

Facilitating Deep Learning in an Information Systems Course through Application of Curriculum Design Principles

Abstract

This paper reports on the incremental improvement of assessment, learning and teaching activities in a large, first-year, undergraduate course. The changes, made over three years, resulted in the implementation of a student-centered (though individual) assessment strategy that included students in developing and applying the assessment criteria themselves. The outcome was a student-centered course design that required students to engage in deep approaches to learning. Using an action research framework, Meyers and Nulty's (2008) five curriculum design principles for facilitating deep approaches to learning (the development of which was guided by Biggs' (2003) 3P model) are used to illustrate how the course was incrementally improved to facilitate deep learning approaches. The paper provides an illustration of how others may pursue similar curriculum design improvements adapted for their own contexts.

Introduction

One of the key challenges facing educators is how to go about imparting skills and knowledge to the students with whom we engage (Ramsden, 2003). This paper is one response to that challenge. Specifically, the paper reports on an action research project that was undertaken in a first-year course with 400+ students per semester over the period 2005-2007. Its aim is to illustrate ways in which assessment can be more effectively integrated into the teaching and learning strategies we use to achieve deep learning outcomes.

The course, "*Information systems for the services industries*", is a compulsory course for students doing business degrees with majors in tourism, leisure, event, hotel, or sport management at Griffith University, Brisbane Australia. What follows shows how action research was used to change the teaching-learning strategy used in this course from a traditional, didactic, transmissive approach, to one embracing student-centered learning, including student negotiated assessment criteria which were then applied by students in producing the subsequent assignments. As will be seen, this shift served to engender deep learning approaches for students and to improve learning outcomes.

Extant research literature has recognized differences between surface and deep approaches to learning for some time, and has advocated deep learning approaches yield better learning outcomes (Biggs, 2003; Marton & Säljö, 1976, 1984). Meyers and Nulty (2008) explain: "Students adopting a deep approach to learning characteristically exhibit: an explicit intent to develop their own understanding of material (Biggs, 2003; Entwistle, 1990); knowledge which is highly structured (Biggs & Collis, 1982; Boulton-Lewis, 1998); an ability to apply their own and other's ideas/concepts to new situations (Ramsden, 2003), and; a highly developed integration

of knowledge (Biggs, 2003)." (p.3) They go on to summarize many of the characteristics of learning outcomes attained by students who adopt a deep approach to learning, and point out that "these are the kinds of qualities we would like to help our students aspire to and to develop" (p.2). They then advocate five curriculum design principles (presented later in the literature review) which, when applied, importantly recognize the systemic nature of curriculum components (Biggs, 2003). These principles are presented.

This is an important point, because the consequences of seeing curriculum components as a system are that effective teaching requires more than "*applying general principles of teaching according to rule; those principles need adapting to your own personal strengths and to your teaching context*" (Biggs, 2003, p.6). Thus, this paper details processes associated with embedding general principles to a particular context. Particular features and challenges in that context included how to cater for a diverse student body, large-class teaching, and how to leverage (first-year) students' comparatively limited experiences. In general terms, the research in this paper addresses the question how can improvements be made to courses in ways that engender deep approaches to learning? As such, it is an illustration of one approach. It is intended to act as a guide to other academics wishing to improve teaching and learning in their courses.

Literature Review

When considering how learning takes place, the surface-deep categorization developed by Marton & Säljö (1976, 1984) resonates throughout much of the teaching and learning literature (Biggs, 2006; Meyers and Nulty, 2008; Ramsden, 2003). It is suggested that learning takes place through knowledge creation, which occurs through

students' learning activities (Biggs, 2003). Students adopt different approaches to their learning.

The surface approach to learning is typically associated with the student attempting to meet course requirements through minimal effort (Biggs, 2003). Typically, in surface learning students focus on 'the signs', treat 'parts' as separate, focus on 'essentials', use memorization, do not connect facts and concepts, fail to distinguish principles from examples, do not separate knowledge from everyday activity, and consider tasks as external impositions (Entwhistle & Marton, 1984; Ramsden, 2003).

The deep approach to learning, on the other hand, is typically associated with students engaging in tasks appropriately and meaningfully by using higher-order cognitive processes (Biggs, 2003). Generally when using deep approaches to learning students focus on what is signified (i.e. meaning), relate previous knowledge to new knowledge, knowledge from different courses, theoretical ideas to everyday experience, distinguish evidence and argument, as well as organize and structure content into a coherent whole. Additionally, students are driven by an internal motivational emphasis (Entwhistle & Marton, 1984; Ramsden, 2003).

