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The judicious utilization of new technologies through authentic learning in higher education: A case study

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Abstract: *Though technology holds significant promise for enhanced teaching and learning it is unlikely to meet this promise without a principled approach to course design. There is burgeoning discourse about the use of technological tools and models in higher education, but much of the discussion is fixed upon distance learning or technology based courses. This paper will develop and propose a balanced model for effective teaching and learning for “on campus” higher education, with particular emphasis on the opportunities for revitalisation available through the judicious utilisation of new technologies. It will explore the opportunities available for the creation of more authentic learning environments through the principled design. Finally it will demonstrate with a case study how these have come together enabling the creation of an effective and authentic learning environment for one pre-service teacher education course at the University of Queensland.*

Keywords: *Learning; technology; pedagogy; integration.*

Introduction

Technology, in all its many forms, offers a great deal to higher education. The use of search engines to find relevant material, the use of synchronous and asynchronous computer mediated communication tools as well as the use of multimedia audio and video resources developed to present students with authentic learning environments can all be examples of technology applied in an educational context. However, realising this potential is reliant on careful educational design and the establishment of learning contexts that effectively use technology. Poor or limited consideration of learning theory and underlying theoretical frameworks for educational design has resulted in much of the promise for improvement of teaching and learning being unmet.

Just as technology can be used for the enhancement of teaching and learning, it can also be mis-used. For example, there are approaches that use dense and complex content focussed online environments, which often bury the learner in text. Designers pretend that such transmission approaches to instruction can be defended because they acknowledge the birth of a “new type of learner”. Also, lecturers sometimes employ edu-tainment and info-tainment packages that rely on technological gimmickry designed to enthuse and excite learners. However, these packages often ignore the lessons we have learnt as a profession about enhancing learning. Many of these have been developed by graphic designers and

programmers rather than educators and as a result the educational goals are subsumed in the pursuit of a clever online, and/or multimedia, presence and so suffer a range of ailments. These include lack of social engagement, lack of authenticity and/or life relevance, and designs which can place a high cognitive load on the learner. Finally, traditional “contact” teaching can belittle the value of applied and integrated technology. Students at times are left with the impression that the technology was simply “bolted on” rather than comprehensively integrated.

The recent literature acknowledges that technological opportunities require the careful remastering of our approach to teaching and learning (e.g., Barnum, & Paarman, 2002; Beckett, 2004; Cheese, 2003; McDonald & Reushle, 2002; Postle, & et al., 2003). However, interest focuses on e-learning, distance and online learning, as opposed to traditional teaching and learning enhanced by technology (e.g., Salmon, 2000, 2002).

A focus on theory building and application could enable a non-disruptive transformation of traditional teaching in higher education. A new order of effective instructional design for traditional contexts needs to arise from a re-conceptualisation of pedagogy. A new approach to pedagogy that effectively considers new technologies will only be possible with attention to the development of a theoretical model, which promotes a balanced learning environment. Some writers touch upon this issue in their discussion of hybrid pedagogies (e.g., McCampbell, 2001). However, much of the work in this field again targets distance learning rather than the more traditional “on campus” learning experiences in the higher education sector.

This paper will develop and propose a model for effective teaching and learning for “on campus” higher education, which is focussed on balancing the elements of content, pedagogy and teaching/learning tools. It will explore the creation of more authentic learning environments through principled design of higher education courses. Finally, it will demonstrate, with a case study, how this model can be applied to enable the development of an effective and authentic learning environment.

The new learner?

The contemporary literature has raised the notion of “new times” to describe today’s society (e.g., Klein, 2002; Millard, 2003) with images of new economies, collapse of time and space, highly mobile populations and new learners. The concept of a new learner considers the tools for learning as directly relevant to the manner and processes of learning. This is not a reasonable stance. It seems unlikely that these new times could significantly change the learners themselves. Learning theorists have developed a fairly comprehensive picture of the underlying processes and circumstances that promote learning and the structure of knowledge, and their key premises are not challenged by the nature of the learning tool or the learning objective. Some of these key premises are, that:

- The learner is the central element in the learning process and what the learner does is more important than what the teacher does (Cevero, 1988; Harriman, 1998; Winch & Ingram, 2002).
- People actively construct their own knowledge based on their own experiences and perceived relevance (schema theory) (Brookfield, 1985, 1988; Candy, 1980; Gagne & Glaser, 1987; Mayes, 2001; Schwartz, Ellsworth, Graham, & Knight, 1998). Learning is a product of active processing by the individual (Mayer, 2004). People actively compare

new concepts with the networks of understandings that they hold and then either adapt, assimilate or accommodate their knowledge structures to include the new information. Information that cannot be instantiated within this network of concepts is often rejected.

