
2. None fully describes the seamless nature of learning processes as they occur over time, in many rich and complex dimensions and contexts (though some partially define learning by exemplifying it in terms of particular behaviours, here-and-now); and
3. Most do not appear to be able to resolve the disparity between learners’ purposes and teachers’ intents.

All three difficulties require resolution if the educational significance of e-Learning is to be determined.

Towards a principled e-Learning Research Approach

We now address our reservations about these studies by proposing a methodology that attempts to provide a clearer picture of participant learning in e-Learning environments. That is, we try to describe and analyse students’ interactions in an e-Learning

environment, for their educational significance. Our working research question, deliberately broadly framed, is:

Can postgraduate students learn through e-Learning, over a semester long subject?

Like Tisdell et al (2004) we propose that technology will mediate learning, and will not be the focus of the study. High value will be placed on making sense of student learning, and students will be positioned as independent: free to explore outside the content of the subject and in ways not necessarily prescribed by the course design. In this way we hope to enable learner purposes to be valued, while still considering the influence of course design.

A biologically based generative view of learning will be taken here. This theory (Schaverien & Cosgrove, 1999, 2000) derives from insights gained from the neurosciences (Edelman, 1992) and evolutionary epistemology (Plotkin, 1994, 1997, 2002, 2004). Whilst generativity has long been recognised as crucial to learning (see, for example, Wittrock, 1974, 1994), this biologically based theory has been articulated and tested over the last decade in a sustained series of studies of student and teacher learning, both computer-mediated (for example, Schaverien, 2003; Schaverien & Cosgrove, 1995) and face-to-face (for Schaverien & Cosgrove, 1997).

According to this view, the process of learning is a three-part heuristic: “first, generating variants [in this case, ideas], secondly, testing them and thirdly, regenerating and hence propagating those variants that have survived the tests” (Schaverien & Cosgrove, 1999, p.5).

A generative perspective identifies three characteristics central to learning:

- First, learning is “driven by values” (Schaverien & Cosgrove, 1999, p.5);
- Secondly, it is “a process of generating and testing” (Schaverien & Cosgrove, 1999, p.5); and
- Finally, that learning is “developmental or progressive” (Schaverien & Cosgrove, 1999, p.5).

This theory supplies a means for examining learning, as it allows us to recognise when learning is occurring.

Our Methodology

A case study of students’ learning in a semester-long postgraduate e-Learning subject, this Honours investigation will provide a detailed description of student learning (if and when it occurs).

The subject is delivered online, with two supporting daylong face-to-face workshops over the semester. Online participation occurs through the use of the course management system, Blackboard Learning System (known within UTS as UTSONline). This system

allows for online discussion of course content and collaboration amongst participants to enable group work.

As the subject itself proceeds primarily by way of online conversations on UTSONline, the researcher will collect data by becoming immersed as an observer in this context. Student contributions within UTSONline, their assignment submissions and other data generated by the reporting mechanisms of the Blackboard Learning System will allow the study design to fulfil Stake's (1995) criteria of observing the case in its "ordinary activities and places" (Stake, 1995, p.134). This increases the possibility that the researcher will gain a holistic picture of the context.

Data gained will be analysed for evidence of learning, based upon a generative framework. For example:

- Are students generating and testing their ideas? If so, how? If not, how might this be explained?
- What values appear to be involved?
- Is there progression of ideas over time? If so, in what respects? If not, what has transpired?

Should learning occur, vignettes or snapshots of these contributions and conversations will be used to create illustrative examples of such learning during the semester.

Conclusion

We anticipate that this methodology will enable us to investigate the educational significance of this e-Learning context. By valuing student learning experiences, recognising technology as mediating learning and being open to allowing the analytical framework to develop, around a particular (generative) view of learning during data collection, we hope to enable the study to follow participants' learning experiences to their natural conclusions, rather than pre-empting findings based on lecturers' subject aims. Such an approach ought also to provide insights into other e-Learning contexts, informing both policy decisions and course design, as well as acting as a test bed to advance the generative theory itself.

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