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Pedagogic Strategies to Support Learning Design Thinking in a Masters Course

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Abstract

The demand for further skills and qualifications in the educational technology field remains strong as the range of technologies increases and their potential use in educational contexts becomes more compelling. Students registering for the University of Cape Town (UCT) Masters level courses are employed in schools, government agencies, universities, non-governmental organisations, or in the corporate sector, where their role in designing educational technology interventions represents part of their responsibilities. Because they have varying levels of experience in designing educational materials and/or using educational technologies, they need to develop learning design thinking and gain practice with a broad range of pedagogic strategies, theories, and technology tools to be productive in the workplace. Over the past four years we have developed and adopted a course for the needs of people who are keen to apply these skills in their work contexts. We describe here, the pedagogic strategies we explicitly adopted to model and support learning design thinking in one of four modules, Online Learning Design.

The module adopts a learning design framework developed by Dabbagh and Bannan-Ritland (2005) to introduce students to design processes, and uses the same framework as a loose structure for the module and assignments. We apply Dabbagh and Bannan-Ritland's classification of pedagogic strategies to model and analyse approaches to cultivating learning design thinking amongst the students. As an analytic device, we draw on Engeström's (2001) Activity Theory to describe the evolving learning context and our changing pedagogic strategies over four years. We focus on key tensions that emerged from the adoption of a range of pedagogic strategies to cultivate the students' learning design thinking when developing learning activities to communicate complex design issues. The key social change highlighted in this paper is that educational technology educators, aiming to cultivate students' learning design thinking, need to apply their design thinking to their own practice.

Key terms: Pedagogic Strategies; Design Thinking; Educational Technology.

Introduction

We see a strong interest for further skills and qualifications in the educational technology field from applicants to University of Cape Town (UCT)'s Masters level Information Communication Technology (ICT) in Education programme. In considering what such a course might ideally cover, we drew on existing literature (Wakefield, Warren, & Mills, 2012) and our own experience as learning technologists in the Centre of Educational Technology (CET) at UCT to establish the key competencies that employers require. Wakefield et al. identified five key competences which include "excellent communication and related interpersonal skills and managing multiple instructional design projects, but also specific traits, and skills that may make a candidate more successful within the field such as working collaboratively in teams" (2012, p. 3126). In addition, educational technologists must display "design thinking", as noted by a number of speakers at the 2012 International Council for Educational Media Conference[1]. This emphasis, to some extent, reflects how professional practices and knowledge are being shifted. These changes have implications for education and how we engage students (Fenwick, Nerland, & Jensen, 2012).

The students registering for the UCT Masters in Education (ICT) are employed in schools, universities, government agencies, non-governmental organisations, or in the corporate sector, where their role in designing educational technology intervention represents a significant, yet comparatively small, part of their responsibilities. Some are not directly involved as online learning developers per se, but use a range of technologies to support learning in their contexts, work as part of an online learning design team, or manage online learning development and dissemination projects. Some have formal educational experience while others have some exposure to technology but not necessarily in an educational setting.

In order to help these students to cultivate learning design thinking, we have over the past four years developed and adopted the module, Online Learning Design, using a range of pedagogic strategies and an ever-changing set of technologies that exhibit the affordances required to meet the online learning tasks. This paper endeavours to explain and justify our pedagogical approach to assisting educational technology students to develop learning design thinking skills, by surfacing some of the key contradictions that arise in the process and suggesting ways of addressing, if not entirely resolving, the social change necessary for future courses.

This paper specifically addresses the question: "How can educational technology educators develop courses to cultivate students' learning design thinking?" This is a companion paper to an evaluation of the ways in which educational technology Masters students developed learning design thinking in the Online Learning Design module during the period 2009–2012 (Deacon & Hodgkinson-Williams, 2013, in progress). The insights are intended to inform our entire teaching team along with other university educators grappling with ways to promote sound design thinking to underpin the successful development of meaningful, coherent, and interesting online learning activities, modules, or entire courses.

Online learning design

Jonassen observes that online learning design is a complex problem-solving approach because it includes "ambiguous specification of goals, no determined solution path, and the need to integrate multiple knowledge domains" (2000, p. 80). In the Online Learning Design course we define online learning design as a complex problem-solving process of determining what is to be learned and why, by whom and how they might learn best, and then designing, developing, and implementing appropriate pedagogic strategies that optimise the affordances of various technologies available within a specific context to devise suitable online activities, and evaluating their effectiveness. In order to undertake online learning design, the key ability that students need to cultivate is design thinking.

[1] http://icem2012.cardet.org/resources/ICEM2012programFinal.pdf

Design thinking

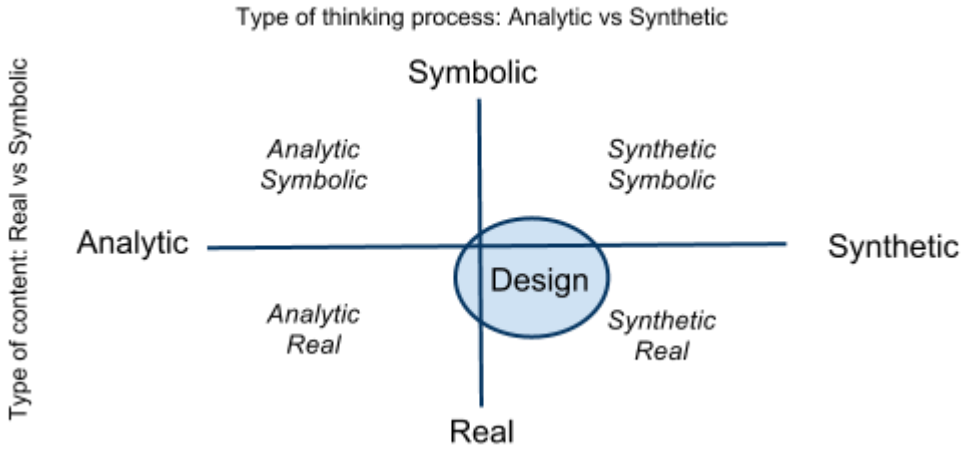
A focus on design thinking is traditionally associated with the arts and engineering education (Huei, 2012). More recently this has been taken up in the educational field (Razzouk & Shute, 2012) and, specifically, in the online learning design discourse as evidenced by blog posts and conference theme [1].

