Pedagogical principles for the design of virtual learning spaces in higher education

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This paper focuses on effective learning spaces in contemporary higher education. Drawing on empirical data from a qualitative study of international students’ experience of blended learning programmes conducted in three computing courses in two Australian universities, a range of issues and challenges are reported. Three pedagogical principles are then presented that respond to these challenges: 1. Enabling learners – learning how to learn in virtual learning spaces; 2. Programming for flexible learning – learning how to manage virtual learning environments; and, 3. Transforming learning – learning how to capitalise on the affordances of new technologies. The pedagogical principles are presented together with examples of types of practices that they support.

Keywords: Virtual learning spaces, pedagogical principles, teaching practice

Introduction

From ancient places like Al-kharaoine (known to be the world’s oldest continuing university) to Bologna (the cradle of western higher education) to today’s modern classrooms, the university has been the traditional gatekeeper and nurturer of knowledge and has prevailed as the quintessential place of formal learning. However, changes to the way we work with knowledge and expertise, supported by the affordances of digital and networked technologies, challenge the structures and processes that have traditionally characterised the university, with some commentators suggesting that universities as places of learning need to be reconceptualised in response to contemporary students’ learning needs and the new spaces that technologies afford (Keppell et.al, 2012; Wilson & Randall, 2012). And so we have seen a proliferation of new types of virtual and blended learning spaces (Brown, 2005), as universities seek to provide a flexible, adaptable and relevant learning experience. Some authors see these new types of learning spaces as change agents, not only for student learning processes and outcomes, but also for teaching practices (Oblinger, 2006).

Research suggests that the incorporation of these new learning spaces in higher education has created a wide range of challenges to higher education teaching practices (Steel & Andrews, 2012), amplified by a lack of maturity in the field of learning space design (Lee & Tan,
Steel and Andrews (2012) argue that teachers need to be supported to rethink their role in such spaces, calling for academic development programmes that address pedagogical beliefs and curriculum and assessment agendas, amongst other things.

Numerous influential frameworks have been developed that seek to support teachers to think through the pedagogical implications of learning spaces supported by the affordances of digital and networked technologies (Collis & Moonen, 2001; Goodyear, 2005; Laurillard, 2002). One example of these is Laurillard’s (2002) Conversation Framework, which seeks to support the interactive dialogue between teachers and students and the discursive, adaptive, interactive and reflective aspects of the learning process. A different view is presented by Collis and Moonen (2001) in their pedagogical profile of a course, where the intention of incorporating technologies into the course is to maximise flexibility and for the improvement of students’ learning experiences. In Goodyear’s (2005) conceptual design framework for networked learning environments, the use of technology is instrumental in supporting the institutional combination of two elements: the teacher’s pedagogical approach (teachers’ philosophy to teaching) and the educational setting including the learning environment, the learning tasks and the learning activities.

This paper builds on this work by reporting the experiences of students and teachers as they engage with blended programmes within postgraduate computer science contexts. Three brief case studies identify issues and challenges emerging in three different blended courses located at two Australian universities. Then, pedagogical implications are proposed in the form of three pedagogical principles that respond to the documented issues and challenges.

About the study

This paper draws on an ethnographic study (Arenas, 2012), conducted at two universities in Australia, that analysed the observed and reported behaviours, attitudes, and experiences of teaching and learning found within multicultural blended learning environments that combine the traditional face-to-face teaching with virtual learning spaces supported by digital technologies.

Within each university site, postgraduate computing courses were targeted for data collection: NetSec (Network Security) and SAD (Systems Analysis and Design) at Site 1; and BAM (Business Analysis and Modelling) at Site 2. Site 1 was located in one of the metropolitan campuses of a multi-campus medium-sized regional Australian university, and Site 2 was located in a large metropolitan Australian university.

Multiple qualitative data sources were used to gain insights into the students’ engagement with and experience of the learning activities. The data included semi-structured interviews, field notes from classroom observations, a reflective research journal, course-associated documentation, and students’ assignments and digital textual records of blog posts and online discussions. Individual interviews were conducted with both teachers and students.
Case Studies – Site 1

Three case studies are provided below, each focusing on a different course. Pseudonyms are used throughout to refer to teacher and student participants. Two of the courses – NetSec and SAD – were located at Site 1. Twelve international students, each enrolled in both courses, participated in the study at this site, and for each course one teacher also participated. The students had diverse educational backgrounds, with different residency time in the country (ranging from 3 months to 18 months). Six were men and six women, including nationalities from Pakistan, Bangladesh, Kuwait and India. All reported that they were experts at writing academic arguments in the English language. They also reported to have expert level knowledge using computer hardware and software and discussion forums; however, only three students reported experience using online learning spaces such as blogs. Site 1 used a purpose-built learning management system (LMS).