- Learning is not socially disengaged but rather is socially mediated and relational. (Vygotsky, 1978) Learning theorists, such as Vygotsky, have shown that learning is socially mediated (1978). It occurs within a social context and is facilitated by social tools (e.g., language). Learners use language to represent the concepts to be learnt and to interact with others.
- Learning is contextual and situated (Anderson, 1990, 1993). The circumstances of the learning event provide a backdrop for the concepts to be learnt and form a complex bundle within an individual's knowledge network. The people who share the learning event with an individual, the setting and the nature of the activities are all components of the situatedness of the learning. The salience of knowledge and ease of retrieval is intricately tied to the relevance of the learning context to future requirement. That is, learning contexts need to be authentic.
- Knowledge is instantiated through conceptual practice, prediction and defence (Anderson, 1990, 1993). Information that is tentatively stored in a knowledge network or schema will develop broken attachments if that knowledge is not drawn upon repeatedly and regularly providing opportunities for confirmation of the knowledge within the structure (Anderson, 1990, 1993). Learners need to practice the application of new understandings by applying them to unique problems, and they need to be given opportunities to defend their solutions based on their conception of the relationships between concepts. These activities provide a forum for knowledge consolidation.
- Learning is not disengaged from emotions (Day & Leitch, 2001; Goleman, 1996; Hargreaves, 2000). Learning is not exclusively a cognitive or intellectual endeavour. Learning events, or learning methods evoke feelings in students, and these in turn reinforce, support or detract from knowledge construction (Goleman, 1996).

Effective learning

Students, therefore, have learning needs that dictate the salience of their learning experiences. These needs impact upon the conformation of the tools of learning, but the reverse is not true. The new tools cannot prescribe a retrofit of learning need. Design for learning cannot ignore these requirements. In short the “new learner” is just the “old learner” with new concepts and skills to be learnt and new tools to learn them with.

Off-the-shelf packages

Commercial software platforms and packages lure teachers with stunning online presence and slick interactive possibilities. However, they can be a trap. They almost certainly have not been designed specifically for any individual course or student cohort and so demand compromises that may jeopardise the integrity of the learning. Other common flaws are:

- **Active screen pages that distract from and disguise learning objectives.** Students can become overwhelmed when working with busy, complex on-screen environments. Without direct instruction and modelling regarding the intent of the presented activities

and environments, and without highly developed content specific meta-cognitive skills, such students often find the sites complicate rather than support their developing understandings (Sweller, 1988; Sweller & Chandler, 1994; Tuovinen & Sweller, 1999).

- **Pages that do not conform internally to a consistent template.** Sites that present different screen images with each click, and which introduce new icons to users, escalate the requirement for induction. This constructs a barrier between the learner and the concepts to be learnt (Apple Computer, Inc. 1992; Chandler & Sweller, 1996).
- **Lack of worked examples.** Problem solution by trial and error does not challenge misconceptions, nor does it allow students to move from supported solution through guided practice to independent solution. Worked examples reduce cognitive load and facilitate the construction of sympathetic, scaffolded knowledge structures for instantiation of new conceptual understandings (Sweller & Cooper, 1985).
- **Convoluting navigation schemes.** These interrupt a student's capacity to think meta-cognitively about the material. Requiring navigation that leads to more than three levels from the portal imposes significant cognitive demand (Apple Computer, Inc. 1992; Chandler, & Sweller, 1996).
- **The presentation of large tracts of text online.** Such presentation, without accompanying guidance as to a framing purpose and possibly activities related to the text, do not support students to engage with the ideas and concepts presented in the text (Hong, Lai, & Holton, 2003).

The best of "Traditional teaching"

The phrase *Traditional* teaching can be used to signify a number of different perspectives. In this case, the phrase is used to indicate the art of pedagogy where there is a confluence of understanding and application of teaching methods, resources and content, utilised within the interaction between a teacher and a student, where the learning of the student is the centre point. The effective utilisation of technology is not something outside of "traditional teaching". Indeed, teaching has always involved utilised technology of some sort, whether it be a pen and ink, or a computer. Focussed flexibility and the ability to blend in different modes and means of teaching and learning characterise the best of the "traditional", authentic teaching and learning environments. The best traditional environments are active, student centred places. Teachers and students collaborate and negotiate methods and goals. Students, with the teacher's support and scaffolding, construct their own understandings and knowledge networks. Students are actively involved in collaborating, negotiating and working with other individuals. Various tools are employed in the pursuit of curriculum goals through appropriate, pedagogy. Technology is just one of these used as part of the diverse, balanced, blended and authentic environment that characterises an effective, successful, supportive, interactive, student-centred learning environment.

Developing a new model for pedagogy

Balanced consideration of the necessary elements for an effective learning environment is the key. When an environment emphasises only one part of the underlying essential elements, whether that is content, pedagogy or tools such as technology, the result will be an unbalanced

learning environment. Figure 1 depicts this. In this instance a course has added a technology element. It has consumed the pedagogy of the course and has become the lone focus.

