Designing an IT-augmented student-centred learning environment

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Abstract: *This paper explores the nature of the relationship between IT and a student-centred quality-teaching environment. It argues that given the need to graduate students with knowledge, skills and capabilities for the extent of change required in a knowledge economy, universities must give more attention to the development of student-centred teaching opportunities in which students learn from experiential opportunities that lead to reflection and change. It argues that IT can be used to augment the face-to-face teaching environment rather than to replace it with on-line teaching, and thus result in an improved student-centred teaching environment. Two examples of IT augmented courses at RMIT are used to explore this proposal using the Laurillard (1994) student-centred teaching model. The paper concludes that the quality of teaching can be improved by adopting an IT augmented approach to teaching.*

Keywords*: Student-centred, IT augmented, quality teaching*

Introduction

Discussion about improving quality of higher educational delivery by Australian universities has ranged over a number of issues as set out in the Senate Employment, Workplace Relations, Small Business and Education Reference Committee [Senate Committee Report] (2001). It is not our intent to discuss all these issues, rather we intend to focus on quality of teaching, particularly whether, and how, IT can augment a student-centred form of education required for a knowledge economy. In confining the paper to this question it is acknowledged that most issues concerning the quality of educational delivery are interrelated. However IT is often discussed as the means to a more flexible, and student-preferred online education.

Quality Teaching - Student-Centred Education for the Knowledge Economy

The Senate Committee Report (2001) into the capacity of universities to meet higher education needs acknowledges that quality in terms of higher education is not easy to define. Professor Karmel argues that educational quality is multi-dimensional and can relate to: course content, teaching, lecturers, graduate outcomes, and the environment for students. For the purpose of this paper we have chosen to confine our assessment of teaching quality to a student-centred educational design.

Universities are confronted by enormous challenges as a more sophisticated knowledge economy is developed. Allee (1999) states that in order to develop knowledge culture there is

need for a fundamental change in human thinking. Seely Brown takes a similar expansive view of the extent of change required and states that there is need for change that involves multiple, intertwining forces of content, context and community (Seely Brown 1999). He states that the real formula for success in a knowledge economy is continuous learning to see and do things differently. To meet these challenges, as recognised in the following submission, universities need to reconsider their contribution:

> Universities are all about knowledge, and the key to the future lies in considering their capacity to produce knowledge, to process it in a sophisticated way, to understand and use it, and to diffuse knowledge and exploit it. Universities are one of the oldest and most enduring parts of the knowledge economy (Senate Committee Report, 2001, p.13),

Thus, for universities to retain their central role in knowledge development they must graduate students able to contribute to the learning cycle of Doing, Reflecting, Conceptualising and Planning. Such a learning process has become synonymous in recent years with a student-centred co-operative learning process in which teachers create "a context of learning which encourages students actively to engage in subject matter" (Ramsden, 1992, p.114).

A student-centred approach has been described as requiring a change in status of teachers and students, as well as a change in focus of the educational process. Instead of providing all the content knowledge, teachers become 'guides, coaches, motivators and facilitators', while students become active 'doers' - presenting, analysing, solving and constructing ways to develop the knowledge provided by the teacher into skills required to function effectively. The use of IT augmented environments requires teachers to also be integrators. Subject matter needs to be integrated across a broad range of disciplines, with the curriculum being developed in a problem-centred approach that engages students in tasks related to the real world. Collaboration across the disciplines at a functional level is required of teachers. Students work both individually and as a team to collect and assess information to solve problems. Finally, student success is assessed in terms of the student's ability to solve problems, communicate ideas, present information and learn how to learn, rather than simply to repeat facts. Laurillard (1994) provides a student-centred teaching model (see Figure 1) in which teachers present students with their conceptual knowledge (both detailed content and ideas), and also encourage students, through discussion, to contribute their own conceptual knowledge. Students are also provided with the opportunity to engage in experiences that model practice, and asked to reflect upon the confluence of this combined conceptual knowledge and practice and to adapt their actions in response. Meanwhile, teachers are encouraged to reflect upon student performance in the teacher-constructed world and in the practical experience, and to also adapt their conceptual knowledge as a result of this reflection.

If we accept this student-centred model as being synonymous with a quality educational experience, the next question becomes, how do we create this environment? Let us explore first the face-to-face teaching environment.

A student centred educational process can be created by developing quasi-experiential opportunities for students through the use of guest speakers who are professionals in their field, case-studies analysis of real or mock cases, and video presentations of real-world events (Jones, 1999; 2000). Action-based learning and research can be used to assist students to analyse and reflect upon their own work experiences (Cherry, 1999).