Pivotaly, Biggs (2003) argues that it is by discouraging surface learning and encouraging deep learning that teaching is improved. Biggs (2003) advocates adopting active methods that engage 'non-academic' and/or less motivated students in the use of higher order cognitions. In this respect assessment plays an important role since it drives the range of learning activities in which students engage (Meyers and Nulty, 2008), thereby affecting both what students learn, and how they learn it (Norton, 2004).

Biggs' (2003) 3P model of teaching and learning has been widely used to systematically examine teaching and learning (Trigwell & Prosser, 1997). This model considers teaching and learning in terms of *presage* (characteristics of the student, course and departmental learning context), *process* (students' perceptions of context, students' approaches to learning) and *product* (students' learning outcomes). Following Biggs' (2003) premise of capitalizing on things within our control, Meyers and Nulty (2008) developed five principles to guide curriculum design in order to facilitate deep learning approaches. According to Meyers and Nulty (2008), teaching materials, tasks and experience should all be:

1. authentic, real-world and relevant;
 2. constructive, sequential and interlinked;
- and should:
3. provide a challenge, interest and motivation to learn,
 4. align with each other and the desired learning outcomes;
 5. require students to use and engage with progressively higher order cognitive processes.

The key focus of Meyers and Nulty's five principles is the creation and use of a *system* of curriculum components that results in more active learning through student-centered engagement.

Engaging in Student-Centered Teaching

Student-centered teaching is where the students take a central role in the educational process (Paraskevas & Wickens, 2003). Such a strategy breaks from the traditional one-way communication model where "*it is supposed that knowledge is passed from the learned lecturer to the eager student*" (Allan, 1999 p. 60). In student-

centered learning, students become active participants in the learning process and engage in analysis, synthesis, evaluation, and exploration of values and attitudes (Boud, 1995; Boud, Cohen and Sampson, 2001; Sivan et al, 2000).

The literature includes many case studies of student-centered strategies being used to increase student engagement. For example: Lozano et al (2003) implemented a student-centered model in their MBA course; Paraskevas & Wickens (2003) implemented a student-centered 'Socratic' method, using questioning as a way to utilize their audience's prior experience in the area being studied; and, in part of a series of studies, Orsmond and others successfully used student-derived marking criteria to facilitate active learning (Orsmond, Merry, & Callaghan, 2004; Orsmond, Merry, & Reiling, 2000, 2002). Notably, the Orsmond et al. series were all conducted with first year students in first year courses.

Another example is Allan's (1999) model for student-centered learning, where the teacher takes on a role as a facilitator instead of lecturer and the student becomes the center of the learning process. Allan reported that this interactive learning model had higher effectiveness than a passive teaching model. In particular, although the use of this model increased student workload, it also made study more enjoyable. Enjoying learning activities, rather than seeing them as external impositions is a sign of deep learning (Biggs, 2003).

Finally, Boud, Cohen and Sampson (2001) have edited a book about 'peer learning' which includes six chapters presenting case studies as illustrations. Peer learning involves the use of activities in which students help each other to learn – as such it is axiomatic that it is student-centered.

Crucial elements in both a deep approach to learning and student-centered learning are students' prior experience and knowledge. When using a deep approach

to learning, students construct knowledge in relation to what they already know (Biggs 2003). Similarly, student-centered approaches use students' knowledge and experiences as a basis for students becoming partners in determining assessment processes and criteria, teaching methods, and learning outcomes (Prendergast, 1994). It follows that many of the implementations of student-centered learning have been with students possessing prior knowledge from previous studies or workplace experience (e.g. Lozano et al, 2003; Paraskevas & Wickens, 2003; Prendergast, 1994). Indeed, within the literature there are limited examples of student-centered learning where students have little or no knowledge or experiences associated with the course foci. This raises a question about how to use student-centered approaches to study in first year courses where it can be argued that "*Students enter a new subject with minimal experience and little knowledge about it*" (Parkinson & George, 2003, pp. 1). Nulty (Under consideration) argues that peer and self-assessment (examples of student-centered approaches to learning) are relatively under-used in first year courses. However, he also argues that this is something that should be corrected.