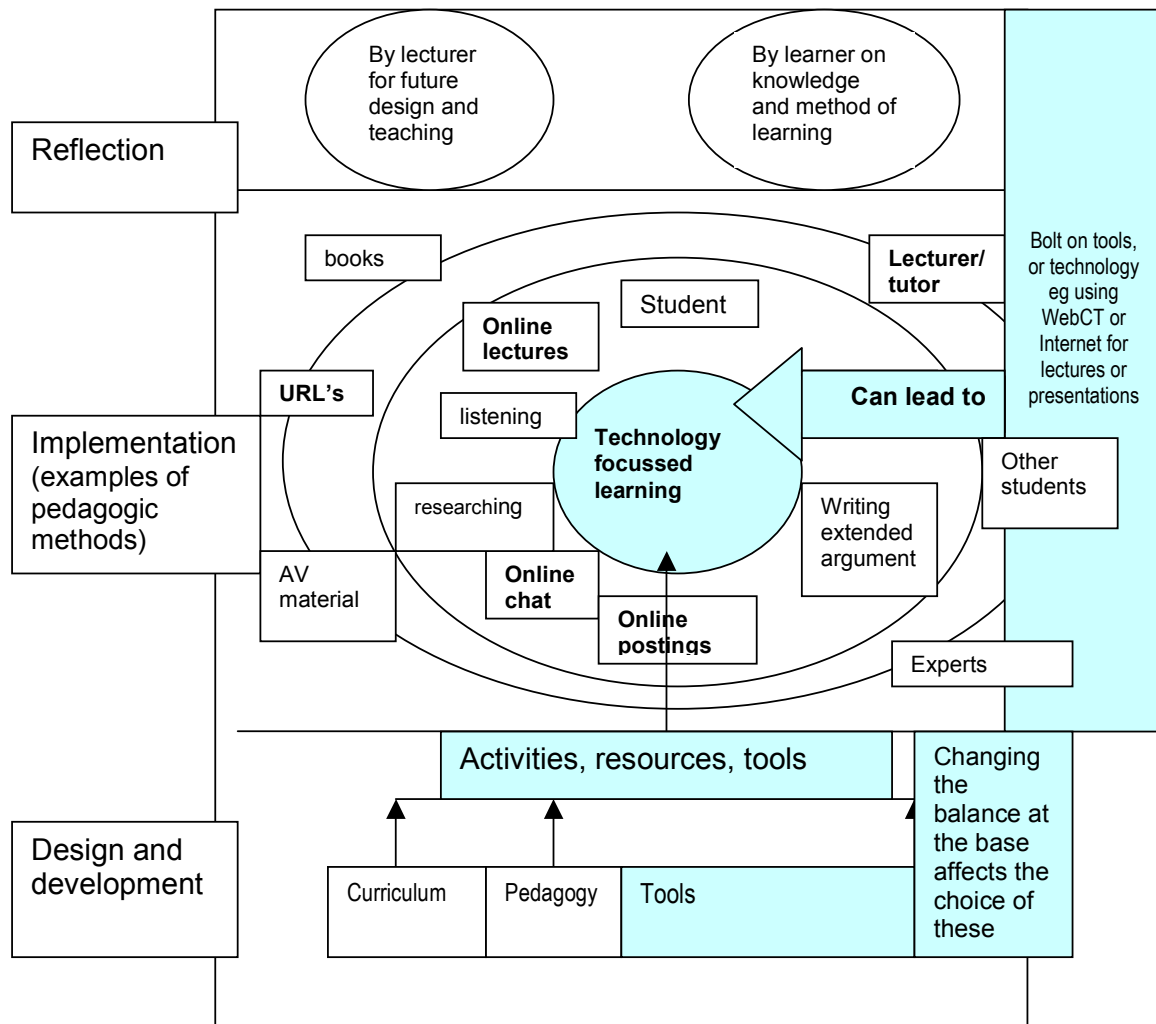


Figure 1: Unbalanced learning model

By contrast, a more balanced model (refer Figure 2) considers the underlying three elements and creates an environment, which encourages and enables learners to engage actively through a number of tools. This model also emphasises the importance of the student engaging with the lecturer/designer or tutor. This relationship is still a key to effective learning.