In reviewing the educational literature, Razzouk and Shute found design thinking to be "generally defined as an analytic and creative process that engages a person in opportunities to experiment, create and prototype models, gather feedback, and redesign" (2012, p. 330). Looking more narrowly at the skills needed by educators and more specifically learning designers, Ertmer et al. (2008) explain that online learning design can also be construed as an "ill-structured task". Mishra and Koehler (2003) refer to teachers who are able to make effective use of educational technology as being "design-wise" (p. 99) and to "learning by design" (p. 103) to capture the way they "learn in ways that ties their knowledge of technology to its educational uses (i.e., authentic problem solving)" (p. 103). A conception of design thinking that is particularly apposite to our context, is that of Stanford University's REDlab: Research in Education and Design, which conceives of design thinking as focusing on "needfinding, challenging assumptions, generating a range of possibilities, and learning through targeted stages of iterative prototyping" http://www.stanford.edu/group/redlab/cgi-bin/. This suggests that a key component of the design thinking process is fostering the ability to not only solve problems, but to define problems.

To deepen an understanding of the nature of design thinking, Razzouk and Shute (2012) adapted a conceptual map conceived by Owen (2007) that contrasts content and processes of thinking in various disciplinary fields (see Figure 1). The horizontal, Analytic–Synthetic, axis classifies the disciplinary fields by process (i.e., the way they work and think). Disciplinary fields on the left side of the axis are preoccupied with finding or discovering; disciplinary fields on the right are focused on making and inventing (Razzouk & Shute 2012, p. 333). The vertical, Symbolic–Real, axis divides the upper part of the map into disciplinary fields concerned with the "abstract, symbolic world" (Razzouk & Shute 2012, p. 333) while the lower part of the map represents disciplinary fields that are concerned with the "real world and the artifacts and systems necessary for managing the physical environment" (Owen 2007, p. 18).

Figure 1

Conceptual map for type of content and type of thinking processes (Razzouk & Shute 2012, p. 334).



[2] http://icem2012.cardet.org/resources/ICEM2012programFinal.pdf

This conceptual map locates the synthetic–real "design-type" thinking that the Online Learning Design course hopes to cultivate in the quadrant in the lower right corner. Our course endeavours to support students in developing learning design thinking by requiring them to create a small-scale, context specific, online learning task and then document each step of the design and re-design process in an eportfolio. Leading up to the development of the eportfolio, we employ a number of other educational technologies for specific pedagogic reasons to foreground design thinking.

Learning Design Thinking

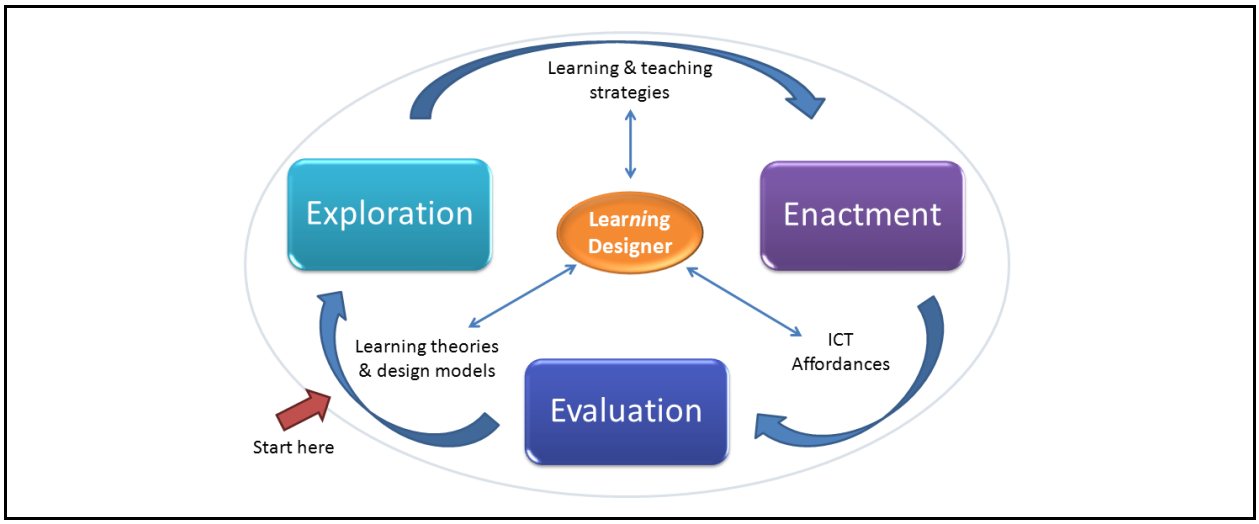
For the purposes of our course, we define learning design thinking as a complex, iterative process of problem-defining and problem-solving of ill-defined learning needs that require a creative and analytic approach through iterative prototyping based on formative feedback. In order to assist students to develop learning design thinking, the Online Learning Design course employs a range of pedagogic strategies.

