Building Self-Supporting Websites to Accommodate Large Numbers of Students

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Abstract

Edith Cowan University's School of Communications and Multimedia is developing a consolidated Bachelor of Communications program in which approximately 600 students will be completing an introductory unit in digital technologies (IMM1120). The unit will be based around a Website that will implement several strategies to support a range of learning outcomes for a large and diverse student body. This is the first time a unit this large has operated within the school, and this paper outlines the approach to design which will be implemented. The potential of these strategies to provide an effective yet efficient implementation across a range of educational outcomes will be discussed. By the time of publication, the authors will be able to demonstrate the completed website and preliminary data will be available for analysis.

Web-Based Learning and Flexible Delivery

The proliferation of Web-based learning is indicative of a broader shift towards more flexible delivery of education and training. One of the driving forces towards flexible learning is a perception that economies can be gained for the university in real estate and student contact time (Ring & McMahon, 1997). Despite evidence that they don't like learning at a distance (Simonsen, 1995), students too are demanding greater flexibility in attendance and access of course materials.

Edith Cowan University's School of Communications and Multimedia is introducing a core program for all first year undergraduate students within the school in year 2000. One of the first semester units to be completed by all students is an introduction to digital media technologies – IMM1120. This unit will cater for a large number of students, with many tutors. This is the first time such large units have operated within the school, and while most units have had some kind of 'web presence', this is often purely as a learning resource than an active learning environment. In units with small enrolments, where the course designer is also the lecturer and tutor this is not necessarily an impediment. There is inherently a consistent approach between classes, and students have adequate access to the lecturer. However, in a larger course such as IMM1120, quality assurance becomes an important issue. While they may have sound content knowledge, tutors may not necessarily be trained and experienced educators, and therefore unable to cater to the individual needs of a broad audience. In this type of environment it is important that the web-based component accommodate the varied needs of the unit's clientele, and be self supporting enough to relieve some of the burden of administration from the unit coordinator.

There are many guidelines that have been developed for Web-based learning environments (eg. Berge, 1998; Wild & Quinn, 1997), and while these vary in terms of their prescriptiveness and theoretical basis, there is a general consensus that the best learning environments make the best use of the available tools, and that design should be a process of complete 're-engineering' to accommodate these, rather than a simple conversion or 're-enrichment' of existing material (Collis, 1997). It is a fair comment that due to bandwidth limitations the Web is a limited tool for content delivery, particularly of media rich material. It is also fair to say that it provides an opportunity for learning strategies using communication strategies that were previously unavailable in fixed media formats such as CD-ROM multimedia. This, combined with a contemporary focus on constructivist learning environments (eg Jonassen, 1994) and an emphasis on learning as a process which is individual and self-regulated (Schunk & Zimmerman, 1998) has led to a general criticism of content-oriented sites as '24 hour-a-day glorified whiteboards' (Archee & Duin, 1995).

However philosophical blinkers are not the answer. Different approaches lead to different learning outcomes, and in a unit like IMM1120, the outcomes are broad, ranging from basic declarative knowledge about digital technologies such as file formats, through applied techniques in using specific software, to higher order outcomes of information design, working within teams and so on. It has been argued elsewhere (eg Rieber in Tobin, 1993; Alessi, 1995) that the philosophical divisions in learning theory are somewhat arbitrary and that pragmatism is a legitimate theoretical stance. Such is the philosophy that has informed the design of IMM1120. While the development of students as independent & self-regulated learners is a major aim of the unit, it needs to be acknowledged that many students are unfamiliar with these modes of learning, and also lack the fundamental knowledge from which to articulate nascent conceptual understandings.

The role of IMM1120 is manifold: It must support student's developing metacognition, teamwork skills, problem solving skills and so on; but it must also give students a sound knowledge-base about digital technologies. This 'digital literacy' may be abstract or applied only to specific situations, but forms the basis of a necessary vocabulary for further studies.

Above all, however, the unit needs to be delivered in a mode which will allow a diverse group of students to learn the way they do best – individually, but without placing an unrealistic burden on the unit coordinator, or making excessive demands on less experienced tutors. To that end, a number of strategies will be implemented which support a variety of levels of learning, incorporating alternatives to traditional teacher-led instruction such as peer scaffolding approaches. The nature of these strategies will be discussed in terms of their ability to support these different levels of learning, as well as the nature of student and learner activity, which they engender.