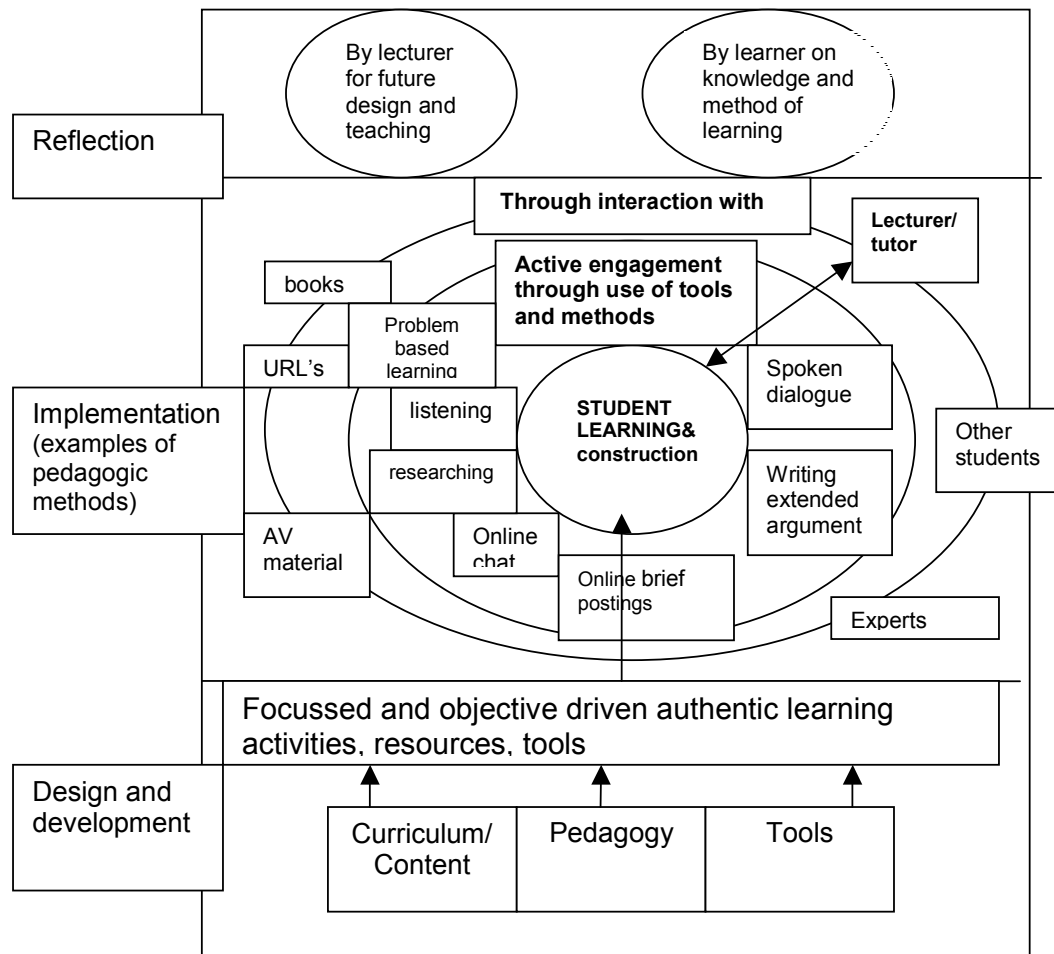


Figure 2: Balanced Learning model

Course design that brings to the fore authenticity would appear the best fit for the balanced model. The quest for authenticity unites the content, pedagogy and tools, and so promotes a solid foundation for balanced course design and conduct. This notion is explored within a case study.

The case study

This course is the last of a graduate pre-service secondary teacher program. It provides a finishing element in student understanding of adolescent circumstances including, the fundamental needs of adolescents and the extended roles of schools, teachers, communities and families. It is timed to follow-on from successful internship, and students come to this learning environment with deep personal knowledge of themselves as beginning teachers and of the demands of the workplace. It is designed to position them as professional contributors, as vectors of change, and as developing leaders for the improvement of schooling, teaching and learning for adolescents. The design recognises the students as accomplished practitioners. The course has been conducted with 6 semester cohorts to date, with an average class size of 85, a teaching team of 6 and combines students from two campuses.

The course is described as “flexible learning” in University materials, but this term that doesn’t quite capture the pedagogies employed. It does, however, truthfully suggest

something different from more traditional, lecture/tutorial offerings. The course relies on a unifying online platform comprised of a range of authentic resources (electronic, print, and interpersonal). Nevertheless, it is not an online course, nor truly flexible. Students do have regular attendance obligations, but it does include significant independent and supported self-directing learning opportunities. The course was developed in response to student feedback which suggested that the preparatory program did not respect their expertise as accomplished practitioners, and did not offer authenticity or relevance to their professional careers.

Authentic learning goals

Authentic learning, in this context, refers to the creation of an authentic learning environment, which situates the learner in a number of “real teaching” scenarios to enable them to problem solve, discuss and research possible solutions. Students, coming to the end of their higher education course, are required to think, act, write and discuss issues, which are re-created through multimedia resources but based on “real life” teaching situations. Many of the multimedia resources, presented in a printed resource book, or on a WebCT site, or on a multimedia CD-ROM are copies of newspaper articles or magazine articles, with the intent to help to orient the student/teacher within the adolescent issues occurring in the twenty-first century world. The final assessment in this course also aids the student/teachers in their journey toward establishing the professional teaching identities, through asking them to participate, as teacher/researchers in making a conference presentation to their student/teacher colleagues, and submitting a conference paper. The best of the papers are collated and published in a book, which forms part of the recommended reading for student/teachers in following years.

Research shows that there is often disjointedness between on-campus learning and the knowledge required for professional contexts for pre-service and beginning teachers (e.g., Zeichner, 1986; Zeichner, & Tabachnick, et al., 1987). Beginning teachers’ report that their preparatory programs are largely irrelevant to their teaching contexts, that they are not grounded in the realities of the classroom, do not demonstrate how theory is relevant to practice, and do not incorporate real world examples. A culture of disregard for university learning has become established amongst school based teachers (e.g., Zeichner, 1986; Zeichner, & Tabachnick, et al., 1987).

With the goal of providing relevance and authentic learning, this course:

- is situated in school contexts and uses emergent themes as a base for the exploration of relevant theory;
- utilises resource based teaching that draws principally from authentic circumstances;
- uses school experienced master teachers in the teaching team;
- relies upon clear development of course concepts from the experiences and expertise of the pre-service teachers, and;
- continues to develop partnerships with school based practitioners.