Online Learning Design course

The core aims of the course are similar to those in instructional design and learning design courses offered elsewhere (e.g., Dabbagh & Bannan-Ritland, 2005). We drew on the Dabbagh and Bannan-Ritland (2005) textbook to provide the learning design framework to introduce students to design processes. This framework provides a common reference point and, in essence, is a variant of the older and widely adapted Analysis, Design, Development, Implement, Evaluate (ADDIE) framework (Gustafsen & Branch, 2007). The design cycle Dabbagh and Bannan-Ritland adopt iterates over three phases: (1) exploration, (2) enactment, and (3) evaluation towards developing a cohesive learning design solution. A feature of Dabbagh and Bannan-Ritland's framework, is the placing of the learning designer at the centre of the design cycle. The motivation being that the learning designer is responsible for making sense of every phase in the design cycle, which is appropriate for small-scale online learning design projects. The same framework, with exploration, enactment, and evaluation (Figure 2), is also used as a loose structure for the course (Horwitz & Hodgkinson, 2010). The course commences with a focus on the student becoming a learning designer, and then unpacks the learning theories and design models and how these relate to a range of teaching and learning strategies. Only then do we introduce information communication technologies and the affordances they offer. The students then revisit these concepts as they step through the exploration, enactment, and evaluation stages as they develop a small-scale online learning activity. They then document their decision-making process of creating this online learning activity in an eportfolio, providing evidence of each stage of development and links to underpinning design theories, implementation activities, and formative evaluations of their pilot online learning activity.

Figure 2

Design framework for the Online Learning Design course (Adapted from Dabbagh and Bannan-Ritland 2005, p. 114).



The course is offered in a blended mode with online pre-course tasks, a six-day intensive face-to-face session, and then approximately five weeks of online post-course activities which, in this case, involved the development of a small-scale online learning activity and an eportfolio. The course is facilitated by the authors of this paper with specific input from other members of the CET staff.

Pedagogic strategies

The course overtly draws on approaches articulated by Dabbagh and Bannan-Ritland (2005) to inform the pedagogic strategies we adopt in teaching the course and in the course content, the readings we have selected, and in the types of assignments we have devised. Our intention being to explicitly reveal our own practices so students can recognise some of the underlying pedagogic strategies we follow. Many of our students do not have a formal educational background and do not always have what Bernstein (2000) refers to as a language of description; in other words, terms conventionally used in educational texts and research to describe and explain the pedagogic strategies underlying the online learning activities they develop. While the overall pedagogy underpinning the task to develop an online learning activity and explain the design choices in the eportfolio is what Dabbagh and Bannan-Ritland refer to as authentic learning, there are many other pedagogies embedded within this authentic learning strategy.

Dabbagh argues that, "Promoting authentic learning activities is the core of all instructional strategies . . . [and needs to] . . . engage the learner in a realistic and meaningful task that is relevant to the learner's interests and goals" (2005, p. 33). Wilson and Cole observe that "by engaging learners in meaningful and relevant tasks, they can see the direct implications of their actions and apply the knowledge gained in real world situations" (1996, as cited in Dabbagh 2005, p. 33). The primary authentic learning activity in the Online Learning Design module involves students developing their own small-scale online learning activity for a specific learning need in their context, and the explanation of their design decisions in an eportfolio. This is a complex task for students and lecturers alike because of its contextual specificity and ill-defined nature.

Embedded in the authentic learning strategies, the Online Learning Design course also employs a range of other pedagogic strategies that Dabbagh and Bannan-Ritland (2005) classify into three broad categories, namely, supportive, exploratory, and dialogical strategies. These are elaborated upon in subsequent sections. While this is a convenient way to broadly categorise types of pedagogic engagement, we have to make the students aware that this is not an uncontested conceptual framework, but one that can act as a useful heuristic. The value of having some ”pedagogic labels” is that students who are not familiar with pedagogical and psychological theories often struggle to explain how they hope their learners will engage in an online learning activity. The broad categorisation into three main strategies also helps students to reflect upon the general engagement they foresee linking the requirements of the task in the online environment and the affordances of the technologies (Bower, 2008) that could assist in achieving the intended outcome(s). Our challenge is to provide students with an experience of a pedagogic strategy so that they have an almost ”embodied” experience of how various pedagogies may play out in the online learning context. Merely ”teaching” students about these strategies does not provide them sufficient experience to apply these possible pedagogic strategies in an online environment.

Supportive strategies

Dabbagh and Bannan-Ritland (2005) group strategies such as scaffolding, modelling, explaining, and coaching, under the umbrella category, “supportive strategies”. Dabbagh notes that:

> Providing the right level of supportive assistance in a learning environment is a challenge for instructors and instructional designers. Novice students and students who already have a significant knowledge base require different levels and types of support to push them to perform at their potential development zone. Therefore, a layered structure to scaffolding is recommended in which novice learners get the support and information they need to help them engage in the learning task without slowing down advanced students who may not need the same level and type of support as novice learners. (Dabbagh, 2003, cited in Dabbagh, 2005, p. 38)

With respect to ”modeling and explaining”, Dabbagh suggests that “when experts model

their internal thought processes . . . students are prompted to reflect on their own performance, compare it to that of the expert’s, and improve their performance” (2005, p. 38).

Exploratory strategies

Exploratory strategies include problem solving, hypothesis generation, and exploration (Dabbagh & Bannan-Ritland, 2005). Dabbagh contends that “problem-solving activities place more emphasis on learning how to learn, rather than learning specific content” (2005, p. 33) and is closely associated with “hypothesis generation” because in the process of problem-solving the learner is prompted to frame a hypothesis, elicit information from a range of sources, and reflect critically before reaching some kind of resolution to the original problem (Dabbagh, 2005). Exploration is also closely associated with problem solving because it involves “limited instruction and guidance from an instructor and more student-generated learning through exploring and discovering information” (Dabbagh, 2005, p. 34).

