Pedagogical Challenges for the World Wide Web

TONY FETHERSTON

Edith Cowan University
Bradford St, Mount Lawley
Perth, Western Australia, 6050
t.fetherston@cowan.edu.au

The World Wide Web (Web) is the latest in a long line of technological tools which can be used in teaching and learning at universities. Current interest regarding its use coincides with increased use of different methods of teaching and learning at universities and with increasing use of the Web to deliver courses to internal and external students.

After locating this article within an extrasomatic information processing framework, the author asserts that the use of the Web poses pedagogical challenges. Some of these perceived challenges are presented and discussed. The author also proposes that the debate surrounding the use of the Web in university teaching should centre around learning and not technical issues. The learning issues and challenges discussed in this article include learning approaches, using the technical features of the Web to learning advantage, assessment, learning to learn and change. The article concludes that the challenges discussed are not new and are mostly the same challenges that have been present in universities for a long time.

Humans appear to have a unique ability to carry out extrasomatic information processing (Csikszentmihalyi, 1993). Extrasomatic means that some
processing of information occurs outside of our bodies, and that we don’t necessarily have to store knowledge internally. Speech and writing are examples of this extrasomatic processing. This ability and the “increase in our power to control the planet” (Csikszentmihalyi, 1993, p. 57), makes it possible for us to learn from the collective wisdom of past generations. Universities are places where new generations can learn without having to go through the expensive process of having to experience it for themselves. Extrasomatic processing relies to a large extent on the use of language and upon permanent storage. Until recently, most of this storage was in written form, on paper, and most teaching at universities still relies heavily on this form. However, the advent of the use of computers has meant that a substantial amount of permanent storage is now in digital form. The use of digital storage means that information can be conveniently presented in more forms than just written the word—pictures, sounds, moving images, and various combinations of these are now possible. A web page represents a convenient way of displaying selected elements of this digital permanent storage. However, unlike a book, a web page is not a solitary entity, but is linked to how ever many other pages as the composer of the original page desires.

Once information was stored in permanent form outside of the student, then ways and means had to be devised so that the student could turn this information into meaning. The emphasis on meaning making has increased recently due to the influence of constructivist approaches to teaching, and in learning, much more emphasis is placed on personal meaning making. Students face the task of appropriating external knowledge and turning it into personal meaning.

The advent of the Web, coupled with constructivist views, places increased demands on students, lecturers, and the ways in which they process this particular web form of extrasomatic knowledge. The demands are pedagogical challenges.

Universities are showing increasing interest in pedagogy. Concurrently there is increasing use of the Web to deliver courses to internal and external students. It is timely, then, to examine pedagogy in relation to the use of the Web in university courses.
Increasingly, universities are either mandating or strongly recommending the ownership of a computer from undergraduates. Apart from this top-down approach, students themselves are increasingly using computers in their studies. For example, the Georgia Institute of Technology estimates that 50% of their freshman own a computer at the start of their course (Available at http://Web.sco.gatech.edu/docs/5.html). Increasing computer ownership raises technical challenges such as providing network access for students. However the more difficult task is how to best use computers to enhance the teaching and learning process at a university.

Setting aside the first big assumption that all students have a computer and access to networks, the first challenge is to begin regarding the use of the Web not as a delivery medium, but as a potential teaching and learning tool. Once the focus shifts from delivery medium to pedagogical tool, we can consider pedagogical constructs that can be applied to the use of the Web shifting the debate from the technical issues.

This view would accord with Clark (1983), who deemed it reasonable to “recommend ...that researchers refrain from producing additional studies exploring the relationship between media and learning unless a novel theory is produced” (p. 457). He arrived at this conclusion after considering five decades of research and providing compelling evidence that the focus should be on the pedagogical issues—and not the media or the various attributes that are inherent to the media.

Commonly, most internal courses at universities involve a lecture and tutorial format in which content is delivered at lectures and discussed at tutorials. The unspoken assumption behind this approach is that delivery of the content results in learning of the material. This transmissive approach assumes a strong link between the means of education, the lecture and the tutorial, and the ends, the learning. Most of the time, lecturers who have delivered the material assume that students have learned. This traditional approach is reliant on inputs, and the key input is exposure to content for a specified time.

For external students, materials delivered by the Web offer access to easily updated textual materials, some limited interactivity and access to audio and video that can be streamed in real time. This makes it technically
possible for them to watch a lecture in real time without attending the university. But viewed in terms of pedagogy, this use of the Web for this purpose is a transmissive (and delivery) mode of learning. Indeed, the Web has been likened to nothing more than a 24 hour-a-day glorified whiteboard (Archee & Duin, 1995). While for some external students this transmissive approach can be attractive because of its instrumental nature, from a pedagogical view it does not necessarily result in the best learning.

Transmissive approaches place the student in the position of being a passive receiver of knowledge. There is usually little emphasis on their own conceptions or the active participation of students in their acquisition of knowledge. Results of these cultural transmission approaches are well documented in a number of learning areas. Studies from the wide field of misconceptions research, (e.g., Gunstone, 1988, in a study dealing with engineering students) have demonstrated that student’s own ideas are rarely addressed. The ability of students taught using transmissive approaches to use concepts systematically can also be questioned. Meaningful change in student’s beliefs is also difficult to bring about using transmissive approaches and it is difficult for students to gain a rich and full understanding of concepts (Shymansky & Kyle, 1992).