NetSec – Site 1 – A digital space provides a place for quality learning

Georgina, the teacher participant for NetSec had more than three years’ experience teaching information technology courses at university. She was a sessional lecturer who combined her professional academic practice with full-time paid work in a senior systems administration role at a prominent Australian financial organisation. She held a Masters degree in information technology from an Australian university.

In NetSec, students were required to use a virtual learning space in the form of a software-based simulator (LabSim™). LabSim™ allowed students to experiment with real world problems in a virtual environment. The LabSim™ acted as a virtual tutor, guiding the students through complex and technical configurations of secured networks. The system could challenge the student to conduct tasks that replicated the real world, providing immediate feedback after the completion of the task. Students were required to use LabSim™ to complete a series of self-directed activities at their own time and pace. Each week, they were required to give evidence of the completion of the tasks by submitting an online weekly progress report for marking.

Issues emerging from the data in NetSec

The use of LabSim™ was seen as a positive and effective experience by both students and the teacher. Interview excerpts reveal three main factors contributing to its success: flexibility of place and time; perceived relevance; and support of ‘deep’ learning.

Manuel (a student from Bangladesh) highlighted LabSim™’s capacity to guide him to construct real world scenarios without being actually exposed to them (and their risks), and he noted the ability to use the tool from home in his own time:

I found the LabSim very useful ...for example; in my home computer I could build a virtual environment to learn routing and networking (Manuel, Bangladesh, Site 1, student interview excerpt).

Georgina (teacher) emphasised the capacity of the LabSim™ for supporting hands-on learning in circumstances where it is not possible or practical for the students to use a live environment:
The integration of the LabSim in the subject was really helpful because a pure technical subject like this should have some hands on practical activities. Because we cannot give them a live environment, giving them a simulated environment like the LabSim is as close as it can be (Georgina, Site 1, teacher interview excerpt).

Bernie (a student from Kuwait) noted what he saw as the relevance of the tool (to industry) and his motivation to seek a deeper understanding of the related principles and practices:

Once I started the course, I found lots of practical things, specially the LabSim … very industry like. That inspired me to put more effort to get a deeper understanding and to implement the knowledge I could get from it (Bernie, Kuwait, Site 1, student interview excerpt).

It is notable that, unlike other online tools observed during this study (and reported below); there was a good fit between the affordances of this adaptive tool, the goals and context of the course, and the expectations and perceptions of the students, particularly in relation to perceptions of industry relevance and usefulness for future careers.

**SAD – Site 1 – Student dissatisfaction with blogging – What is this place?**

The teacher participant for SAD (Richard) was a full-time academic staff member with three years’ experience teaching information systems courses. He held a Masters degree in information systems and a Graduate Certificate in Higher Education (GCHE).

In SAD, student participants were each required to create a blog for reflecting on their own learning experiences in the course. This blogging activity was supported by nine topical questions that were spread over the last nine weeks of the semester. The blogging task was assessed. The teaching staff provided structured marking guidelines to promote quality work and to ensure each student contributed the nine expected reflections. They also monitored students’ progress and provided prompt feedback.

**Issues emerging from the data in SAD**

The use of blogging in SAD proved to be a dissatisfactory experience for both the student participants and the teachers. Issues included students’ lack of awareness and familiarity with blogging, students’ insufficient understanding of how to use blogging to support learning, and the resultant low quality of blog posts against the teacher’s goal of promoting critical reflection and analysis of the subject matter.

Vert (a student from India) “did not have any idea about the existence of [blogs]” (interview excerpt). He reported that using blogs in the context of learning was a burden and that it took him a while to get accustomed to using them for the purposes required in the course. Similarly, Katerina (also a student from India) explained that the blogging activity was “kind of a shock” (interview excerpt) and negatively affected her experience of the course. Another student Kathy (from Kuwait) saw the blogging activity as one part in a suite of new experiences and requirements that made her transition into her course difficult:
What I felt when I came to this university, I found it a little bit tough because everything was new to me; the assignments, the exam preparation, and on top of that the blogs, a very new thing which I found very interesting. However, I think blogs should not be in the first semester (Kathy, Kuwait, Site 1, student interview excerpt).