Further, extant literature suggests that when student-centered strategies have been attempted in large classes, some educators have encountered difficulties (Scott, Buchanan, Haigh, 1997). Others have questioned the practicalities of implementation (Sparrow, Sparrow & Swan, 2000). Specifically, Sparrow et al. (2000) suggested that student-centered learning may not be practical or possible in classes of over 30 students due to diversity in student backgrounds, experiences and prior knowledge. Scott et al (1997) found that not all students responded positively to student-centered learning.

Alternately, positive outcomes have also been reported, albeit that different interpretations of 'large classes' exist within these examples. For example, Barkham

and Elender (1995) had 54 students, while Prendergast (1994) had over 100 students. These differing interpretations of 'large' need to be considered with regard to the positive and negative outcomes reported from studies in which student-centered learning innovations are tried. Further, there are examples where student-centered approaches to learning have yielded demonstrably positive outcomes with unequivocally large classes, notably including some which involved first year students (Rust, Price, & O'Donovan, 2003; van Hattum-Janssen, & Lourenço, 2006).

In summary, the literature reviewed above gives rise to three hypotheses. First, that if students adopt a deep approach to learning their learning outcomes will be qualitatively better than if they adopt a surface approach to learning. Second, that a course can be designed to engender deep approach to learning by ensuring its assessment learning and teaching activities are student-centered. Third, that it is possible to evaluate whether a course is likely to engender deep approaches to learning by the application of five curriculum design principles offered by Meyers and Nulty (2009). What follows reports on a process by which improvements were made to a course that were designed to engender deep approaches to learning through greater use of student-centered assessment, learning and teaching activities. The evaluation of these improvements was through application of the curriculum design principles offered by Meyers and Nulty (2009).

Method

The research method used in this study was action research. Action research is commonly used in education where academics themselves conduct critical inquiry into their own teaching practice (Zuber-Skerritt, 1992). It is an approach that avoids some of the practical and ethical difficulties associated with conducting educational

research in a more traditionally experimental way: e.g. by comparing an experimental 'treatment' group with a 'control' group. The specific focus of this paper is to report on three action research cycles that were undertaken in a large, first-year, undergraduate course. Each cycle was designed to promote deep learning approaches through increasingly student-centered approaches to assessment, learning and teaching. For each cycle, the outcomes are presented and compared to Meyers and Nulty's (2008) five curriculum design principles.

The specific action research elements used through the three cycles in this research were: the identification of problems; implementation of a plan to improve practice (Kemmis & McTaggart, 1988; Whyte, 1989); and, monitoring and reflecting (Jennings, 2001). The strengths of action research are the in-depth and first-hand understanding that the researcher obtains (Benbasat et al., 1987), and the concurrent use of both inductive and deductive research processes in a cyclical manner (Perry & Jensen, 2001).

The action research in this paper commenced from an inductive perspective. This perspective was based on student responses to assessment and the course's assessment, learning and teaching activities. Deductive perspectives were informed by the five teaching principles which were used to help make improvements to practice in each successive cycle.

In using action research, the researcher (Hornby) and co-authors were aware that this method has been criticized for its potential lack of objectivity, and limited generalizability of findings (Benbasat et al., 1987; McKay & Marshall, 2001). To help counter this, this paper details the teaching context to allow readers to consider the findings in light of this context. However, we also argue that the principle purpose of this paper is to *illustrate* the merit of both an approach to course improvement, and

the potential adoption of comparable methods. For any who follow in our footsteps, the use of action research will help to ensure that any use of the specific methods reported here are adapted to the contexts in which they are applied. As such, our perspective is that the method is intrinsically strong, ensuring that due attention is paid to Biggs' caution reported earlier (Biggs, 2003).

An important part of action research is that evaluation takes place. In this study evaluation involved critical reflection and comparison to teaching principles in the extant literature. Critical reflection was associated with consideration of the nature and quality of students' assignments, classroom interactions, student evaluation responses, and the reflections of tutoring staff. Both informal and formal evaluation was undertaken with students and this furthered the researcher's critical reflections.