A Framework for IMM1120

Multiple Levels of Learning

There have been many attempts to classify learning, most of which define it in terms of a hierarchy, from lower level outcomes such as knowledge and comprehension, to higher order outcomes such as analysis and evaluation (Bloom, 1956). Such definitions are often framed in Piagetian terms, relating to the level of concrete or formal operational thinking required for their achievement. If one accepts the argument that many adults still do not operate at a formal operational level (Slavin, 1991) then any approach must still accommodate those that operate at a concrete level, while providing opportunities for their skills to a more formal level.

The authors have devised a continuum with 3 defined stages to represent the multiple levels of learning which need to be integrated into IMM1120. These are: Concept Acquisition; Concept Mediation; and Concept Synthesis.

Precedent for this can be found in Saljo (1979, cited by Alexander, 1997), who defined five categories of learning:

- Learning as a quantitative increase in knowledge
- Learning as memorisation

- Learning as acquiring facts, skills and methods that can be retained and used as necessary
- Learning as making sense or abstracting meaning
- Learning as interpreting and understanding reality in a different way.

Alexander rightfully claims that that there are similarities between the first three categories; a position which is reflected in the stages proposed here.

Concept Acquisition can act as something of an umbrella for the first three of these. Following completion of IMM1120, students should be able to 'know' more about digital technologies than they did previously. This can occur through memorising content that is provided in the text and lectures and by applying this knowledge in defined environments (such as the use of software for web development). It is important to note that in this mode, learning is may be abstract or applied to concrete situations, but can only be articulated in terms presented by the teacher.

Concept Mediation is analogous to the fourth category in which knowledge is framed in the learners' own existing schema. This differs from acquisition in that it is a meaningful process, leading to ownership of the information. While knowledge can be acquired and reproduced through surface strategies such as memorisation, it is only understood when new knowledge is linked with existing understandings.

Concept Synthesis is an extension of this, where the learner can use their understanding to generate general principles, which may then be applied to unfamiliar situations. This is the ultimate aim of IMM1120; by developing concept synthesis, students are better equipped to tackle unfamiliar and ill-structured problems. In essence, students learn to become better learners.

These three dimensions act in a continuum. Many students of IMM1120 may already have a strong knowledge-base from which to work. This is particularly true of some school leavers who have an existing interest in Multimedia, and may have completed preliminary studies in digital technologies at school. Typically, however, these students lack skills in self-regulation, teamwork, and metacognition, having come from a highly structured, didactic, and somewhat competitive school system. At the other end of the spectrum, a proportion of students enrolled in Multimedia are mature-aged, and often have previous tertiary education. These students are often well equipped learners, but lack a basic knowledge of technical issues.

To accommodate all of these levels across a wide group, consideration must be given to the critical elements of design for the IMM1120 website. Strategies need to be built in that can support all of the above elements in an environment that is both efficient for the coordinator and tutors, as well as flexible and accessible for students.

Critical Design Elements

It has previously been argued (Oliver, 1999) that designing effective on-line Learning environments involves a careful integration of content, activity, and learner support (figure 1.)

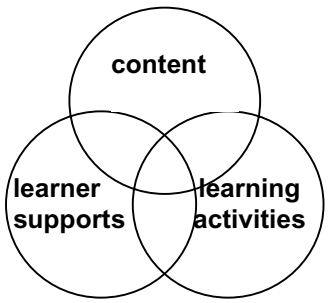

Figure 1

None of these dimensions are not mutually exclusive and all contain contains elements which are supplied by the teacher, the student, and the properties inherent in the learning environment. For lower levels of learning, content, activity and support may be highly integrated, as in a typical drill and practice activity. For higher levels, content may only a small aspect of the learning environment. An example of this is in group-based problem solving activities, where the content generated by students in a highly active and collaborative environment, where support provided by review and assessment of others' work.

IMM1120 will need to reduce the role of the teacher in providing content, giving support to the learner, and in creating the activities that promote learning. These efficiencies must also be balanced by the need to accommodate the 3 levels of learning across a large and diverse student group.

Thus, the properties of the environment become crucial to the effective, and above all effective and efficient implementation of the unit. Strategies need to be integrated that support the varied educational needs of the student in a self-sustaining manner. While the strategies to be discussed do not operate exclusively within a particular level of learning, this paper argues that consideration needs to be given to the usefulness of a particular strategy to achieve defined outcomes, and the nature of the activity which each involves.