In the suite of courses that comprise the pre-service program, there is no specific preparation for contribution to the broader professional community beyond the classroom. The students are potential future leaders of the profession, and so this course aims to arm them with a sense of agency and confidence to enter into educational debate.

The final goal is to develop a deep understanding of the issues and circumstances surrounding adolescence and their implications for teaching and learning in schools and communities. Pre-service teachers are encouraged as theory builders, and as principled practitioners, who are

well informed of the relevant academic literature and are capable of operationalizing recommendations for practice that emerge from theory.

The design framework

The course components and their relationship are illustrated in Figure 3. The idea is to give students the opportunity to delve freely into the materials, utilising technology and to select topics that suit their interests and expertise whilst still ensuring exposure to the broad range of issues.

The website presents a space for discussion lists and course profile material as well as providing the portals for viewing video and audio vignettes, and authentic items from the schooling context (e.g., student work). There are around 130 authentic items that can be accessed. The website also links students to public domain resources for and about adolescents. Supporting references include the published conference papers of previous student cohorts. This reinforces students as contributors to professional debate as well as providing some vital support and direction as they prepare their own conference papers.

Regular lectures by experts provide students both face-to-face contact during the course and the chance to engage with working professionals. These speakers may be teachers from the juvenile detention centre, principals from disadvantaged and challenging school communities, social workers with experience of youth homelessness, researchers and general classroom practitioners. Workshop groups team students with a master teacher and provide a central forum for discussion, problem solving and clarification of concepts.

A learning guide provides supporting narrative about the set readings and presents around 140 learning activities for the students to consider. The learning activities are varied and range from pen and paper table completion through to investigation of adolescent chat rooms. Each student is not required to do them all; they must select an area of interest. Thirteen separate readers are available in PDF form on a CD. These readers provide core and amplification readings for each of the topics.

Clearly, the resources of this course are extensive. Students can be self-directed across multiple modes of learning, but the key concepts are encountered in numerous forms, thus creating boundaries around the adolescent theme. Most of all, the material is designed to promote enquiry arising from authentic prompts. Figure 3 shows the design intent. Note the website draws the diverse elements together, but does not replicate elements that are better presented in another format.