Implementation

The Context

The course, "*Information Systems in the Services Industries*", is taught to undergraduate students studying tourism, leisure, hotel, event or sport management in their first semester of study. It is delivered to two geographically distant campuses. This course was first offered in 2005 (being developed through the merger of two previously existing courses), with the explicit aim of technologically enabling students by teaching them how to use word processing and spreadsheet software, while simultaneously covering theory about the role of technology in the different industries. Each week, the lecturer delivered a two hour lecture at each of the two campuses. These lectures focused on the theoretical components of the course. Each student also attended one hour weekly tutorial/computer laboratory sessions. These focused on the development of practical skills. Each session had between 20-25

students and was led by the lecturer and numerous sessional tutors. This original course was the target of the first action research cycle.

The majority of students taking this course were school-leavers, aged 17-19 years old and undertaking their first semester of tertiary study. Course enrolments across the three years of this study make this a large course – minimum combined enrolments always in excess of 400 students. Details are shown in Table 1.

Each student cohort was a mix of domestic and international students, though in different proportions. As summarized in table 1, the percentage of international students at campus A was between 15-18%, with the exception of the second semester offering in 2007, which was 33.4%. Campus B varied from a high of 16.5% in 2006 to a low of 4.4% in 2007. The majority of international students were of Asian origin, mainly Chinese and South Korean.

		Student Numbers	% International Students
2005	Campus A	267	17.2%
	Campus B	159	8.2%
2006	Campus A	285	17.2%
	Campus B	127	16.5%
2007i	Campus A	314	15.9%
	Campus B	183	4.4%
2007ii	Campus A	84	33.4%

Table 1: Student numbers and % of International students across the three study cycles.

The following sections overview the three action research cycles associated with this study.

Cycle One

In 2005, the course involved lecture topics on fundamentals of information systems, the internet, and specialist topics on tourism, hotel, sports and events management. Tutorial content was separate from the lecture topic, and involved a range of computer exercises to teach students how to use a range of office automation software (word processing, spreadsheet, and presentation). All assessment items for the course were individual-based, and consisted of: (a) a *business report*, applying concepts learnt in the lectures to a business scenario; (b) a *portfolio* of computer exercises from the office automation software (Microsoft Word, Excel and PowerPoint), related to the tourism, hospitality and leisure industries; and (c) an end of semester *exam*.

Using Meyers and Nulty's (2008) five principles, critical reflection on the 2005 offering of the course reveals a number of problems with the assessment strategy and its related content (summarized in Table 2). Firstly, few of the tutorial exercises built upon each other, and also bore no relation to other assessment items, (that is, the business report, and the final exam). Thus, principle two, that learning experiences should be interlinked, constructive and sequential, was not achieved.

Secondly, although the portfolio exercises were included because of their relevance to the tourism, hotel and leisure industries, (thereby providing students with “authentic, real-world and relevant” experiences - principle one), one exercise in a sport event context was relevant to leisure management students but not to hotel management students. Thus, on reflection, principle one was also not achieved.

Third, it was found that most students had already acquired skills in using word processing, spreadsheet and presentation software through their previous

(school) studies. Consequently, they did not engage in higher order cognitive processes for the portfolio (principle three). Furthermore, as many of the students already had the skills to complete the portfolio exercises, it was also not challenging (principle five).

Fourth, although the business report required a lot of conceptualization, which resulted in students having to engage in higher-order cognitive processes, there was no progression to this – a key part of principle three. While it did achieve part of principle five, making tasks challenging, as it was the first semester of study for most students the lack of progression resulted in many of the students finding the assignment overly difficult, highlighting the importance of progression within principle three.

This analysis of the course shows that deep learning was not being encouraged or supported. Instead students tended to engage in surface approaches to learning (specifically through imitation and memorization) (Prosser & Trigwell, 1999). Despite this, grade results demonstrated that this approach still enabled students to do well in assessment items – suggesting that the assessment also needed to be modified.

	Portfolio Assessment	Report Assessment
Student learning experiences should:		
1. be authentic, real-world and relevant;	- relevant: with a diverse student group, exercises varied to cater for different groups each week.	- student diversity catered for by offering three scenarios to base report on
2. be constructive, sequential and interlinked;	- no linking between different exercises, or	

	different packages	
3. require students to use and engage with progressively higher order cognitive processes;	- only imitation and memorization	- no progression in cognitive processes, resulting in the assignment being too challenging
4. all be aligned with each other and the desired learning outcomes; and	- no relation between report assignment and portfolio	- no relation between report assignment and portfolio
5. provide a challenge, interest and motivation to learn.	- not challenging, with very little decision-making	- too conceptually challenging for first year students in their first semester of study

Table 2: Summary of how the five principles applied to the assessment strategy in 2005

Cycle Two

After recognizing the problems outlined above, two primary and several consequential or subsidiary changes to the course were implemented in 2006:

First, the tutorial content was changed, discarding the office automation software and replacing it with database and website development. These two technologies were chosen as they underpin many of the applications examined in the industries of focus, thus making content real-world and relevant (principle one). These technologies were also a part of lecture content, and therefore a consequential change was that they were perceived to bring more alignment between lecture, tutorial content and assessment (principle two). Many of the students coming into the course

already had skills in office automation software, so it was thought that the database and website technologies would also provide more of a challenge (principle five).

Secondly, tutorial content was linked directly to assessment, with inclusion of two (again individual) assessment pieces: a database assignment and a website assignment. In these assignments, students had to apply their technical skills learnt from the tutorial content, hence interlinking the two (principle two). A subsidiary change was that both the database and the website assignments had to be for 'an event', as this catered for a wider range of student interests with events found across different industries. For example, a conference could be of interest for a hotel management student, while a fund-raising charity event may be of interest to a leisure management student (principle five). It was hypothesized that an events focus would provide greater appeal to the interest of students, and to encourage deeper learning (Prosser & Trigwell, 1999).

Further critical reflection at the end of semester revealed a number of additional areas for improvement. Firstly, in both assignments the marking criteria rewarded students for their ability to perform technical tasks; however, students were unlikely to work in technical roles and thus some of the 'real-world' relevance was lost (principle one). Additionally, the marking criteria rewarded imitation and memorization (Ramsden, 2003) rather than higher order cognitive processes (principle three). Although assignments were contextually linked, skills and knowledge were not progressively built from one assignment to the other (principle two).

Furthermore, although the assessment had been deliberately more challenging, the database assignment was found to be too challenging: many students had difficulty with it. On reflection this was due in part to a lack of progression (principle three), but also to the limited time to teach the content. A summary of how both

positive (+) and negative (-) aspects of these changes fit Meyers and Nulty's (2008)

five principles are summarized in Table 3:

	Database Assignment	Website Assignment
1. authentic, real-world and relevant;	+ underpin many applications in the lecture content and industries - not representative of likely workplace role	+ underpin many applications in the lecture content and industries - not representative of likely workplace roles
2. constructive, sequential and interlinked;	+ more alignment between lecture, tutorial content and assessment	+ more alignment between lecture, tutorial content and assessment - not build on skills and knowledge of database assignment
3. require students to use and engage with progressively higher order cognitive processes;	+ higher order cognitive processes engaged - no progression to these - still rewarded imitation and memorization due to marking criteria	+ higher order cognitive processes engaged - no progression to these - still rewarded imitation and memorization due to marking criteria
4. are all aligned with each other and the desired learning outcomes; and	+ aligned with lecture content on databases, and various industry software applications	+ aligned with lecture content on website development, website use in various industries, and database assignment

5. provide a challenge, interest and motivation to learn.	+ catered for student interest - too challenging	+ catered for student interest + challenging
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Table 3: Summary of how the five principles applied to the assessment strategy in 2006

Cycle Three

In 2007, further changes were implemented to address problems with the course content, and its assessment, learning and teaching activities. The first major change was to eliminate the database content and associated assessment. Student feedback and grades both indicated that the database content had been too challenging; and no more time could be made available to further focus on such content. The website assignment, however, appeared to be pitched at the right level for students. Additionally, student feedback indicated that they enjoyed that assignment (a facet in deep learning).

Discarding the database content meant that more time could be dedicated to the website development content. Accordingly, two initiatives were introduced. The first was the introduction of a new assignment which required each student to develop a *website plan* for an organization of their choice. The second was to implement the use of *non-technical student-derived assessment criteria* for the website.

The introduction of the website plan engaged students in making design decisions about the website prior to developing it. Students had to link their planned website content, design and management to the organizational context and goals, thus promoting linking and consideration of underlying principles (Prosser & Trigwell, 1999). To guide students, the principles and processes of website planning were

introduced into the lecture content, thereby providing further links between lecture content, tutorial content and assessment (principle four).

The website plan in addition to linking with an organization, made the assignment authentic, real-world based, and relevant (principle one). It also provided interest and motivation to learn (principle five). Moreover, to complete the assignment students were required to engage in high order cognitive processes rather than imitation and memorization (principle three). Consideration of the relationship between technology and its appropriate use within an organization was a desired learning outcome, and was relevant to the student's future careers as managers in the service industries (principle four).