Dialogic strategies

According to Dabbagh and Bannan-Ritland’s (2005) classification, dialogic strategies include articulation, reflection, acknowledging multiple perspectives, collaboration, and social negotiation. Dabbagh suggests that “when students are provided with opportunities to articulate their knowledge or understanding of something, they are explaining to others what they know” (2005, p. 35). Closely associated with articulation

is reflection which Dabbagh characterises as a "process of analyzing and making judgments about what has happened to give a situation new meaning" (2005, p. 35). The goal of promoting multiple perspectives is to:

> generate cognitive dissonance so that firstly learners are aware that there are multiple perspectives on an issue, which is the case in real world situations. Secondly, learners are engaged in exploring each perspective to seek a meaningful resolution to the issue at hand, constructing new meaning in the context of their own experiences and knowledge. (Dabbagh, 2005, p. 37)

Collaboration can be defined as a "collection of activities that emphasize (1) joint construction of knowledge; (2) joint negotiation of alternatives through argumentation, debate, and other means; and (3) student reliance on both fellow students as well as teachers as learning resources" (Dabbagh, 2005, p. 36). Social negotiation is therefore an "integral component of collaboration" (Dabbagh, 2005, p. 36).

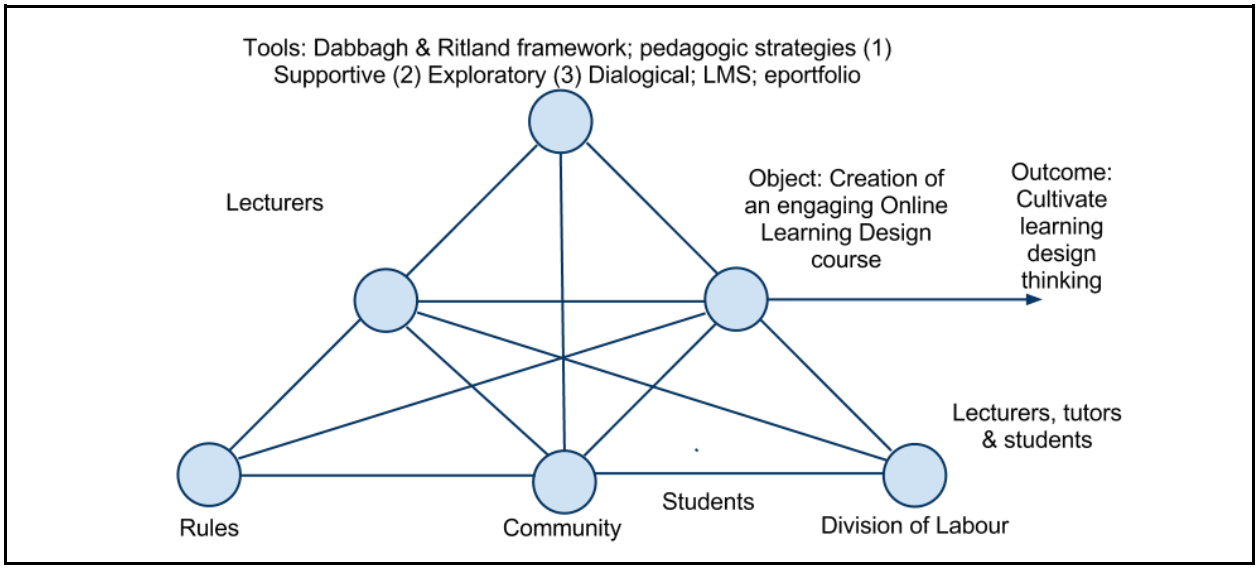
As lecturers, it was our role to use these various pedagogic strategies in concert with various educational technologies in order to mediate, inspire, and model potential pedagogical strategies the students could adopt in the design and development of their specific online learning activity. In this way we hoped to provide students with a learning experience and a language of description to assist them to create an authentic online learning activity and an eportfolio to reflect on design decisions and thereby cultivate their learning design thinking.

Activity theory as an analytical frame

Activity theory, as a conceptual framework, is well suited to investigating the interactions of students and lecturers in the context we have described where there is a common purpose. Activity theory helps identify the unit of analysis, referred to as an activity system. In our case this involves the lecturers (Subject), who use a range of pedagogic strategies and software tools (i.e., mediating artefacts) to assist students to design and develop an online learning activity and reflect upon their design decisions in an eportfolio (Object). Cultivating learning design thinking among students is the intended outcome from this activity (Figure 3).

Figure 3

Activity system for the Online Learning Design course (Adapted from Engeström, 2001, p. 135)



The Finnish educational researcher, Engeström, in extending activity theory recognised five principles in describing an activity system that we will draw upon:

- A collective, artefact-mediated and object orientated activity system, seen in its network relations to other activity systems, is the prime unit of analysis.
- Activity systems are multi-voiced and the division of labour creates different positions for participants, who carry their own diverse histories, and the activity system itself carries multiple layers and strands of history.
- Activity systems take shape and get transformed over lengthy periods of time (historicity).
- Contradictions (historically accumulating structural tensions within and between activity systems) play a central role as sources of change and development.
- There exists the possibility of expansive transformation (i.e., learning) in activity systems. (Engeström, 2001)

These principles are used to describe the model of expansive learning involving staged cycles of transformation. Expansive learning is not the same type of learning experienced by, say, the students in a traditional course involving learning concepts or facts, but closer to that of the learning design thinking we described. In a traditional course the learning outcomes tend to be clearer and the lecturer possesses the knowledge that students are intend to learn. In expansive learning people "learn something that is not yet there" (Engeström & Sannino, 2010, p. 2). The staged cycle can be summarised as (a) questioning practices, (b) analysing past and existing practices, (c) jointly building new models, concepts, artefacts for new practices (d) analysing and discussing models, concepts, artefacts (e) implementing these (f) reflecting on and evaluating processes and (g) consolidating new practices. This cycle closely mirrors Dabbagh and Bannan-Ritland's (2005) framework for learning design.

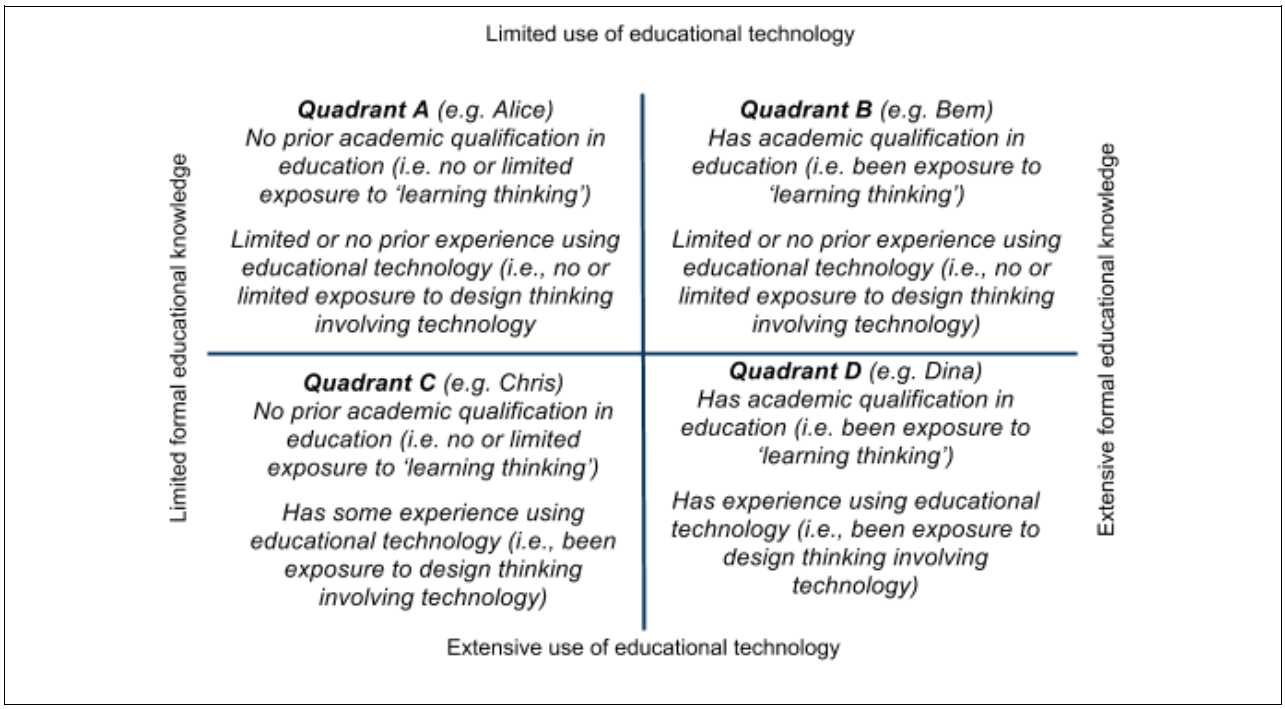
Methodology

This paper is a qualitative case study (Stake, 2005) of the pedagogic strategies adopted in the Online Learning Design course over the period 2009–2012. Of the 58 students there was a roughly even gender split with 27 female and 31 male students. Their ages ranged from 25 to 62 years with the majority in their late 30s, and representing a mid-career stage. This course offers a Mellon Foundation scholarship to students working in higher education institutions in Africa which helped attract a number of students from outside South Africa. There were 33 students from other African countries, 22 from South Africa and the remaining three were working in African countries at the time, but came from Europe or North America. As expected, students' home languages varied greatly and only 10 of the 58 were mother-tongue English speakers.

As a way of mapping our expectations of the students' performance to their actual performance, we systematically assigned each of the 58 students as A, B, C, or D in one of four profiles on our map (Deacon & Hodgkinson-Williams, 2013, in progress). This involved assessing their prior exposure to academic educational knowledge and technology design skills using the course documentation (Figure 4). The horizontal axis classifies students' formal knowledge along a continuum from "limited" to "extensive". The vertical axis classifies students' experience of educational technology along a similar continuum.

Figure 4

Classification map distinguishing four quadrants of prior experience



Students' scores over the four-year period were plotted against the student profile types as a measure of pedagogic success in cultivating their learning design thinking.

Content analysis (Bauer, 2000) of the pedagogic strategies evident in the course learning management system, Vula (meaning *open* in Nguni languages), a localised version of the open source learning management software, Sakai, forms the main evidential base for the paper. The companion paper (Deacon & Hodgkinson-Williams, 2013, in progress) provides a detailed analysis of the students' perceptions of the course.

Adoption of pedagogic strategies to support learning design thinking: analysis of the Online Learning Design course

While as lecturers we subscribe to a constructivist view of knowledge, we do not conflate this with constructivist learning because our experience has guided us to use a range of pedagogies dependent on the particular task and the students' readiness to undertake this task. We deliberately adopt supportive pedagogic strategies at the commencement of the course. Although we did not set out to necessarily model every pedagogic strategy that Dabbagh and Bannan-Ritland (2005) identify, a post-hoc analysis of the Vula course site, and reflection on the reasoning behind our decisions, revealed the adoption of a wide range of pedagogic strategies in service of promoting learning design thinking. We group the strategies that we used for each of the three main phases of design, namely, exploration, enactment, and evaluation, because these broadly mirror a pedagogic progression from the more supportive pedagogic strategies, through the exploratory, to the more dialogic pedagogic strategies adopted later in the course. It is important to note that the exploratory strategies as defined by Dabbagh and Bannan-Ritland (2005) should not be conflated with their exploration phase of design.

Exploration phase of design

Supportive strategies

Because the students presented diverse prior knowledge and experience, the course needed to provide sufficient cognitive scaffolding for those new to the field. In order to establish the type of scaffolding required and to model the design practice of assessing students' prior learning we administered a pre-course survey. In 2009 and 2010 the survey results were used to inform the lecturers only, but in 2011 and 2012 the survey findings were reported back to the entire group to give students a sense of the diverse prior qualifications, experience, and expectations in their cohort group.

One of the most basic pedagogic strategies adopted in the course was the use of the Vula wiki, or content outline tool, to provide a hyperlinked class schedule to presentations, associated readings (in the course reader and/or online), assignments and rubrics—to organise and manage the resources used in the course. What emerged from the types of activities on the Vula site was that the scaffolding provided expanded each year as we increasingly appreciated the value of having all the course activities linked to one dynamic page as a way of simplifying a complex course design, and keeping it current.

In 2009 and 2010 the lecturers took prime responsibility for reviewing and explaining some of the key instructional design and pedagogic literature summarised in PowerPoint slides. However, due to the need for the students to engage more deeply with these concepts, we changed our strategy in 2011 to allow the students to take responsibility for explaining particular design theories or elements of these theories to each other during in-class teach-back sessions. This more student-led supportive activity seemed to assist the students to develop at least one or two areas of expertise which they could use as a measure to compare against other design models. At that point they were not yet learning by design, but learning by explaining design. This change in pedagogic strategy altered the balance of power in the class and allowed the students, who were mostly other academics, to take a more central role in supporting each other.

Exploratory strategies

To encourage students to commence their design thinking by exploring their individual contexts, one of the pre-course activities required them to undertake an individual thinking and resource-gathering task. It was explained that:

> During the course you will be asked to describe a situation in your context where an online learning activity could be a useful response to a specific:
>
> - learning need (i.e., where school learners, university students or employees have expressed their desire for particular instruction or support)
> - teaching need (i.e., where school teachers, university lecturers, staff trainers have expressed their wish for teaching their area of expertise or supporting their learners, students or peers)
> - institutional need (i.e., where an institution has decided to offer a course via distance learning or through a combination of distance and face-to-face teaching – sometimes referred to as "blended learning").

Students were requested to bring along any resources (e.g., lesson plans, curricula, training manuals, evaluation reports, links to URLs, teaching and learning reports), that might help them describe their learning, teaching, or institutional need. This strategy remained constant over the four-year period.

Dialogic strategies

In preparing the teach-back sessions during which they prepared a short lecture on a specific section of the online design implementation process, we initially allocated students to collaborative groups before the face-to-face sessions, but changed our strategy to have students self-select the peers with whom they chose to work because students seemed to be ambivalent about the value of collaborating with an assigned partner, especially for graded tasks.

As a way of encouraging multiple perspectives, in 2009 and 2010 students were introduced to four instructional design theorists broadly representing behaviourist, cognitivist, constructivist, and social learning inspired theories. Because we were concerned that our selection might be too restrictive, and because students seemed to gravitate to the theory they had presented in a teach-back session, we introduced four additional theorists in 2011 and 2012. We suspect that this gave them too many options because many reverted to the Dabbagh and Bannan-Ritland (2005) model alone, unfortunately defeating our initial objective of encouraging multiple perspectives on learning design.

Enactment phase of design

Supportive strategies

In 2009 and 2010, lecturers coached students to develop an authentic online learning intervention and explanatory eportfolio. From 2011 and 2012 students were encouraged to invite at least one peer to review their eportfolio, and in 2012 students without prior educational technology experience were paired with a student tutor or one of the lecturers for one-on-one coaching.

Evaluation phase of design

Dialogic strategies

The key pedagogic strategy adopted in all four years was that of reflection. Students were required to formally reflect, in groups, upon the value of one day of the face-to-face session; individually, upon the lessons learned in the process of developing the eportfolio; and then to provide a short self-assessment of what they felt were the most well-developed sections of their eportfolios, and which they felt warranted further development. Given our prior experience, in a previous course, of students being requested to reflect in blog entries, we realised that students needed some support in what was understood by reflecting so that they moved beyond mere description of the course or their online learning design activities. Although students were free to choose the structure of their reflections, we adapted a framework of Mezirow (originally adapted by Panda & Juwah, 2007) to provide a useful way to prompt students through the stages of observing, questioning, making meaning, validating, appropriation, and transformative learning. Despite this prompting and the in-class opportunities to witness various forms of reflection, the evidence of reflective thinking varied quite widely among the group of students.

