Creating Engaging Learning Environments for IT Students

Glenn Stewart  
Queensland University of Technology

Jude Smith  
Queensland University of Technology

Tim Dunn  
Queensland University of Technology

Follow this and additional works at: http://aisel.aisnet.org/amcis2004

Recommended Citation
http://aisel.aisnet.org/amcis2004/14
Creating Engaging Learning Environments for IT Students

Glenn Stewart
School of Information Systems
Queensland University of Technology
Australia
g.stewart@qut.edu.au

Jude Smith
Creative Industries Faculty
Queensland University of Technology
Australia
je.smith@qut.edu.au

Tim Dunn
School of Information Systems
Queensland University of Technology
Australia
tl.dunn@qut.edu.au

Abstract
This paper details the curriculum innovations in a $300,000 project focused on engaging students in learning ICT. Three strategies are discussed. One strategy is to use a digital portfolio to trap student outputs, relate these to industry expectations and provide a means for students to reflect emerging professional competence. Another strategy is to frame the learning experience through a series of authentic tasks. A third strategy is to visualise and track the attainment of skills in terms of industry criteria. This paper reports progress on this project as well as its application to the Enterprise System curriculum area.

Keywords
IT Curriculum, Digital Portfolio, Industry Skills, Enterprise Systems

INTRODUCTION
The Queensland University of Technology (QUT) Engaging Learning Experience paper (2003) describes the need to develop appropriate environments attractive to first year students who: ‘From multiple starting points[…] are on a journey to becoming self-managing or self-directed learners.’ How can university facilitate this development? Coaldrake (2002) has reported on the need to engage the first year student more effectively in the university curriculum. This project seeks to develop effective engagement environments.

Juxtaposed to the students’ inherent and often unarticulated expectations of University is the demand from industry to develop more rounded graduates. When students are expected to develop industry relevant skills, what form must the first year experience take in order to engage students in the curriculum and to become active partners in their learning process? How can this be extended in subsequent years to ground students in the theoretical foundations of their discipline yet develop industry relevant skills at each stage?

This paper presents the background to the project, its research objectives and the project plan. It then discusses the current situation and shows how the approaches have been implemented in one coherent stream of information systems units – in the Enterprise Systems specialisation. The paper concludes by summarising the main strategies used in the project.

BACKGROUND
There is an ongoing debate on the skills and capabilities required of Information Technology and Creative Industry graduates in the 21st century. In Information Technology, identifying these skills has led to the Information Systems Centric Curriculum 1999 (Lidkte et al 1999), the IS 2002 (Longenecker et al 1999) and CS 2002 (IEEE and ACM taskforce) curriculum documents, which specify personal, interpersonal and discipline-specific skills. In terms of the creative industries, Ball (2002:11) identifies the need for “people with excellent generic skills in communication, networking and teamwork, individuals who can work flexibly with good interpersonal and research skills”. The importance of encouraging independence, autonomy, the ability for self-direction (Ball, 2002; Otter in Dumelow, MacLennan & Stanley, 1999) as well
as adaptability, resourcefulness, and enterprise (Manidis, 2001:27) is seen as integral to student educational experience. The Engaging Learning Experience report (2003) suggests that students need an opportunity to set personal goals and undertake self-assessment. It also suggests that learning should occur in contexts which are as authentic as possible.

We thus conclude that learning environments must develop this wide range of capabilities, link with the real world through engaging students in learning based on authentic tasks. An authentic task is one which is similar to that completed in industry.

We anticipate that the students will view more positively the acquisition of skills demanded by industry and curriculum authorities if the output is tangible artefacts related to industry tasks. We seek to develop learning environments which can provide visual confirmation of increasing capabilities and thus be more motivating to the pragmatic students that dominate our enrolments. The innovation in this project lies in the design of appropriate authentic tasks and their mapping to the generic and discipline specific capabilities, using criteria based referencing and the visualisation and tracking of capability acquisition. In addition, we seek to develop re-useable learning activities that span the faculties, providing enrichment opportunities for students. Our work on learning styles of first year IT students has shown that they are predominantly procedural learners, who prefer fact-based and hands on learning experiences (Stewart 2002, 2003). These studies raise serious questions about how to frame appropriate learning experiences for this diversity of types.

ENVIRONMENTS FOR ENGAGING STUDENTS

There are three foci in this project: increase engagement of the student; develop self-directed learning competencies in the student; build reflective and critical thinking skills in the student; and situate the learning in authentic tasks. We believe that this integrated approach in developing and implementing a variety of engagement environments will increase student motivation to learn. The next section discusses how digital portfolios may assist students in becoming self-directed and reflective learners.

Digital Portfolios

Research in Higher Education and electronic learning portfolios informs the activities of the project. Claxton (1999: 339) argues:

In the context of the constantly evolving needs of the global employment market it is essential that students are equipped to be flexible, adaptable and prepared to take responsibility for their own learning and their own continuous personal and professional development. This places a responsibility on teachers and tutors in higher education to develop teaching environments which encourage students to take a more pro-active role in articulating and striving towards self-determined learning goals.

Brown (2002:229) purports learning portfolios engage affective and cognitive domains and can initiate an ubiquitous change in student’s perspectives and attitudes.

Through the creation of portfolios, students may become more aware of their own self-directed learning as well as enhance their abilities to engage in further self-directed learning projects in the future” (Brown, 2002; 229).