The introduction of non-technical student-derived assessment criteria for the website assignment presented significant advantages to engaging students in deep approaches to learning. Firstly, instead of the technical criteria, marking criteria based on the students' own evolving concepts of developing a 'quality' website were used (details of how this was done appear later). This meant that students understanding of the criteria and standards relevant to this kind of work were directly enhanced. In addition, students not only had to be able to perform the technical skills they had identified as relevant, but also had to make decisions about how to use different technical features of a website. In so doing students had to understand what made a website a high quality website. Thus, this required students to engage in higher order cognitive processes when making decisions (principle three), rather than memorization and imitation.

Consideration of what made a high quality website, and how and when to use technical features engaged students in critical thinking (Brookfield, 1995). This also provided appropriate tasks for student's future careers as managers in the service

industries (principle four). An additional benefit of basing the marking criteria on the notion of website quality was that students were free to develop a website on whatever topic they wished rather than being restricted to an events website. This meant the assignment was directly linked to students' interests, which provided much more motivation to learn (principle five).

The student-derived aspect of the marking criteria was a student-centered strategy to have students become more active participants in the learning process. This is well supported in the literature. For example, David Boud (1995) argues that students should develop the ability to assess their own work and that this begins with "... the development of knowledge and an appreciation of the appropriate standards and criteria for meeting those standards which may be applied [to students work]" (p.11). Further, in an extensive review of literature about formative and self-assessment, Black & William, (1998) argued that "self-assessment is a *sine qua non* for effective learning" (p.26) and, as such, is "not an interesting option or luxury: it has to be seen as essential" (p.54-55).

The procedure for generating the student-derived marking criteria was as follows. In the week following a lecture on website development processes, students' were engaged in a tutorial discussion of what constituted a high-quality website. This was a group discussion, even though the assessment was kept as individual assessment. Students were given a one page lead into the discussion. This page quoted various definitions of quality, and pointed out some of the subjectiveness inherent in the concept of quality in an attempt to get students to question the notion of quality. In this process, students brainstormed various factors that made a website high quality. The tutor then discussed and asked critical questions to get students to explain the meaning of the different factors, as well as linking and grouping factors. The group

then discussed which factors were the most important, for the purpose of deciding weighting of the different criteria in the marking guide.

For student-centered learning, conditions have to be created so that all concerned parties can participate in effective dialogue (Lozano et al, 2003). To create this environment, a number of steps were taken. The ‘brainstorming’ activity assisted in building students’ confidence, since no ideas were rejected. As the tutor began to put some factors as headings, and others underneath them, students began to understand that some were related. Students became more confident that they were on the right track, and began to offer more ideas. This was further reinforced as the tutor linked points made by different students. This, in turn, demonstrated that there was some agreement between students’ ideas of quality – and, perhaps, a growing awareness that they were part of a community of collaborative scholars collectively responsible for the determination of consensus on such matters.

There were various benefits from the student-centered activity. The discussion directly impacted on assessment and made it immediately relevant to the students’ lives, thereby subsequently increasing their engagement (principle one). Many of the factors raised in the discussion linked website quality factors to elements of the website plan. This assisted the students in making explicit linkages between the website, assessment criteria and the website plan assignment (principle two) with these all aligning (principle four). The discussion activity was also aligned as a curriculum-relevant activity that was real-world (principles one and four), because discussion of how to create a good quality website is an activity the students’ would engage in as managers in the service industries.

Another key element of the discussion required students to think critically about their own experience, a key learning outcome. This differed from previous

implementations of student-centered strategies, as most of the students were school leavers and did not have industry experience (e.g. Lozano et al, 2003; Paraskevas & Wickens, 2003; Prendergast, 1994). However, students were able to reflect on their experience *visiting* websites, which all had done in the past. This was critical in the student-centered activity working successfully for a first-year course, overcoming a major barrier.