Some university lecturers are beginning to contemplate using other, less transmissive approaches, and to consider the utility of constructivist approaches. Constructivism emphasises the interpreted and individual nature of knowledge (Duffy & Jonassen, 1992). This knowledge is not developed in isolation but within a social and cultural context (Brown, Collins, & Duguid, 1989). Constructivist learning approaches usually have some emphasis on social aspects of learning.

The use of the Web could assist lecturers who wish to change their pedagogy. Approaches that encompass collaboration and build a sense of community support constructivist learning and the Web could be used to advantage. Such use has “the potential to allow classes to be run so that authentic activities are set and understandings are sought rather than content delivered” Fetherston (2000) and this use is becoming an important focus of research.

Another important consideration arising from regarding the Web as a teaching and learning tool is that it can support social constructivist approaches to learning. If this is to occur then university lecturers will need support as they undergo personal, social, and professional change.
The Web has probably been the main influence that has changed the way we conceive computers. They are no longer machines which have to be conquered or commanded but have become transparent (though maybe some operating systems and browsers make them translucent!) windows into an information world. Students need a sense of this world, a sense of the audience participating and an understanding of the mostly unwritten rules that govern its behaviour, to successfully use the new medium. The second challenge facing the use of Web then is to equip our tertiary students with the conceptual models and practical skills to enable them to participate in this community. This is necessary because, according to a social constructivist view, such participation can lead to different and better learning.

The goal of increased participation in a web community forces consideration of who is participating at the moment. Because of the nature of the Web, reliable information is hard to obtain. Estimates indicate that it is mostly a male, (62% but with increasing female participation), college educated, middle-income activity (Available at: http://Web.gvu.gatech.edu/user_surveys/).

Before students can actively participate in constructing their knowledge, using the information available on the Web, they need an additional skill to those mentioned above: the skill of being able to evaluate the quality of the sources. At this stage it is difficult to tell what sites can be relied upon. We have no well thought through ways of deciding if the information from a site is just chatter or is information that can be relied upon, quoted and used to support an argument. Some system needs to be developed so those sites can be identified that have information that would correspond closely to the veracity of what might be found in a university library. This quality guide would be at the cost of the imposition of a level of control over that information. This raises the third challenge in regard to use of the Web of equipping our students with the critical thinking skills necessary so that they can confidently use information on the Web for learning purposes. This is not a new challenge but has been around as long as we have had information stored in permanent form.
 USING THE TECHNICAL FEATURES FOR LEARNING

Students can fill in forms, watch video, complete a multiple choice test, have it marked, watch live video, listen to live broadcasts, watch and interact with animations, submit written assignments, e-mail other students, talk to other students and look at other students through the use of the Web. These capabilities represent clever technical achievements and there is no reason to think that development in this area is likely to slow. However these achievements pose a third challenge of how to best implement technical capabilities to bring about meaningful learning.

The response to this challenge lies in using these technical achievements to promote engagement in learning by students. We can assume, probably correctly, but it has yet to be demonstrated, that most users find material presented through the Web inherently engaging. Engagement should not be confused with interactivity. Although both may overlap, engagement is idiosyncratic, cognitive, and context dependent. This is why the same content can have different learning effects in different people. Interactions are usually classified as to their type and are not often linked to cognitive processes. According to a constructivist view of learning, it is a learner’s cognitive actions that affect their learning and this can depend on their interaction with content.

Certainly the user centered, nonlinear act of browsing and the use of search engines appear to promote curiosity and challenge—two features of Malone’s (1983) theory of motivation (cited by Alessi & Trollip, 1991). Another possible reason for this inherent engagement could be because “the variety of symbol systems often used, engages several of a learner’s separate intelligences (Fetherston, 1998a). The various media that can be used and the many kinds of possible interactions lead to the challenge becoming that of finding good pedagogical practices that will build on the inherently engaging nature of the Web and to produce engagement that will lead to good learning.

Such practices are likely to allow the student themselves to select and combine different media on a particular site so that they find the best combination that suits their learning approach. Engagement is likely to be enhanced if there is a wide choice of learning paths available to accommodate individual learners as they find their way through content presented. Fortunately the Web seems custom made to enable students to do this
The use of learning strategies based on cooperative and/or collaborative learning also has potential to meet this challenge and many educators throughout the world are exploring these approaches with the Web. The Web allows asynchronous, and increasingly amounts of synchronous, communication. Much research is being conducted on this in various domains but the key question that has to be asked, especially for our distance education students, is this: Does the use of the Web and asynchronous communication produce any better learning than the use of traditional text material and the telephone? The answer will lie not in direct comparisons of different mediums, as Clark (1983) argued, but more likely in attributes like the time spent on task, the quality of the instructional design, and the amount of development time spent on the particular product.

**ASSESSMENT**

To properly answer any question regarding better learning requires a consideration of assessment techniques. