Is there a fit between pedagogy and technology in online learning?

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The study followed a group of online lecturers from different disciplines who were engaged in different levels of online teaching. The researchers' experiences with e-learning have indicated there are a variety of ways by which teaching staff approach e-learning. As new technologies provide a challenge to make learning an interactive and collaborative experience that is guided by social constructivist approach to teaching and learning, some academic staff embrace the technology to enhance their pedagogy and others are reluctant to use the technology.

We conducted qualitative research in an attempt to answer the research questions of what pedagogies are used by teaching staff to facilitate e-learning, and how lecturers change their use and understanding of e-learning techniques. The study suggests that there is a continuum in the way the constructivist pedagogy has been implemented by the different lecturers and also a continuum in the way the technology has been embraced by them. From our observations, we categorised the university lecturers in relation to their pedagogies (level of social constructivist approach) and to the level at which they used the technology, in order to explore how the relationship between these two elements changed.

The study helps us to understand how the technology enabled some of the lecturers to develop their pedagogies and change their perspectives on social learning online. In addition, for others who used social features of the technology to an optimal level the technology helped them accommodate and reinforce the notion of a social constructivist approach to teaching and learning. Finally, the interchange between the ability to use the technology and the adoption of social constructivist approach to teaching raised new questions in relation to implementation of online learning.

Developing quality online teaching environments

Technology is becoming an increasingly important part of teaching in higher education. Universities are shifting more and more from traditional lecture-based courses to online teaching in order to remain competitive and to provide more flexible learning opportunities for students. However, although advanced technology appears to offer enormous scope for developing engaging and interactive environments, the

traditional lecturer-centred knowledge transmission models still prevail (Taylor & Maor, 2000). In spite of the trend towards online teaching, many higher education faculty members are not using this technology and they are unsure of what to do with it if they did (Conard, 2002). On the other hand, technology may be used but the pedagogy may remain traditional.

Developing and providing university courses online is complex and challenging and its success depends not only on the use and availability of appropriate technology, but also on an underlying pedagogy that ensures high quality learning experiences. Although there is a growing body of research in the field of online learning and examples of good practice can be found (Salmon, 2000; 2002), universities still have some way to go in developing highly interactive and collaborative online courses. Therefore, whilst attention is given to developing online technologies, more attention needs to be given to the pedagogy that will enhance quality online learning (Hendriks & Maor, in press). To this end, this paper examines the fit between online pedagogy and technology. We argue that a social constructivist approach to teaching and learning will enable lecturers to create high quality, interactive online learning environments (Hara, Bonk & Angli, 2000; Garrison, et al., 2000). This, however, requires an integration of relevant technology and constructivist pedagogy.

Social constructivism

In the context of e-learning, recent studies have also revealed that the teaching and learning environment can foster interaction, collaboration and negotiation of meaning among participants using particular protocols and a variety of delivery techniques (Maor, 1999, Maor & Hendriks, 2001; Bonk & Cunningham, 1998; Von Glasersfeld, 1995). Key elements in successful e-learning include: affective support, the creation of a community of learners, peer learning, reflective discourse, and student-centred learning with the instructor taking the role of facilitator (Maor, 2003; Jonassen, 2000). This type of learning is underpinned by a social constructivist approach to teaching and learning (Tobin, 1993, Von Glasersfeld, 1995), which involves creating a student-centered approach where the teaching staff assume the role of facilitators and the students engage in learning that is interactive, collaborative and shared among the community of learners.

Our experience with online learning has indicated that teaching staff approach online learning in different ways. There is an emerging group of lecturers who are enthusiastically adopting online learning to match their social constructivist approach to teaching. There is a second group who are using the technology but do not extend their pedagogies to take advantage of the interactive potential of the technology. A third group of lecturers use a constructivist approach in their face to face teaching but they lack technological knowledge and therefore do not use online technology for the same pedagogical goals. Finally, a fourth group still do not acknowledge the potential of using e-learning as an interactive tool for teaching and learning and therefore deliberately do not use the technology in their teaching.

Research methodology

The focus of this research was to investigate lecturers' understanding and use of social constructivism in an online environment. The aim was to examine the experiences of a group of lecturers in order to understand what *pedagogies and technologies* they use in their online courses, and what changes occurred as a result of engagement in this research. A qualitative methodology was undertaken with a view to gain in depth understanding about the fit between technology and pedagogy in online teaching.

Participants

University staff who were engaged in online learning, or who were planning to go online, were invited to participate. Initially the research involved a group of 10 (volunteer) lecturers from different academic disciplines. No incentives were provided, except for the monthly workshops, an addition to their normal workload. The university provides some technical support to the academic staff, however, there is no forum for them to deal with pedagogical issues or other online teaching experiences. At the end of the first year, 6 lecturers were still highly committed to the study. They were from the Environmental Science, Veterinary Science, Law, Education, Information Technology and Humanities.

Data collection

Our two primary methods of data collection for this study were interviews and workshops. At the beginning of the project, participants were requested to complete a questionnaire which gathered data on what online courses the lecturers were engaged in, the kinds of technologies being used and how they perceived online learning. During the project, the lecturers took part in series of interactive workshops that dealt with various aspects of online teaching and learning. The workshops addressed topics such as the principles of social constructivism, technology, collaborative learning, social learning and reflective discourse, WebCT tools, online assessment and action research. Sessions were recorded and later transcribed.

The interviews were conducted towards the end of the academic year and were recorded and transcribed. A number of participants also conducted action research projects, however, these are not reported here.

Data analysis

Results from the questionnaire were analysed using Nud*ist. During the year, data collection and analysis from the workshop discussions were a simultaneous, ongoing activity conducted through a process of category construction (Merriam, 1998).

Participants' profiles and engagement with online teaching

The questionnaire provided an initial profile of the participants and their online activity. The units being taught online were mostly undergraduate, both internal and external. There were undergraduate units, a small number of graduate units, honours or clinical teaching. Most of the internal units had a face-to-face component and the

online component mainly took the shape of discussion forums. Most of the participants therefore started to see the value of using online technologies as a complement to face-to-face internal mode of teaching and to overcome isolation and promote communication in external units.

Among participants, all but one lecturer used the Web. The tools they were using ranged from WebCT, (the official e-learning platform for Murdoch University), and E-mails, assignment submissions, providing feedback and grades, MP3 lectures, to discussion forums, CD of images for image identification, Dreamweaver, story-lab, play-role simulation and online conflict resolution.

The reasons given for why the lecturers used online technologies varied but were classified according to three factors: technology, pedagogy and student learning. Technological reasons included having contact with external students, providing flexible delivery, having less paper flow, speeding up communication with students, making use of interesting media other than books, and providing study material online. Only a few of the reasons stated by the lecturers dealt explicitly with pedagogical issues. These related to stimulating more collaboration and interactivity amongst students, and between students and lecturers, providing more opportunity for discussion and feedback, and enhancing students' learning outcomes.

Using a social constructivist framework to teach online

During this project, participants engaged in a number of workshops aimed at initially exploring their understanding of the meaning of a social constructivist approach to teaching and learning, then establishing a better understanding of the theory, followed by the question of how to adopt this framework in the online environment. Data from the workshop discussions and interviews of individual lecturers are presented in this section in order to describe the main themes emerging from this study. Major pedagogical issues identified included participation, collaboration, interactivity, and the role of the lecturer. These concepts were further analysed in the interview data to investigate the implementation of these aspects in the online courses.

Participation

A major goal of the lecturers was to have students actively participate in the online learning environment. There was an overall concern that students were not participating enough in online activities, and strategies to encourage participation was one of the workshop discussion topics.

Alex, an experienced online lecturer, expressed his concern about students' participation.

> … the only thing that concerns me is that there wasn't good participation from some students. So I am looking for a way to encourage all students to become more active. I might consider the idea of setting quotas for postings (A. Interview, Nov 02).

Rose, a new online tutor, questioned the quality of the participation:

> I initially expected more participation and more well thought out postings. After altering my approach, by intervening more often and making clear what was expected of students, I found that the commitment improved (R. Interview, Dec 02).

Participation increased and there were more well thought out postings after Rose changed her approach and was very explicit about her expectations of the students.

In several cases online activities were voluntary and this did not encourage participation. Jane, who is not currently teaching online but plans to do so, did not want to introduce another assessment tool. Her goal is to achieve participation without the necessity of assessment. She was seeking her colleagues' advice:

> My dilemma is how to actually get people to engage with each other. I don't want to make it another assessment component. But I do want a free flow of information and I'm still working out how I am going to work this… (J. Interview, Jan 03).

The erratic, low level of online participation is also reflected in the following comment by Bob.

> First we had a little hello thing, happy to have you on site etc, then I immediately put up a question, that particular question was answered by two or three students straight away, then I gave a sort of composited answer, a summary from a different view, and a few different links, I was hoping would go somewhere, they all died with it. So I put up another question. It sat there for three weeks. Sure, there were other discussions going on, but they didn't even test the question, so I finally put up another thread to that question…But I'm participating more than I need. (Bob – May 6)

Bob's comment suggests that an ad hoc approach to teaching online would not guarantee successful participation. The need for careful planning and use of technology proved to be essential to successful student participation.

All four examples suggest that although the lecturers have different perspectives on teaching they were looking for strategies to increase participation. The above data emphasises firstly, that structuring the course will influence how well students participate and secondly, the importance of having clear guidelines, clear expectations of the course, a clear set of structures and rules of engagement. These are part of successful online teaching.

Degree of collaboration

A second theme that emerged from the data indicates the varying levels of collaboration between lecturer and students, and between students themselves as well as initiatives to promote collaboration. In an interview, when asked about the social presence of others and how it influenced students' activities, Alex felt that collaboration could be enhanced through the effective use of public and private online spaces:

> This one aspect of the online environment that is valuable is that you can set aside private spaces…students can collaborate in that private space …usually agree on the tack to take and display that publicly (A. Interview Nov 02).

Group-based activities that required students to work together were viewed as an effective way to promote a high level of collaboration. Jane described her way of getting students to work together, by empowering them to decide their goals:

> I usually get people to do a number of different activities in groups. … They have to work together … its usually based on interest so they join together in groups based on what they want to work on and they decide what the goals are going to be (J. Interview, Jan 03).

However, participants generally felt that the level of collaboration in their classes needed to be improved and that not all students experienced effective collaboration. For instance, Frances stated that:

> One of the students said to me that perhaps her group is one of the groups that didn't work so well [together] and she was the only one that did push it …She thought it was very difficult to work because you send out an email message and you've just got to wait (F. Interview 15 October, 02)

The pitfall of lack of equitable contribution amongst group members and also the passivity of "waiting" for interaction to occur causally reduces collaboration between members and reduces the enthusiasm to work online.

As well, without clear direction on how to work with the medium students can't go far and therefore could not collaborate. Another lecturer had high expectations of students' ability to work in groups. However, it would appear that the relatively simple tasks of uploading a file and sharing a document were not easy tasks for students:

> I thought the WebCT presentation space could be used for this because it effectively allows for file sharing. So I thought students could get together on-line, share a document, revise it, amend it, discuss it and produce a group project, so to speak.

Alex attempted to increase collaboration by assigning collaborative group writing projects for students to write together. However, to his surprise this didn't work. The students were unable to use file management system properly:

> most of the students just couldn't grasp what to me was fairly straightforward, the file management system. They just couldn't get the idea of how you put a document up, how you change it, how you rename it, down load it, put it back (A. – May 6)

In addition the study provided an opportunity for the lecturers to collaborate among themselves and to learn from one another. They learnt useful tips from one another, avoided pitfalls, encouraged and supported one another.

Promoting interaction

Interactivity implies dialectical relationships in which people engage in a purposeful and meaningful way to bring about new knowledge and understandings. One of the challenges in creating quality online learning environments is to create opportunities for students to engage in activities that require them to interact with each other. The lecturers used a range of activities with varying degrees of success.

Rose used role-play simulation to encourage interaction. She divided her class into groups and assigned them roles in order to have an authentic discussion on real life problems. Most of the time she was satisfied with the active role of the students, but not always; therefore Rose set a goal for herself to do action research focussed on actively engaging students through role play simulation.

> In Asian studies on-line we've done a role play simulation of a development studies scenario. Sometimes it's worked brilliantly, with all the students involved in the discussion and taking part actively. Other times, and I don't know why this is, and this is actually part of the action research project that I'm doing with Dorit. Other times the discussion doesn't take off and I can't get students involved. (R. – May 6)

Bob indicated that he had little knowledge and understanding of social constructivism and that he was aware that he did not promote interaction and left it to the students to use the online discussion:

> I put up the topics or questions and the students discussed these without any constraints. *After* certain amount of discussion I or the other course coordinator step in and puts up the answers. However, whenever I did this the discussion stop dead (B. Interview, Nov 02).

Kevin also expressed concern about the limited interaction between students and the material online

> *...they* are *not interacting much with staff in this. There is more interaction between themselves to some extent* (K. Interview, Nov 02).

Alex used dispute resolution as a major activity.

> The negotiation process is like a bargaining process online with groups of students playing different roles and then negotiating a solution to the problem, ...the mediation is similar except that you have a third role which is the mediator. (A. Interview, Nov 02).

These examples suggests that most of the lecturers in this group adopted a problem-based and activity-based teaching/learning approach and sought innovative ways to use technology as a way of providing students with opportunities to interact. However, they realised that the technology provided more innovative teaching methods that were only partly adopted by them.