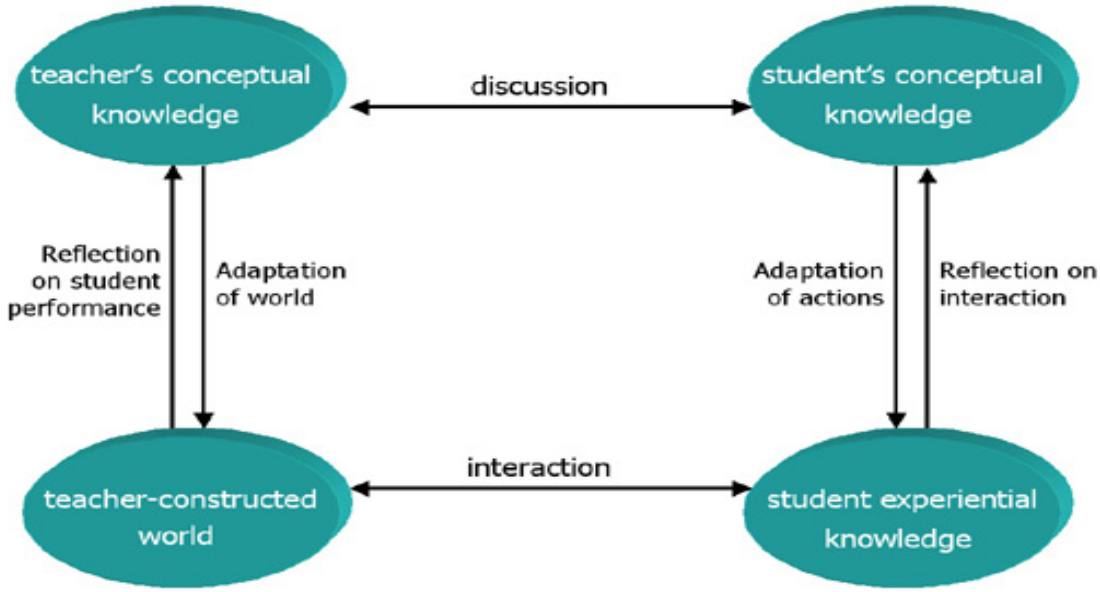

Figure 1: Student-Centred Teaching Model

IT has been sighted as a means to augment the face-to-face opportunities to provide a student-centred education by enabling students to become a community of learners. Professor Swannell is quoted as stating that the principle advantage of on-line education is "removing the need for social disruption, removal from the workplace and removing the cost of relocation" (Senate Committee Report**,** 2001, p.170). Moreover it is argued that on-line education enables flexible delivery through time and place and thus contributes to the life-long learning required in a knowledge economy (Brabazon, 2001, p.8).

However there is debate as to the demand for, and advantages of, on-line education. Ryan states that online education is being supply driven by universities rather than demand driven by students Senate Committee Report 2001:170). In a student survey undertaken by Curtin University (http://www.curtin.edu.au/home/allen/we3/igt/tool21.html.), students demanded face-to-face contact as central to the course (cited in Brabazon, 2001).

It is further argued that there are concerns about the quality of online educational experiences given that the cost of producing innovative teaching materials is very high, at a time of declining funding to universities. This view is supported by evidence that the cost in the US of developing quality on-line packages is about $25000 per 'instructional hour', or $650,000 per semester Senate Committee Report 2001, p.172). This has led some to argue that Universities should use the internet to do what they have always done better:

> Quality teaching is about finding the right balance between face-face communication, interaction via other media and individual work so that each experience is maximised. Flexible delivery of teaching is not intended to cut costs but to improve access and quality of the learning experience for students" (Senate Committee Report, 2001, p.173).

This is a similar approach to that adopted in industry to improve communication. Nohria and Eccles state "a minimum amount of face-to-face interaction is necessary for any type of social organisation to work effectively" (Nohria & Eccles, 1992, p.300). This is required because there are many factors present in face-to-face communication that are often absent in technologically mediated communication. This includes; understanding the contextual basis of communication, capturing visual cues such sight, hearing, smell, taste and touch, and

enabling people to interrupt, and change the form of communication based on visual response. Indeed in 2001 Massachusetts Institute of Technology (MIT) launched its 'OpenCourseWare' initiative in which all MIT OpenCourseWare materials used in the teaching of almost all undergraduate and graduate subjects available on the Web, free of charge, to any users anywhere in the world, in the belief that:

> MIT OpenCourseWare will provide the content of, but is not a substitute for, an MIT education. The most fundamental cornerstone of the learning process at MIT is the interaction between faculty and students in the classroom, and amongst students themselves on campus (MIT, 2001)

Thus there is need to consider how IT may augment rather than replace face-to-face teaching in order to retain a student-centred approach to education. The ability of humans to use 'fuzzy logic' (see http://whatis.techtarget.com/definition/0,,sid9_gci212172,00.html) to extend boundaries and innovate and to interact is often not reflected by the lack of complexity in technological products. The next section outlines two examples of such an approach at RMIT in Victoria.