These students’ lack of experience and knowledge about how they might use blogging to support their learning, and the lack of support provided to them to develop skills and knowledge about effective learning within such a space, resulted in the students’ missing an opportunity to leverage this assessment task as a potential place for learning. Blog entries tended to be limited to short summaries of information, without the reflection, argument and critical analysis that might be expected within the blogging genre. This conclusion about the students’ engagement with the learning space is consistent with disappointment expressed by the teacher (Richard).

The initial idea was to incorporate the blogs as a learning space to enhance learning, but somewhere down the track it has lost that purpose … Some students do not understand this type of technology. Initially they struggle a lot since this is the first time they experience things like discussion forums, blogs and learning management systems (Richard, Site 1, teacher interview excerpt).

It is notable that the students were less concerned with the quality of blog posts as they were with developing the skills to operate in the blog environment. It may be that this focus on operational skills took their attention away from a deeper source of difficulties, that is, their lack of understanding of what might constitute a high quality blog post or lack of skills to engage in this sort of online writing and thinking. We might also speculate about the students’ perceptions of the relevance and future usefulness of this type of activity within the computer science discipline: the relevance of practical skills supported by activities such as the LabSim™ simulation are often more obvious to computing students than more generic skills such as critical thinking, argument and reflection that are valued by lecturers and employers (Lynch et al., 2001).

**Case Studies - Site 2**
The case study course at Site 2 was BAM. Six students participated at this site: three men and three women including nationalities from Australia, Oman, Vietnam, Indonesia and China. Except for the Australian student, Site 2’s students had been living in Australia for a period of between one month and two years. These students had between four and thirteen years’ experience working in an information technology field. Only one student claimed to have novice expertise in computer hardware and software and discussion forums compared to the rest who reported to be highly experienced using these tools. Similarly, two students reported having novice experience writing academic arguments in English, with the rest reporting to have expert level essay writing skills. Except for one student, they did not have substantial teamwork and management experience. A popular, commercially available learning management system (Blackboard™) was used at Site 2.
BAM – Site 2 – “So can we slow it down?” – Volume and pace at the expense of space

Sophia, the BAM teacher participant, was the principal academic teacher responsible for this course. She had completed a Ph.D. in Computer Science and also a GCHE. She had extensive experience as a research scientist in information architecture; and usability analysis and design for various industrial and research projects locally and internationally.

BAM was characterised by explicit links between face-to-face participation and online participation using the LMS discussion forum facility. Students were required to use discussion forums to extend their engagement with concepts initiated in face-to-face classes. There were six discussion forums, three of which were designed for individual participation where students were asked to challenge or critique questions raised by the lectures or peers during the face-to-face classes. There was a general discussion forum for issues arising from the course and two group-project-related discussion forums.

Every other week, each team was required to post a message to the discussion forum sharing ideas and experiences about the group project. Individually, students were required to discuss not only posts from their own group but also from those from other groups; and to bring these issues to the face-to-face sessions for further discussion. In addition, for each week, students were required to write a summary of the weekly mandatory online readings, which they then had the opportunity to discuss further. To ensure each student received due credit for the work, there was also a peer assessment task built into the group project, which addressed both a progress report and a final report.

Issues emerging from the data in BAM

A number of issues emerged from the blending of face-to-face, out-of-class group work and online work in BAM that were seen to contribute to students feeling overwhelmed by the workload and unable to work in-depth with the content. Issues included what was perceived as a high number and frequency of course requirements, the resultant pressure on students to ‘keep up’ with the fast pace of the course, and their response by dealing superficially with course requirements. There were a large number of relatively small activities (both online and face-to-face) that were required of students and all were compulsory.

Taking the student perspective, one of the BAM students (unknown, Site 2) submitted the following anonymous post to the general discussion area, communicating his/her “struggle” with the pace of learning activities and his waning excitement and energy for the course:

I think a lot of needs to be done: assignments, summaries, survey, and participations... Sometimes I am busy during maybe two weeks, and what about my participation then, especially when we have to write a report ... lots of time is needed... so can we slow it down? We don’t have time to think.... We still have other subjects to do, however, I spend most of time struggling with this subject... and it is still hard to understand.... At the very beginning, it was exciting about these new experiences..., however; now, I am exhausted... how about you guys? (Unknown, Site 2, discussion forum excerpt).

In interview, Thomas (student from Vietnam) reported that:
At first, I followed the discussion forum but after a while I found hard to follow. You must read everything, post the questions, reply to others. I have to do a lot of thinking to read, post questions and post answers to other people questions (Thomas, Vietnam, Site 2, student interview).