Learning Strategies Available IMM1120

Some of the strategies to be discussed have been integrated into other units through a number of web-based tools (Oliver, 1999) but never in such a cohesive manner, and to support such a wide variety of outcomes. Others are simply approaches whose implementation will be dependent on funding and development time. This paper will discuss some strategies that may be available to the IMM1120 Website in terms of the level or levels of learning which each supports, as well as the manner in which each strategy demonstrates the integration of content, learner support, and learner activity. Since a major focus of IMM1120 is the development of a self-supporting learning environment, economies gained through the implementation of the strategies will also be discussed.

Strategies to Support Concept Acquisition

The process of concept acquisition inevitably involves a strong focus on the content to be learned. In face-to-face learning this aspect is typically characterised by lectures followed by some form of assessment (frequently an examination). Much the same approach can be integrated into a Web based course environment. Face to face lectures will be conducted once a week, recorded, and then exported to the Web as video for users to review. As well as a form of revision, this allows students who are unable to attend due to sickness, work commitments or timetable clashes to participate in the lecture without the university needing to schedule extra contact time.

While lectures have been much maligned due to their fixed approach to content and the passivity of learner-participants, they still represent a legitimate didactic teaching strategy especially when used as a component for presentation within an overall strategy involving a sequence of instructional events (Gagné, Briggs, & Wager, 1988).

To enhance retention and transfer assessed drill and practice activities will be conducted on-line at regular intervals during the semester. Once an initial investment is made in the development of the web-based tools and in setting up monitored access for students, it is expected that these activities will prove to be more successful than an examination at the end of the semester. Since the aim of the Website is to support multiple levels of learning, engagement with new content must take place throughout the semester, rather than 'crammed' at the end. Students will log into the tool using their student number (keyfield) and a self-defined password. A random set of multiple choice and short answer questions from a pool will be presented, and students will receive immediate feedback. The results of student responses will be sent to a database for collation. In this type of activity the boundaries between content, activity, and support blur. It is a highly active process for the student, but one where the students are not given much responsibility for their learning since the level of student control is very limited.

Content is defined by the system and assessed on the basis of those definitions. Significantly, while the development of domain specific content knowledge is a requirement of the course, those that already have this knowledge no longer need to attend a lecture series, which may to them appear superficial and somewhat tedious.

Strategies to Support Concept Mediation

While on-line lecture and assessment are ideal strategies for delivering predefined content, they focus on the inputs (content exposition and questions) and outputs (learner response) of learning rather than the internal processes which take place. To enhance retention of learning and transfer to new situations, new information needs to be framed in the light of existing understandings (DiVesta, 1987). This process of making meaning is an important step in the learning process and is inevitably of a higher order than mere reproduction of existing content.

This level can be achieved through approaches such as an on-line debating strategy, which allows multiple perspectives of content to be displayed, with students defending or refuting particular positions. Arguments are recorded for others to peruse and consider. The act of debating allows users to reflect on the views of others and articulate their own thoughts based upon their prior learning and experiences.

Another strategy, which is in some ways similar, is the implementation of a dynamic list of Frequently Asked Questions. Students having difficulties can seek help by posting their problems to a bulletin board, which has high visibility to other class members. In order for students to collaboratively, contributing solutions to each other's problems, a sense of collegiality needs to be instilled. This is no easy task; the course design must tackle the competition inherent in the academic system, as well as offer incentives in the form of assessment points. However, a successful implementation has the potential to support a wide range of student abilities. Weaker students have their questions answered without having to run to their tutor for help, while stronger students are rewarded with the kudos of being a mentor to others.

At first glance these approaches appear to be epistemologically opposed. While debates embrace multiple perspectives, Frequently Asked Questions attempt to distil these into 'best practice' hints and tips. However, both are similar in that they have students as the producers of content. Students are actively involved in framing their learning within familiar terms and reproducing it to their peers. Other than some support provided by the tutor in the form of moderation, this approach is entirely student centred. Learning is scaffolded through peer collaboration; students articulate new concepts in terms that are familiar and operate within their zone of proximal development (Vygotsky, 1978).

Strategies to Support Concept Synthesis

The application of new knowledge to *un*familiar situations is the ultimate goal of student centred learning. As has previously been stated, the aim of IMM1120 is to both provide students with a core knowledge base but also to make students better learners; that is, to be able to develop general principles from their learning and apply them to new tasks. In defining generic skills required for independent self-regulated learning, one must consider skills such as information gathering (research), organisation, analysis, problem solving and the ability to work as part of a time.