	Website Plan	Website Assignment
1. authentic, real-world and relevant;	+ link to a real world situation	+ underpin many applications in the lecture content and industries + representative of likely workplace role + discussion influencing marking criteria made discussion relevant to students + discussion of website quality a real-world activity
2. constructive, sequential and interlinked;	+ linked to website assignment	+ more alignment between lecture, tutorial content and assessment + build on skills learnt in tutorials, and linked to lecture content + student-derived marking criteria discussion linked by

		students to website plan
3. require students to use and engage with progressively higher order cognitive processes;	+ engage in linking and underlying principles	+ higher order cognitive processes engaged in decision making
4. are all aligned with each other and the desired learning outcomes; and	+ aligned with lecture content, website assignment, and future career role	+ aligned with lecture content and database assignment + student-derived marking criteria discussion align website assessment with website plan + discussion of website quality a desired learning outcome
5. provide a challenge, interest and motivation to learn.	+ interest and motivation from student choice	+ linked directly to student interest + challenging

Table 4: Summary of how the five principles applied to the assessment strategy in 2007

Discussion

Beginning in 2005, three action research cycles took place, resulting in adjustment of content, as well as changes to assessment, learning and teaching activities in the course “Information Systems in the Services Industries”. These changes were made specifically to encourage students to adopt deep approaches to learning. Critical reflection in each of the cycles identified areas for improvement.

Over the three action cycles, the assessment learning and teaching activities were progressively adjusted to move away from activities that were not integrated or challenging (resulting in surface approaches to learning); toward activities that were integrated, challenging, and incorporated assessment that included student-centered learning (thereby requiring deep approaches to learning).

A major innovation of this praxis-based study was the adoption of non-technical student-derived assessment criteria for the website assignment. This enabled students to engage in assessment tailored to their interest. At the same time, it enabled the different assessment pieces (plan and website) to be linked together, and rewarded students' critical and conceptual thinking through the marking criteria. This made both assessment pieces more 'real-world'. The process of developing the assessment criteria was also a 'real-world' activity, which, furthermore, was directly inline with desirable learning outcomes and future workplace requirements. Implementation of these action research-based course improvements was successfully carried out in a large, first-year course, by angling the student-centered activity to leverage the experience that the student cohort had, regardless of workplace experience.

While the use of non-technical student-derived assessment criteria was a big step forward for the course, it also carried with it a burden of extra work. This was mainly from having to keep a record of the 'website quality factors' derived from the different discussions with different tutorial groups, and the subsequent need to collate and integrate the different factors arising in the different groups. However, given the positive student reactions to the exercise obtained through standard course evaluation surveys and unsolicited email (as well as in passing oral comment), the practice justified the effort. Nevertheless, this burden needs to be recognized and incorporated in course workload calculations.

The next phase of this (ongoing) course improvement initiative is to explore the use of online tools to support students' discussions of website quality. A wiki tool could be used, which would require students to read critically to identify parts of website quality missing or disorganized; then engage with concepts of collaboration and publishing (Richardson, 2006). As Lozano et al (2003) reflect, use of technology in education does not necessarily need to replace interpersonal dialogue, but instead can complement it. Such a tool could be used in addition to the classroom discussion, and possibly enhance the discussion through extending the period over which discussion is held. This would allow more time for students to critically reflect.

This would especially be of benefit in the multicultural classroom, where some cultural norms may lessen the participation of some students. A fuller incorporation of different cultures into this exercise may lead to more interesting results, as Tsiriktsis (2002) suggested that culture has an impact on website quality. In the changing demographics of the university classroom, this student-centered approach allows these differences to be recognized, valued, and incorporated into assessment as assets not liabilities. As well as this, students learn from opinions of other students in the classroom, and international students develop a better understanding of what is expected from them in the host institution. Furthermore, it would also reduce the paper-based administration of the approach by reducing the need to transcribe discussion results, and having the record in an easily searchable and storable format.

Conclusion

In conclusion, this paper has described three cycles of an action research project, which used a particular theoretical frame to guide the refinement of the assessment, learning and teaching approaches used in the course. These refinements

transformed the ways students were required to engage in learning from a passive, surface approach to an active, student-centered, deep approach. The changes in assessment were found to engage students, to require them to think critically, and thereby to engage in deep learning. Student evaluation indicated that students benefited by developing more depth of understanding of website quality issues, more engagement with the course, and found the course more interesting due to an innovative format.

The description of the process by which the action research proceeded is provided to allow others to see how they might use a similar approach to their own course improvement. A next step in this student-centered approach is to utilize online tools, to facilitate elongated discussion that is inclusive of people from different cultural backgrounds, and possibly reduce administrative work associated with the approach.

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