There was a sense that the students’ feet barely touched the ground before they were off again. The anonymous comment about not having “time to think” was echoed by another anonymous poster who noted the negative impact on his/her engagement with the course’s content:

We all just try to answer questions and questions without any in-depth analysis because we all work against time having many assignments from many subjects due. As a result, we try less and less (Unknown, Site 2, discussion forum excerpt).

Similar sentiments were given by BAM students in interview. Eloisa (a student from Australia) reported not having enough time to make use of feedback received:

I know the lecturer is quite flexible but the feedback that you are getting is difficult to use because of the amount of work that needs to be done: one week we have to write summaries, the next week we have to post questions. You cannot establish a pattern or rhythm of learning (Eloisa, Australia, Site 2, student interview).

Taking the teaching perspective, Sophia programmed the use of discussion forums as virtual learning spaces “for thinking and pushing ideas, a kind of tool for students to support each other and help them to grow” (Sophia, Site 2, teacher interview excerpt). Unfortunately, as exposed above, the results were not as she expected. In her opinion, the effective use of discussion forums ‘requires lots of energy from students, the ability to stop and think and, most importantly, time and strategic management skills’. These are attributes that she did not take into account during the planning and design phases of the learning activities:

I assumed what they would have to know but that was a big mistake, so I learned from that mistake. I learned that you have to really be clear about what you assume from the students right from the start (Sophia, Site 2, teacher interview excerpt).

Reflecting on Sophia’s interview data, the teaching qualifications she held through her GCHE, put her in a position of using and selecting appropriate learning technologies with the purpose of improving students’ learning experience. In this regard, she was aware of the potential value of using discussion forums in students’ learning; however, as she explicitly expressed it, it demands effort and understanding to implement them effectively. The data also suggests that the assumptions and expectations held by her, which she hoped were built into the teaching, and learning environment, were not understood or shared by the students. Unfortunately, from Sophia’s perspective, not much work was done to make her assumptions and expectations explicitly known and understood by the students from the start of the term, which she recognised as “a big mistake”.

The combination of practice with theory and critical discussion was an essential component of the teacher’s instructional design for the unit, and the explicit links between spaces, where
face-to-face spaces and virtual spaces informed and built on each other, might be seen as an effective strategy for building relevance and making use of the affordances of different types of space. However, the programming of the learning activities was such that the workload overwhelmed and discouraged students, and ultimately undermined the learning goals of the course.

**Summary of Issues**

In summary, the issues arising from these three case-studies include:

1. *Familiarity with online tools and how they might be used to facilitate a place for learning.* This issue was particularly prominent in SAD where students’ demonstrated insufficient understanding of how to use blogging to support learning, resulting in low quality engagement against the teacher’s goal of promoting critical reflection and analysis of the subject matter.

2. *Explicit “fit” between student expectations and the types of learning spaces provided.* This issue was noted in NetSec where the relevance and usefulness of virtual spaces were obvious to student, who were then able to engage in “deep” learning and reported a positive experience. This contrasted with SAD, where students perceived the virtual space as a burden and did not appear to be aware of the learning benefits that might accrue.

3. *Perceived manageability of student workload and work flow.* This issue was particularly prominent in students’ experiences in BAM, where the pace of the course was seen to inhibit (and ultimately discourage) in-depth treatment of the content and the capacity to respond to and learn from peer and teacher feedback.

**Pedagogical Principles**

In this section, we seek to translate insights gleaned from the three case-study courses into practical guidelines or principles for the provision of learning spaces that manifest for students and teachers as effective *places* of learning. The pedagogical principles are filtered through a reading of the key themes in the data from each course as summarised above, through a reading of the literature on learning spaces and of best practice within these contexts, a reading of learning and teaching frameworks supported by the affordances of digital and networked technologies, and through our own eyes as experienced and reflective practitioners. It is intended that the pedagogical principles could be used to support the integration of virtual learning spaces in order to leverage the affordances of new technologies in the provision of effective places for learning. The three principles are:

1. Enabling learners – learning how to learn in virtual learning spaces;
2. Programming for flexible learning – learning how to manage workload and work flow in virtual learning environments; and,
These principles are derived from observations made of computing courses of students from diverse educational and cultural backgrounds, but the issues to which they respond might be more generally applicable and found in other disciplinary contexts. Each principle is described and illustrated below.