Lecturers' role/attitude

As facilitator, the lecturer's role is to structure stimulating learning opportunities and provide pedagogical and technical support. In this regard, the participants perceived themselves as facilitators or mediators, who exercised less control over students' learning and relied more on student input and independent learning. For instance Alex saw his role as

> try[ing] to encourage discussion among students and participation. So I see myself as creating an environment for the students rather than telling them all they want to know (A. Interview, Nov 02).

Likewise, Rose found that it was important to make clear to the students that her role would not be to answer every posting, "rather my role is that of mediator" (R. Interview, Dec 02). Jane saw her role as one of designing an online environment for students that promotes interactive learning:

> So my task then is to think about how am I going to do the same sorts of things [as in face-to-face teaching] in an online environment or using technology of some description" (J. Interview, Jan 03

It is clear that the lecturers are facing some dilemmas. They had to find the right mix between facilitation and intervention.

Use and understanding of technology

Constructivist online learning activities presuppose the purposeful and appropriate use of technology that enables online lecturers to design quality learning environments.

In our study the lecturers revealed different levels of understanding and use of collaborative technology. A few lecturers who were knowledgeable about technology made use of a wide variety of collaborative, communicative tools such discussion boards, e-mail, chat-rooms and student presentations, while others were limited to the use of e-mails and online discussions.

Rose and Frances, for instance, demonstrated a high degree of technology use. Frances in particular works in an IT area that enables her to make optimal use of technology. Even she, however needed to be creative in using the available technology:

> …[L]earning a new language virtually. You have to learn abbreviations, the emoticons, learn the different way of communication. You have to be more proactive, a lot more humour (F. Interview, Oct 02).

Rose's technical ability improved over time:

> I have added to and diversified the website. For example, changes to the software in the chat-room, added a slide show to accompany academic reports and I've altered the look and feel of the site (R interview, Dec 02).

Bob on the other hand does not perceive himself as an online lecturer and therefore uses the web and collaborative tools in a limited way. He sees online learning as a way of varying the delivery of learning material and noted that "I have very little use of e-learning techniques so far" but notes that he would "like to use modelling and 3D" (B interview, Nov 19). Furthermore, he did not appear optimistic about the benefits of technology but by the end of the study he was more open to the potential of using technology to enhance learning.

Discussion

Although online technology provides opportunities for developing quality online learning, the use of advanced technology will not necessarily lead to quality learning if it is not matched with appropriate pedagogies. Therefore, the pedagogy associated with online learning is crucial. To this end, this paper suggests that the integration of collaborative technology tools and teaching/learning principles rooted in social constructivism can result in a quality online learning environment.

However, our study suggests this may require a shift in the way lecturers perceive and approach their online teaching. The key elements of constructivist learning include collaboration, interaction and co-construction of knowledge (Maor & Hendriks, 2001). The challenge is to translate these theoretical principles into the online environment so that there is a fit or congruence between the technology and pedagogy used by the lecturers.

As with the use of technology, the interview data suggested that the lecturers' understanding and application of social constructivist principles varied, which also seemed to impact on the quality of student interaction and participation. Participants used a variety of interactive and collaborative learning activities such as role-play and synchronous discussion and the technology used ranged from email and discussion boards to virtual synchronous tutorials. However, linking of learning activities and

online tools seemed to be sometime a hit and miss affair. It also depended on lecturers' technological knowledge and skills. Only a small number of participants were fully competent in the use of online technology while others lacked the knowledge to use the technology in an effective way.

Those lecturers who had neither an advanced pedagogical framework nor advanced technological skills faced a steep learning curve in both areas. Those with more knowledge or experience in one or both of these aspects nevertheless found it challenging to integrate pedagogy and technology. For some, technical problems simply made it too time consuming to continue experimentation. For others, adapting face-to-face collaborative and interactive methods into the new technology proved daunting without outside support. One participant suggested that the development of an effective e-learning environment incorporating constructivist principles might take an unassisted lecturer several years of experimentation and adjustment.

Constructivist pedagogy and online technology are clearly compatible and may be mutually reinforcing. However, implementing both to provide high quality e-learning environments requires instructors with appropriate knowledge and skills. Lecturers who rate highly on both the pedagogic and technology continua we have identified will be best placed to take advantage of the synergy between online tools and constructivist teaching methods. Those who are not as well versed in either the technology or the constructivist method will struggle and be unable to realise the benefits of combining them. For all lecturers trying to realise effective e-learning time, support and encouragement will be essential.

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