Authentic tasks and its relationship to capabilities

We argue that rich and authentic tasks articulate the expectations of industry and engage the students more that those items focused on assessing individual components of the curriculum. This project thus seeks to identify the competency set and render this as a matrix, instantiated at the unit level. These competencies are then mapped into the assessment items, and student achievement is rated against standards. The industry expectations and job descriptions have been generalized into a university wide set of graduate capabilities. These are being specified within the context of the disciplines found in each faculty. These elements are often reflected in formal curriculum documentation that informs the entire process of teaching and learning. We frame the engagement with this material through a series of authentic tasks (using the inverted curriculum model proposed by the Information Systems Centric Curriculum document) thus providing a structured path to the acquisition of skills and knowledge. There is a series of scaffolded learning resources that accompany the authentic tasks which clearly articulate the learning outcomes, the actual learning activities and the technology used to support the learning. The relationship between these variables is shown in Figure 1.
One of the challenges is to develop reusable learning resources that span the faculties or year levels. These reusable learning resources can provide rich extensions for advanced students (e.g. adding multimedia features to a web page) or be shared across units (e.g. multimedia features used in both CI and FIT multimedia units). These learning activities and authentic tasks then produce a series of inter-related artefacts which span the types of productions expected in the specific discipline. These range from physical products such as working systems, and video products, to the support communication outputs of reports, speeches and posters as well as reflective journals.

Visualisation

Some of the reporting elements needed to be supported are shown in Figure 2.

The capabilities matrix is the visual means to engage the student. It contains the following elements: the capabilities matrix; the fit to capabilities matrix; the appended artefact as evidence of best attainment of skill and the reflection of the student on their emerging competencies and interests. The existing digital portfolio provides most of the required functionality for reflection, but at a higher level of granularity than trapped by the faculties. This project will develop the specifications for the enhancements to the portfolio, and provide the mappings from the specific faculty level graduate capabilities to the generic university graduate capabilities.

A hypercube is a metaphor for the visualisation of the capabilities matrix. A hypercube has more than three dimensions. Some dimensions of interest here include: attainment of skill against industry expectation; attainment of knowledge against the curriculum objectives; and student interest in the area. We note that skill acquisition in any authentic task is multi-dimensional with components in each of the following skill sets: technical skill, personal skills, and interpersonal skills. How to render this hypercube into an interactive interface which allows for students to discover their strengths and weaknesses is a major focus of this project.
CURRENT SITUATION
This project is now being implemented. Currently underway is the dissection of the learning program into a series of learning experiences. These are being represented as adjacency graphs, which show the sequencing of learning objects. Focal activity sets for Professional Studies include database systems, web application development, multimedia development, poster development, project management and team dynamics. Some of these learning objects are being rendered into online resources, but the focal activity at this stage is the mapping of the learning activity to the authentic task and the mapping of the authentic task to industry skills. In addition, a prototype for a system tracking student achievement against industry skill acquisition is underway. Models of self-directed learning and self-reflection are being developed, against which the efficacy of this approach will be measured.

Two focal units are targeted for 2004: Professional Studies 2 and Introduction to Multi-media Technology. Lessons from this project are being applied in other areas of the curriculum. For example, in the Enterprise Systems specialisation, students are given an authentic task relevant to their unit. In most units within the ES specialisation, students reflect on which elements of the curriculum they enjoyed the most and why, as well as those areas that they did not enjoy and why. For those areas that the students are having difficulty with, students are asked to report on their strategies in overcoming these difficulties. From this work, we have found that students do enjoy the authentic tasks, but do not enjoy sharing their reflections on learning. Part of this reluctance to share may be because the student feels that this process is invasive, as well as not seeing the relevance of reflection to skills acquisition. In addition, many units have moved to the use of criteria based referencing. This process is ongoing and a full review of the efficacy of this approach in the Enterprise Systems track is currently underway. Preliminary results may be available by the time of the conference.

CONCLUSION
The key concepts of the project are to engage the student through explication of expectations from industry and curriculum authorities, through the use of authentic tasks demonstrating attainment, and, using criteria based assessment, evaluating that attainment against the capabilities matrix. In addition, students reflect on learning, interests, competencies and personal goals thus progressing to becoming self-directed learners, oriented to goal attainment through use of these environments. This project also seeks to inform future development of the Digital Portfolio and Student Capabilities projects.

A key outcome is engaging the student as an active learner. Through interacting with the different environments (including reflective portfolios, capabilities matrices, authentic tasks and associate learning activities, reporting and self-assessment interfaces) the student will explicitly see the range of skills (personal, interpersonal, and discipline specific) that industry and curriculum authorities are expecting from graduates. They will see the linkage of the learning tasks to these outcomes, and be able to offer example outputs (artefacts) as evidence of their attainment of capabilities recorded in the skill matrix. This clear linking of teaching, learning and outcome to a criteria reference base is expected to motivate the student to learn.

We anticipate greater participation rates in the learning activities and higher performance outcomes. We anticipate less attrition through this engagement. We also seek greater articulation of taught material to industry and discipline outcomes. In the short term, we anticipate greater student satisfaction with material and improved performance. In the long term, we anticipate more clearly coupled teaching and learning resources to industry expectations and clearer articulation of standards and assessment.

ACKNOWLEDGMENTS
The Faculty of Information Technology and Creative Industries Faculty have each contributed AUD75,000 to the project with the QUT Teaching and Learning Large Grant scheme contributing an additional AUD140,000 for two years (2004-2005). Thanks are given to the Director of Software, Multimedia and Learning Environments (SMILE) and her staff for their strong support and interest in the project. Thanks are also given to the Directors of Teaching and Learning in each faculty (Associate Professor Christine Bruce and Professor Stephen Towers) and the Deans (Professor John Gough and Professor John Hartley) for their strong support for this project. Thanks are also given to the unit coordinators of the target units for their interest and involvement in the project.

REFERENCES
1. Anon (2003), ‘Metaphors and motivation: Understanding college students' learning experiences at four types of schools’ Colleges and University Washington Fall 2003 Vol 78, Iss. 2 pp 21