IT Augmented Student-Centred Education at RMIT

RMIT University has a Teaching and Learning and Scholarship Strategy that emphasises three main factors:

- the development of student knowledge and skill capabilities
- internationalisation of the curriculum context
- the provision of flexible learning opportunities (RMIT Teaching and Learning Strategy, 1998-2000; 2001-2005)

The University is committed to using interactive communication technologies (ICT) to change teaching and learning processes (Deputy Vice-Chancellor, 2000). In 1998 the University began implementation of an incremental approach to ICT part of which was to develop a university-wide Distributed Learning System (DLS) aimed at providing a common framework for on-line educational experience for RMIT students. The system aims to connect students to information and access services, to access online content and interactions with both peers and academics, and to develop programs fully available at a distance, or online. It is the second level of this activity - developing online content that is the subject of this paper.

The RMIT ICT strategy devolves responsibility for implementation of online initiatives to each Faculty. The Faculty provides "staff development and software training, lower end online and media production and implementation of and support for specific projects as distributed to the faculties" (Lines, 1999, p.7). It is academic course (subject) co-ordinators who design any IT enhancements, which vary from fully on line text-based courses to IT and Web-augmented 'learning objects'. Identified in terms of the Laurillard student-centred model, IT augmentation of face-to-face teaching can be identified as follows. First, teacher's conceptual knowledge can become embedded in IT enhanced learning objects. Second, the teacher-constructed world can be presented through the internet or on video and CD. Third, student conceptual knowledge can be shared through internet chats and discussion boards. Finally, experiential opportunities can be augmented to appear more realistically and to assist student virtual discussion and thus enhance reflection to assist in developing generic and industry specific capabilities. It is recognised, however, that staff development in the use of

technologies to augment face-to-face teaching is necessary. Two examples of IT augmented courses (subjects) are presented below.

Example 1: Postgraduate Employment Relations Subject

The School of Management at RMIT offers a course in employee relations management to postgraduate student practitioners. The course has been delivered in face-to-face mode based on the Laurillard student-centred teaching mode. Teachers' conceptual knowledge has been provided in written and orally presented information supplemented by examples from guest speakers, professionals in their practice. Students have been provided with the opportunity to provide their own conceptual knowledge through a joint course design process before semester begins, and through class discussions, debates, and presentations. The teacher-constructed world has been enhanced by production of a video of an actual dispute over changes to employment practices. Finally, the opportunity for student experiential knowledge to be developed has been made possible by student involvement in a full day role play in which the effects of different work practices and conditions on employment relations is accessed.

In 2001 the lecturer sought to explore IT augmented opportunities through the DLS. First, learning objects in the form of PowerPoint slides were provided through the DLS to supplement face-to-face class delivery of the teacher's conceptual framework. This was done to provide students with the opportunity to review and check their own notes against the exact overheads used in class. In so doing she recognised that these added little to the face-to-face learning environment and could be subject to the limitations that students may not attend lectures, and the educational process may be reduced to purely copying points rather than developing critical thinking (Brabazon, 2001).

Second, the teacher-constructed world was supplemented by a student assessment activity that required them to view a (teacher determined) commercial video with a request that they consider the underlying message from the video concerning employment relations. Students responded in discussion that the exercise did provoke them to think about the values, judgements and ethics that underpin films and videos. Indeed there was one reference to the 'McCarthy effect' (used to refer to the anti-communist approach adopted by Hollywood) on films during the 1960s.

Third, a WebBoard was provided for students to share their conceptual knowledge as far as it related to the employment relations implications from the video. The outcome was student written papers were more reflective than previously as they drew, and indeed referenced, each other's views. The disadvantage from the student's perspective was the asynchronous nature of the discussion (despite substituting one class to support this discussion students did not take advantage of this opportunity).

Finally, the student experiential opportunity was IT augmented by providing the background company information as a Company Website on the DLS. The role-play was separated into two parts over two weeks. In the intervening week students were encouraged to use the WebBoard for a virtual discussion to agree on a work redesign for the company to become the practical exercise in the next face-to-face class. The outcome of this was first; the time it took in the face-to-face meeting to agree on the new work design was reduced from previous years. Second, student written papers reflecting on the effects of different work designs on employment relations drew on student comments made on the WebBoard, and led to more detailed reflection.