Course performance

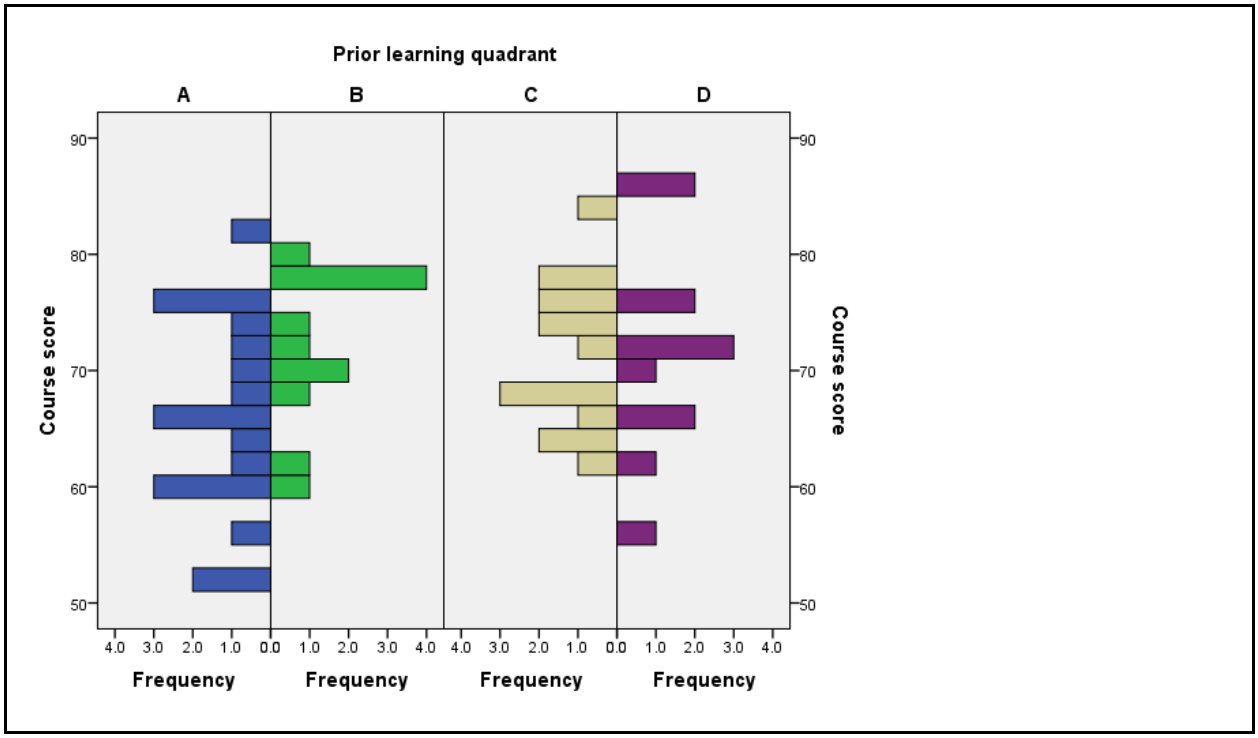
To inform our impressions from past years of how students' prior knowledge and skills impacted on their performance in the course, we drew on the conceptual map (see Figure 1) as a frame to characterise incoming students' prior exposure to learning design thinking (see Figure 4). The course score can be considered a summary measure of the quality of students' eportfolios.

We then systematically characterised students from the previous four years into one of these quadrants. Using this simple classification, we found there were roughly even numbers in each quadrant, with slightly more in the A (19) and C (15) quadrants than in B and D (12 each). Looking at course performance within

each of the four quadrants, there was little difference in the means other than for the A quadrant. The mean score for A was 66%, while B, C, and D clustered between 71% and 72%.

Figure 5

Back-to-back histograms of course scores for the four categories of students



Projecting forward, this analysis had two key implications for the course design. Firstly we were likely to continue to have students in the A quadrant with little or limited exposure to the academic education literature, and little experience in using technology in educational contexts. While there have been capable students in the A quadrant who have been able to demonstrate learning design thinking through their eportfolios, they are the exception. The majority of these students need support especially at the start of the course.

The second implication relates to students in the D quadrant and, to some extent, those in B and C. These students may recognise some aspects of online learning design, but may have conceptual misunderstandings with some aspects. These are difficult to anticipate or recognise since these students may be able to articulate their thinking quite well on specific topics. We had to be alert to the possibility that they may not have understand as much as they assumed they did, and be vigilant of students merely recognising terms rather than genuinely understanding the underlying concepts.

Discussion

Some of the key contradictions include those where our explicit intention to model pedagogic practices to encourage students' development of learning design thinking did not work quite as expected. The first of these contradictions that emerged between the Subject (lecturers), Tools (our pedagogic strategies), and the Object (create an engaging course to cultivate learning design thinking) can be seen in the way in which we modelled the pre-course survey to gather individual student needs. Novice learning design students (A

& B) did not necessarily note that we were modelling a particular practice, but instead seemed slightly overwhelmed by all the questions we posed; inadvertently making them feel anxious about the course. Although some students (mostly from the A quadrant) noted the scaffolding strategy and even copied our survey in their own contexts, expecting novice students to apprehend both their engagement with the task and the embedded design was unrealistic. Pre-course surveys need to include a smaller range of questions about technologies with which students may be familiar to limit the expectation that they should know about and/or be able to use all these technologies. Alternatively, a pre-course survey could merely pose an open-ended question about knowledge of, and skills in, using technologies. More explicit reference can be made to pedagogical strategies embedded in the course, without being overly academic, at the stage where a specific strategy is introduced.

A Subject-Community-Object contradiction arose when we explicitly introduced students to a range of perspectives on learning design. Because the literature informing learning design is quite extensive and emanates from various traditions, we endeavoured to include multiple perspectives on online learning design approaches (different ideas of what is understood as acceptable online design by different scholarly and practitioner-based communities). We introduced students to these through a range of activities. Using a hyperlinked schedule we grouped resources and activities together. Nevertheless, having students engage with a selection of these resources in teach-back sessions did not necessarily mean that they made sense of how all these perspectives linked and overlapped. Over time, we refined our selection of resources to limit their initial engagement with seminal texts and made the links more explicit. There is still a balance to be struck between engagement with the extensive and sometimes contradictory scholarly literature, and students' need for pragmatic design guidance. Many of the novice students came with the expectation that there was one correct way of designing online learning activities, which we endeavoured to dispel by introducing them to the range of online learning design traditions. However, the danger was that they adopted the one example of an online learning design tradition they taught back to the class or, given too many options, they seemed to revert to our adapted version of the Dabbagh and Bannan-Ritland (2005) model.