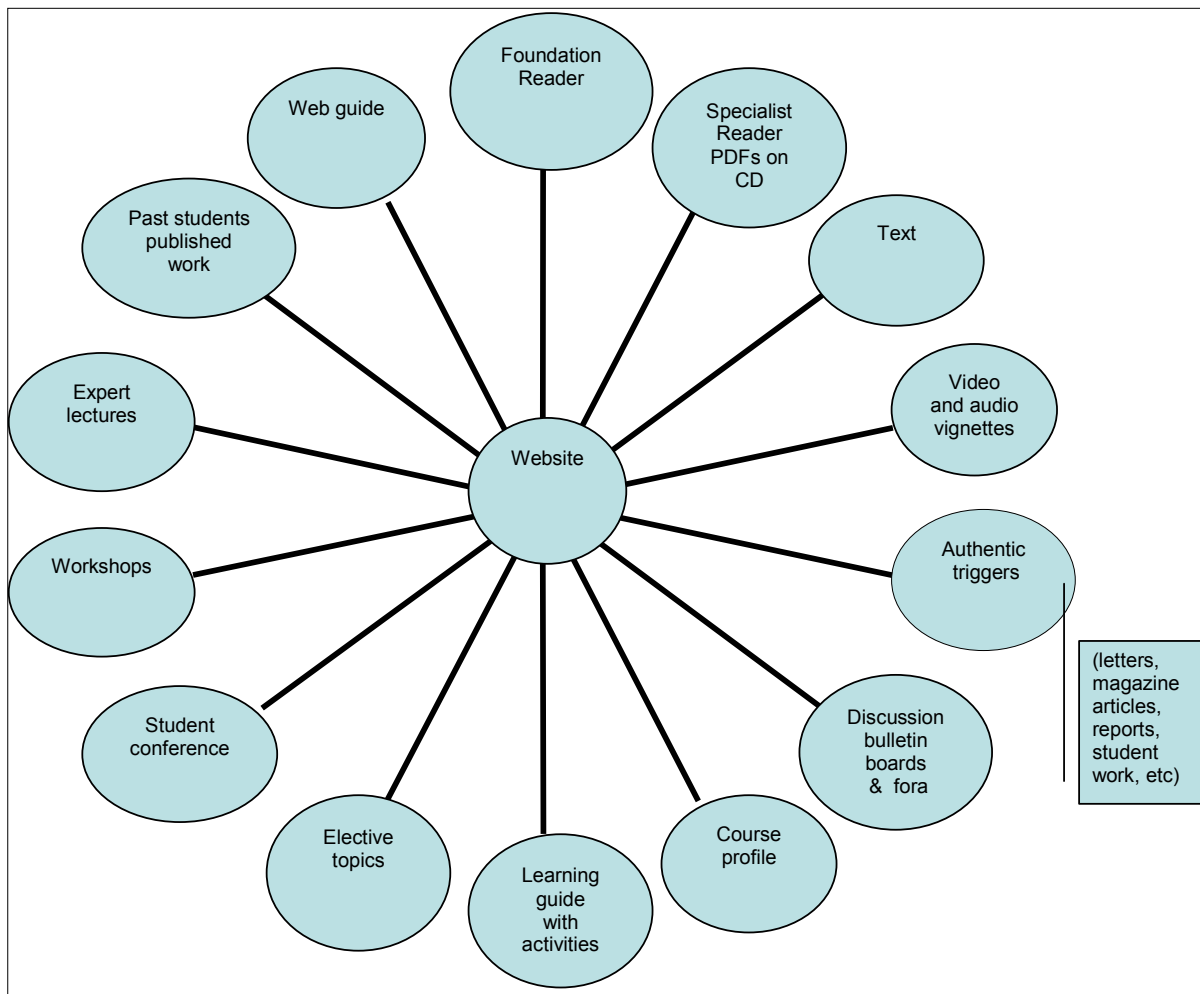


Figure 3: Course components

Figure 4 shows the site map for the website. While the site is complex, nevertheless, the navigation system does not require students move more than three clicks from the home page.

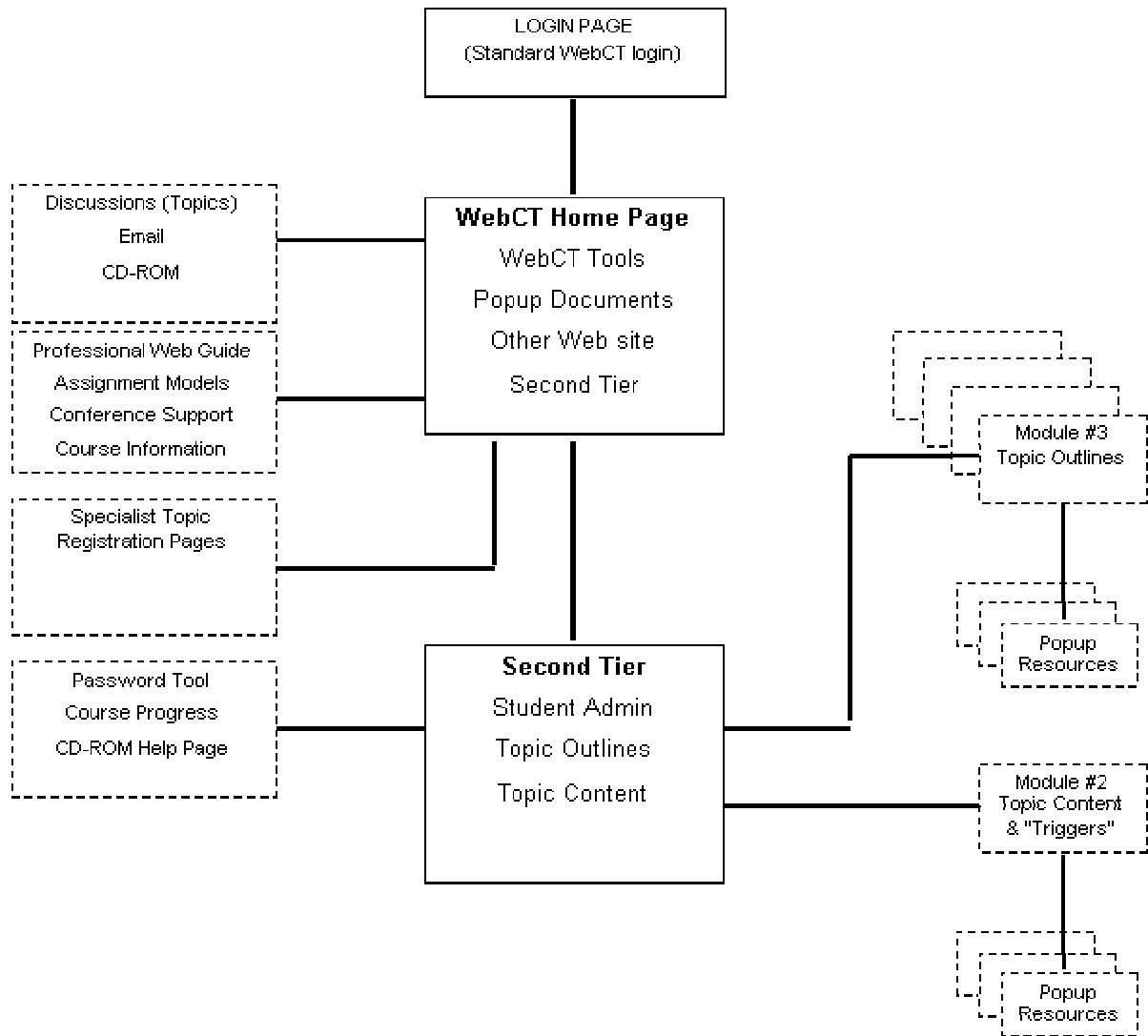


Figure 4: Website map

Figure 5 shows the screen image for the site. This graphic visually organises the course elements and is maintained as the theme throughout the various materials. Streamlining of icons between all of the various elements is essential.