In summary, IT augmented opportunities utilising the internet to provide students with information relevant to a role play in which they participated, and providing opportunities for students to discuss issues virtually, did lead to deeper reflection on issues, the values underlying issues and exploration of greater opportunities for change. There was no reduction in face-to-face class attendance, with power-point slides used to supplement lectures, or to replace lectures missed due to genuine work commitments. Thus, IT augmentation of face-to-face teaching was judged to have improved the quality of the student-centred teaching model. However, in so saying it is recognised that in moving to this model academics need to develop a more open-collaborative approach and work closely with IT specialists, and educational designers to achieve the innovative outcome desired (Jones 2001; Jones and Creese 2001).

Example 2: Introductory Undergraduate Business Computing Subject

The School of Business Information Technology at RMIT offers a first year computing course to IT professionals and non-IT professional in large and small groups, in Australia and overseas. In recent years technology has been used to provide a variety of delivery options. Teaching and learning resources have been developed on the Web and on CD in order to provide flexibility, as well as to encourage student-staff interaction. Each traditional use of teaching spaces and contact hours was examined with a view to improving the quality of the student experience. Technological tools aimed at augmenting the quality of the student experience were chosen for each component.

Care had to be taken to ensure that learning objects were clear and tightly defined to overcome the disadvantage of moving from a traditional environment in which cohesion and order in the process of learning is accomplished by the teacher providing contextual links among the concepts delivered in a lecture. Designing sample solution in demonstrations and ways to engage students in skills development activities, normally achieved in workshops, had to be considered. The creation of abstract links through business case context materials provided content cohesion while the introduction of a problem solving approach to learning provided abstract links between the learning objects.

To ensure increased flexibility in allowing knowledge components of learning objects to be changed, each component was designed as an entity in its own right. They were also designed to be used to augment face-to-face lectures or to be utilised differently according to the teaching space available or the requirements of a particular group of students.

Learning Objects were provided on the Web and also on a CDROM to increase flexibility. These include:

- power point slides and shows of lecture material, together with the capacity for students to take notes whilst listening to the lecture one slide at a time
- audio material of lectures being given face-to-face
- business models utilising Excel, Access, Word, PowerPoint and FrontPage were integrated into the lectures and demonstrations,
- business Case Studies provided examples of all applications software taught and embedded in a systems approach
- assessment tools that required problem solving, skill application and presentation were designed with the solutions added to their case study resources.
- workshops were designed to enable students to build the case study examples displayed in HTML, Word, Excel, Access and PowerPoint

Assessment tools are based on the business cases included in the CDROM and Web site. The completion of continual assessment requirements necessitated an understanding of the business cases used to place lectures and demonstrations within a contextual basis. Sample solutions are provided that directly link to demonstration and lecture material and indirectly link to the assessment tools. The model building exercise further illustrates the use of abstract links between the skill base described in the demonstration and workshop resources. As well as providing a vehicle to meld the fragments of knowledge and skills learnt during a course of work, the material encourages a real life problem solving approach to learning.

The augmentation of face-to-face teaching and learning with IT based opportunities has resulted in improvement in the students' skill base. The skills previously gained in the workshops are now provided by the creation of the business models in the demonstrations. Students' perception of the lectures as a learning mechanism has shown improvement since the adoption of the technologies and the problem solving approach as have their perception of their own competency levels.

The skills required by the assessment tools are reviewed as part of the quality cycle implemented at the course level. This process has highlighted the increase in the level of skills acquired by the students and the necessity for integration in the application of skills to provide relevant outcomes. Other identified benefits include the facility for students to add text to the lecture notes in real time.

Finally, it is interesting that, despite the flexibility provided with the on-line material, most students have chosen to attend the face-to-face classroom teaching as their predominant learning mode, supplemented by the on-line learning resources. However it is expected that as students' become comfortable with the technologies in question and as they embrace a more independent learning of conceptual material, they are more likely to enjoy control over their own learning. Further, academics designing the learning objects develop their skills in using the technology over time.

Conclusion

To be recognised as providing quality education that graduates students with the knowledge and skill capabilities for the chaotic and ever-changing knowledge economy of the future universities need to encourage a student-centred teaching environment. This paper has argued that IT can be used to augment face-to-face teaching in a way that provides enhanced experiential opportunities for students and develops their reflective abilities. The argument is supported by two examples of IT augmented courses that improved the student-centred teaching environment. In so doing it is recognised that an IT augmented approach allows for continual quality improvement as technology becomes more sophisticated and students assume more personal responsibility for their learning and teachers develop more skills in using technology to augment the student-centred face-to-face learning environment.

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