One way of promoting these is by implementing a Web-based bulletin board designed to allow students to share relevant Web links that they have discovered through their web research activities. The provision of URLs can be considered an important supplement to content provided by the teacher's lecture material and the textbook. Here, though, the students create the content. This ensures that the content remains up to date without relying on the lecturer to maintain it.

This is a highly student centred approach, focusing on higher level learning. As a strategy for students to "seek and display alternative information sources and to reflect on their quality and integrity" (Oliver, 1999), it directly supports the higher order outcome of concept synthesis, since students are applying general understandings developed from engaging with course content to new situations.

In selecting Websites useful to the course, students are engaged in critical evaluation - the highest level of Bloom's Taxonomy of learning outcomes (Bloom, 1956).

Problem solving has been identified as a key generic skill in many environments (Engel in Boud & Faletti, 1991) and this is supported through the RonSUB tool. This powerful database driven application has been used successfully in similar units at Edith Cowan University (Oliver, 1999), and performs the management of small group problem solving activities. Students develop solutions to practical problems and post them to RonSub for peer and tutor evaluation.

As an example, a problem is given to the students in which they have to recommend to a friend the purchase of a digital or traditional film media camera. This authentic problem is relevant to students and therefore highly motivating (Keller, 1987). It requires them to use declarative knowledge about issues such as file formats, delivery media, and data compression, and apply it to the new situation of selecting a type of camera. The approach to content is as a more a "problem oriented task rather than a fact-oriented one" (Oliver, 1999 p 6), and the peer collaboration and assessment involves students supporting each other through working actively to offer a solution. The best solution is determined through consensus rather than a predefined 'model answer.'

Implementation Issues

There are many factors that can impact on the successful implementation of a Web-based learning environment for IMM1102. In an evaluation of a unit with a similarly large cohort, Freeman (1997) identifies a number of salient issues, namely: the involvement of committed academic and support staff; efficient 24 hour access to reliable technology; staff and student training; and a rigorous approach to evaluation.

Many of these issues are in the process of being resolved. For example, the School of Communications and Multimedia has a laboratory of Apple iMac computers, which have proven to be highly reliable. Capital expenditure on new labs of similar machines over the coming months should further increase access to such technology, however there are still other issues inherent in a unit with such a large cohort that are not easy to resolve, such as the need for committed staff and the management of over 600 students.

As a large introductory unit, it is likely that IMM1120 will be taught by up to twenty tutors on a sessional basis. Also, unit course attrition and tutorial mobility are a reality, which must be catered for within the learning environment, particularly since group work is involved. In fact, the implementation of a converged learning environment such as this is an advantage in that the notion of 'tutorial groups' can blur between off-line and on-line activity, anyway - there is no real impediment to students working in teams outside of their regular tutorial group. In such instances, the use of sessional tutors in the unit can actually be an advantage, also. The criticism has been made previously by students of sessional staff who are ex-students or who have backgrounds in industry, that they are not necessarily the best teachers, and are not familiar with all of the policies inherent in the university system. However, many of the functions of the tutor such as policy implementation and didactic teaching will now be built into the Website. The learners will be the ones taking the responsibility for their learning, with the role of the teacher more as coach and facilitator.

Of deepest concern to the authors is the level of activity which these student centred activities can require. In previous implementations of RonSUB, students have expressed concern for the weekly tasks as 'time consuming' and 'a lot of effort for a few marks'. This 'marks' orientation is to be expected in a society which has instilled such values from birth – students can hardly be expected to value education when the education system itself reduces it to normative scaling and assessment. Many students will also be facing computers for the first time, which can be both disorientating and frustrating due to a steep initial learning curve. It is hoped that by accommodating multiple levels of learning, from basic knowledge about digital technology, to being able to apply their understandings to varied practical problems, the needs of the large group will be accommodated; but this will not be fully known until the unit is evaluated following an initial implementation.

By the time of publication the Website will be completed and available for demonstration. Approximately 600 students will be enrolled in IMM1120, and some data will be available for analysis. While it is anticipated that this will be a demanding unit for students, the opportunity it will provide them to develop their skills at a level appropriate to their individual needs will hopefully create a rewarding experience and a successful basis for further studies.

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