Home: [View](#) [Designer Options](#)

EDUC5059 - Adolescents in Schools and Communities (Sem 1, 2003)

[Home](#)

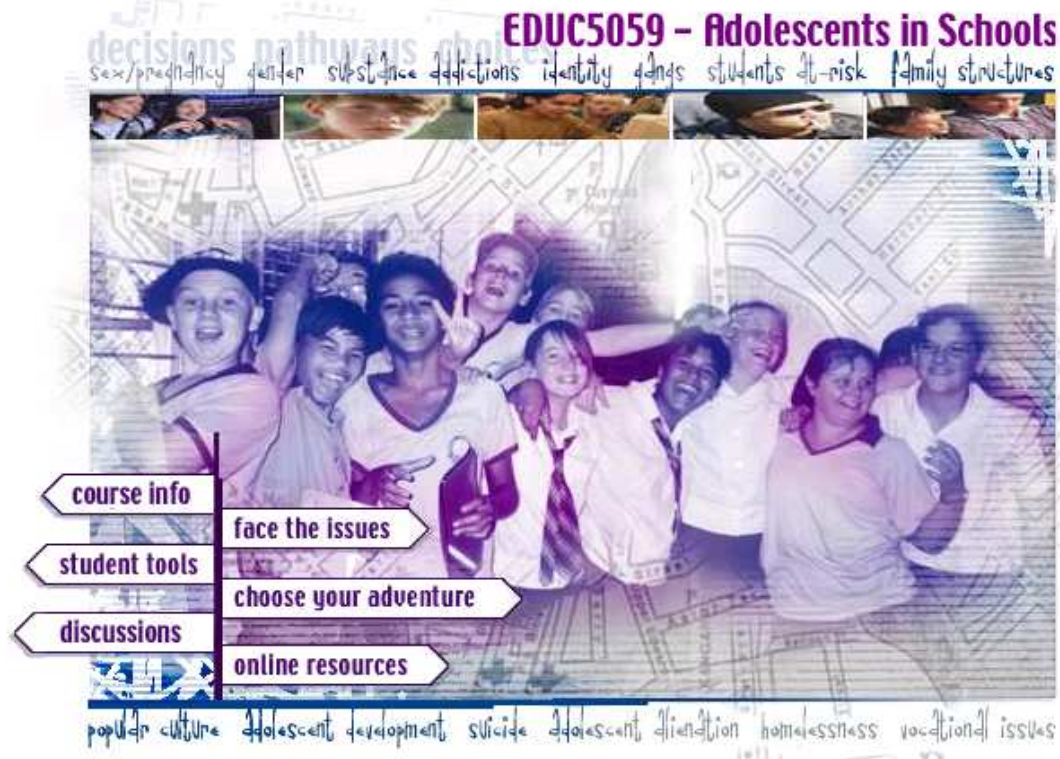
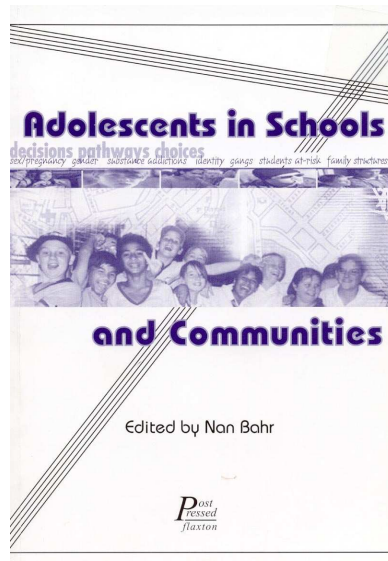


Figure 5: Screen image for the online course element.

The “triggers” and CD video/audio vignettes provide a basis for authenticity as the students consider relevant theoretical argument. The exemplar student work provided as a recommended text provides worked examples for student problem solving (Refer Fig 6).



(a)

22 February 2000
Dear Mum,
I've moved into my room at the boarding house. My room is number 2 Redman Building. Mrs Kennedy is the house mother and she's nice. I have a friend named Kelly, she comes from Longmarch St. She's away from home too. I know I had to come here mum, but I really miss home. I want to put Max and I want to see you and dad. Will you be able to visit sometime soon, some of the girls are having their family visit next

(b)

SPRINGSIDE STATE HIGH SCHOOL SEMESTER 1 2000	
Student: Hamish Anderson Form Class: 10/2	
Maths Mr Anton	Hamish has not applied himself yet this year. He finds trigonometry difficult and is easily discouraged. Hamish will need to work hard to improve.
Science Mr Camrodine	Hamish is often disruptive and distracted in class. Homework is often not, and assignment work is rarely submitted. Hamish is an able student but is not working to his capacity in this subject.
English Mr Wood	Hamish has been absent from class frequently. As a result he has been unable to keep up with the remainder of the class. He will need to work hard to improve.
Citizenship Education Mr Connor	Insufficient work submitted for a grade to be given.