**Enabling learners – learning how to learn in virtual learning spaces**

Supporting students’ engagement with the assumptions and rationale behind the learning design, the expectations and roles of students and teachers, and approaches that might allow them to leverage the affordances of the online spaces for learning, enables the students to be more aware of what effective learning looks like within the virtual learning space and to be more strategic and reflective in their learning behaviours (McLoughlin & Lee, 2010).

This principle responds to the feeling of disappointment of the teacher participant at SAD and observations about the low quality of student participation within the virtual learning space, and evidence from student interviews of their lack of clarity and skills around how to use course tools to learn effectively. This principle points to the need to support students to develop understandings of what skills are required to meet the requirements of the learning activities and to learn effectively through these activities. In the SAD example, the students could have been better prepared and more empowered to be effective learners if, for example, they had been provided with opportunities to engage with the aims of the online learning activity, the rationale behind the design, and guidelines and examples of what effective participation would look like within the blogging activity and in reflective online discussions more generally. Teachers can play an active role in shaping students online behaviours by modelling the effective use of online tools and explicitly acknowledging and reinforcing quality student contributions.

**Programming for flexible learning – learning how to manage workload and work flow in blended learning environments**

Many considerations inform the programming of learning activities within a course. Links between learning activities can increase the meaningfulness of different spaces and experiences and can potentially enhance the quality of dialogue in any one space and in the course as a whole. However, as seen in BAM high levels of complexity can be overwhelming and discouraging and can work against these goals. Previous research suggests the benefits of providing multiple pathways through course material in order to facilitate student choice and to respond to students’ learning needs (Cornelius et al., 2009; Guest, 2005; Sølvberg & Rismark; 2012). This principle is about creating pathway options that both take advantage of the potential gains of authentic links between face-to-face and virtual learning spaces, but that also empower students to select combinations of activities that provide for effective work flow and deep engagement. Such an approach would be enhanced if it also accommodated students’ individual learning needs, interests and preferences. This principle responds to the workload issue raised in BAM and is consistent with research suggesting that excessive student workloads can result in students’ superficial engagement (Ramsden, 2003), with negative impacts on students’ deep approaches to learning (Garrison & Vaughn, 2008), as
evidenced by this study. The benefits of student choice in such matters is widely recognised (Marton & Booth, 1997; Biggs, 2003) and choice can be facilitated in relation to numerous dimensions of the learning experience, including content (what to learn), strategies (how to learn), and space (where, when and in what mode to learn). Choice is also a critical component for authentic self-direction, which many see as at the centre of effective virtual learning in higher education (Biggs, 2003; McLoughlin & Lee, 2010; Zimmerman & Schunk, 2001).

Transforming learning – learning how to capitalise on the affordances of new technologies

Particular technologies are understood to have particular affordances and constraints (Laurillard, 2002), that is, any one technology can be analysed and understood to afford some types of usages and behaviours while constraining others. Consistent with the finding of this study, where students responded differently to different types of digital media, this principle is about using new technologies to provide new types of learning spaces that take advantage of the affordances of the technologies and related cultural practices, while also retaining the benefits of more traditional spaces and interactions (Littlejohn & Pegler, 2007; Sharpe et al., 2006). In this way the redesign of student learning focuses on programmes and processes becoming more meaningful to users and responding to the challenges identified earlier in this paper. For example, in the case of NetSec the use of technology was experienced as meaningful in terms of its practicality, particularly in the design of courses where it was not possible for the students to use a live environment where they could practice what they learned in theory. In this way, the affordances of the technology were a good fit for the learning aims of the course and for the learning expectations of the students. In fact, the ‘fit’ was so good, that no promotional work was needed on the part of the teacher to convince students of the value of this particular space as a place for learning. There was also a good fit between the affordances of the tool and the needs of students in terms of anywhere/anytime.

Conclusion

The provision of university learning spaces that are experienced as places of learning by contemporary university students and their teachers is not that an easy task. New technologies are alluring, but their affordances and constraints need to be established through a reading of the learning aims of courses and the needs of students and, paramount amongst these being the need for meaning, flexibility and relevance. The pedagogical principles presented here have been developed based on observations within three courses that sought to blend traditional face-to-face spaces with new virtual spaces facilitated by online technologies. It is our intention that the principles put the needs of learning and learners first, such that quality learning can be supported through the meaningful combinations of technologies and their related spaces. In doing so, we have raised issues of students’ skills and understandings in relation to learning technologies, student workload and work flow, and the affordances and constraints of the tools/spaces available.
References


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