A second Subject-Tool-Object contradiction arose in relation to how we mediated the scholarly literature about online learning design. Students found some concepts too challenging to engage with on a first reading. Prompted by the external examiner, we moved the introduction to the concept of affordance (Gibson, 1979; Norman, 1999) to the first module to give students more time to understand the concept and its implications for design, and focused more specifically on affordance analysis (Bower, 2008) in the Online Learning Design module. Another strategy we adopted was to include the more seminal texts in the printed course reader and to refer to online versions for additional readings. This had the benefit of reducing the size of the printed reader which students had found intimidating.

A third Subject-Tool-Object contradiction became apparent in our analysis of the course materials and the underpinning pedagogical strategies. Over the period 2009–2012, we gradually relinquished some of the control, and allowed greater participation by the students in crafting and presenting the course. Initially, students presented a section of the Dabbagh and Bannan-Ritland (2005) models as a pre-course task and an example of the design traditions in-class, but later focused more specifically on different pedagogies as a pre-course task and compared at least two online learning approaches. Although this had the benefit of heightened student engagement with specific literature for teach-back sessions, students did not always partake in or even question some of their colleagues' presentations of a specific learning design approach. The move to focus on the more invisible pedagogies underpinning online learning design was prompted by the contradiction we noted in students' leap of faith between the requirements of the task and the affordances of the various technologies. The general design approaches did not necessarily make these sufficiently clear and so we shifted the pre-course task to a collaborative, paired teach-back session on a group of pedagogies drawn from Dabbagh (2005). This assisted students to acquire a language of

description to explain their choice of pedagogies adopted in the online learning activities in their eportfolios.

A Subject-Object-Division of Labour contradiction emerged in the implementation of our key pedagogic strategy of having students develop a small-scale authentic online learning activity. Although the course content and activities were all employed to scaffold this course, individualised coaching remained important for students to succeed. The key challenge here was the extensive investment of time, not to mention exceptional insight into contextual problems and the ability to undertake rapid affordance analysis, required from the lecturers. In order to support more rapid feedback, we encouraged students to invite at least one peer to be a "critical friend" to give them informal feedback, and to make use of departmental interns or other members of the Centre for Educational Technology as individual tutors, depending on the type of technology the students chose to adopt. An associated challenge was helping the students to compose an eportfolio—a writing genre that was completely new to most students. The assistance of colleagues from the Writing Centre to outline writing strategies in portfolios, and the help of interns to prompt with basic readability and comprehensiveness of the students' developing eportfolios, helped address this tension to an extent. However, given the diversity of languages of the group, explaining and justifying pedagogical choices underpinning an online learning task was a challenge for many of the students. Over the years, our choice of technology for the eportfolio has enabled more and more collaborative opportunities so that our interactions of formative feedback could include both conceptual and linguistic advice.

One way we endeavoured to address some of these contradictions was to provide detailed formative comments during the development of the eportfolios. The challenge we faced was the time-consuming nature of this formative feedback because each student's online learning activity responded to a particular context and consequently, each reflective eportfolio was unique. In order to maximise the value of the construction of formative feedback, we made use of an open Google Doc collaborative writing space to synthesise "generic" comments and focus students' attention on the kinds of issues addressed by "students who have done well". This more positive focus on what could be done, rather than on what students had done incorrectly or inadequately, seemed to prompt some of the students, although not all.

The expansive transformation that seems apparent in this analysis is our learning as lecturers about the efficacy of adopting various pedagogical strategies to assist students to develop learning design thinking. Expansive learning may be viewed as what happens as people perform their work and seek to improve practices that address common problems. This helps in making sense of our observations of the learning design process. Neither the outcomes nor the pathways were known to us prior to developing the course; these had to be designed, discovered, and negotiated collaboratively among ourselves and the students. The course is therefore not a product of a designed policy, although it would "make sense to develop and pursue policies that can make expansive learning less painful and troublesome" (Engeström & Sannino, 2010, p. 18). This in part justifies our interest in writing this paper. The activity system being described is not stable, but rather in a state of change while being mediated and transformed by tools and the actions. Our challenge is to observe how we develop learning design thinking through various tools that include pedagogic strategies and can negotiate with the social and technological environment to solve problems and learn.

Conclusion

This paper set out to reflect on how we, as educational technology educators, develop courses to cultivate students' learning design thinking. While by no means a comprehensive interrogation, it highlighted a number of useful pedagogic strategies, identified key contradictions, explained resolutions adopted, and ways to improve such a course. The most useful overall pedagogic strategy is authentic learning, which

underpinned the main assessment tasks of developing an online learning activity for an authentic context, and capturing the design decisions in an eportfolio. Other strategies we identified include scaffolding, modelling, coaching, explaining, and reflection.

Key contradictions emerged mostly in relation to our mediational role as lecturers, that is, Subject-Tool-Object tensions. These were particularly noticeable in:

- novice learning design students' inability to notice the modelling of pedagogic strategies while they were engaged in a task
- their conceptual struggles to make sense of the range of learning design traditions that underpin online learning design when presented by peers
- the extensive range of literature that they needed to master to fully understand online learning design
- the need to have a language of description to explain the pedagogic strategies they often implicitly adopted in developing an online learning task and
- the need for individualised and therefore time-consuming conceptual and linguistic feedback on their eportfolios.

On reflection, educational technology educators aiming to cultivate students' learning design thinking need to apply their design thinking to their own practice. This can be surprisingly challenging in identifying aspects of significance. We have drawn on Engeström's (2001) frame in highlighting contradictions that demanded we develop new solutions and practices. The process involves continually interrogating and refining what is understood by learning design thinking. and continually reflecting upon the relevance of the course content, the usefulness of the pedagogic strategies chosen, and the suitability of the activities devised for students—because these all reveal the explicit or implicit learning design thinking that underpins online learning design courses.

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