(c)



(d)

Figure 6: (a) Supporting Text providing exemplars of student work. (b) & (c) Example authentic items presented to students. (d) Screen still of a video vignette.

Elements of balance

The sense of balance for a resource-rich course relies on the consideration of how the elements content, pedagogy and tools are considered and applied in a particular circumstance. A further consideration is that the course focuses on presenting an authentic learning environment for the students. Theoretical concepts to be addressed in the course therefore needed to emanate from the exploration of authentic materials. The course needed to be resource rich, and those resources needed to reflect professional contexts, needed to prompt examination of extant solutions to problems in the workplace, and they needed to bring the students to a deep understanding of the literature and theoretical debate that might inform real solutions at the coal face. It was the goal of authenticity that provided the essence of balance between content pedagogy and tools for this course.

Course critique

The success of this course has been evaluated using several techniques including:

- teaching and course evaluation surveys, (written and/or online completion);
- end of program focus groups;
- follow-up unstructured interviews with graduates;
- Informal and unsolicited comments from students, and;
- bulletin board comment monitoring.

Qualitative comments

Focus groups, interviews, bulletin board and other comments have been genuinely and generally positive toward the course. The following comments are typical:

The range of topics available to study were all fascinating and allowing students to choose a topic to specialise in assisted in increasing motivation to study. (2002)

[The course]...brought the content to life, made it more than information. I can't possibly imagine more quality information or a more quality delivery. Don't change a thing. (2002).

This was an excellent subject – it opened my mind and eyes to different aspects of the life of a young adolescent. I now understand them 100% better than I did before doing this subject. (2002).

The conference idea was great ... forward thinking and interesting in providing professional development opportunities. (2002).

The introduction to WebCT and the virtual teaching paradigm with resources online and CD Rom uses. Excellent. (2002).

From my POV, today was a great success. I really enjoyed the conference (2003).

Online survey

A mid-course (week 5 of 9) online survey was completed by 28 of the pre-service teachers. The students were presented with a Likert scale measures of attitudes towards the course. Students rated statements on 5 point agreement scales ranging from 0 to 4, with 0 indicating strong disagreement and 4 indicating strong agreement. A response of 2 was the notional midpoint. Items were constructed with the objective of presenting a simple unambiguous statement of a single idea (Foddy, 1996; Payne, 1954). For example, a typical item read:

The course elements were well integrated.

☐ strongly disagree ☐ disagree ☐ neither disagree nor agree ☐ agree ☐ strongly agree

Table 1 shows the responses to questions about learning arising from the authentic elements of the course. Please note, “triggers” are authentic items presented for consideration by the students and “learning activities” are problems presented in the learning guide that direct students to consider practical implications of issues arising from theory. The results showed students particularly appreciate the authenticity of the course materials and approach. Responses consistently lie above the notional midpoint score of 2.

Table 1: Student evaluation of course

Statement	Mean	Std Deviation	Median	Mode
The course elements were well integrated.	2.68	.95	3.00	3.00
Learning activities were a useful way of encouraging me to think about issues.	2.72	1.06	3.00	3.00
I learned more than I thought I would learn from the learning activities.	2.68	1.03	3.00	3.00
Triggers were a useful way of encouraging me to think about issues.	2.76	1.13	3.00	3.00
Triggers motivated me to consider the theory.	2.44	.92	3.00	3.00
The study materials stimulated my interest in the subject.	2.60	1.00	3.00	3.00
The structure of the subject has helped me to develop the ability to learn independently.	2.60	1.44	3.00	4.00
My critical abilities have increased during the subject.	2.40	1.26	3.00	3.00
I have developed an understanding of this subject.	3.25	.44	3.00	3.00
I liked the opportunity to select from multiple pathways to direct my own learning.	3.13	.99	3.00	3.00

Institutionally managed surveys

Institutionally managed Course and Teaching Evaluation (CEVAL or TEVAL) surveys have been conducted with consistent high overall ratings¹:

2002; CEVAL Rating 4.1/ 5; TEVAL Rating 4.6/ 5 (35 respondents).

2003; CEVAL Rating 4.4/ 5; TEVAL Rating 4.4/ 5 (15 respondents).

All of these are designated “Hi” (high) by the conducting service (Tertiary Education Development Institute) which compares results to other similar level Social Sciences course scores.

Conclusion

Enhancing teaching and learning in higher education requires a principled approach to the design, conduct and evaluation of courses and programs. While this, in itself, may not be a surprising statement, it would seem that there is often a temptation to simply patch technology into the teaching and learning mosaic. Effective employment of new technologies, as a teaching and learning tool, is reliant on the careful development and operationalisation of a balanced learning model. The case study presented here demonstrates that a key element in achieving a learning balance is authenticity. Courses that are designed to be relevant and to employ authentic circumstances as a foundation for exploration of concepts and understandings, will better engage learners and support the effective construction of their knowledge, as well as their application of the knowledge within their later work as teachers.

¹To ensure any individual cohort has not been over-surveyed, institutionally managed CEVAL and TEVAL surveys have not been conducted for each iteration of the course. In some semesters only qualitative evaluative data was collected and for still others the online survey.

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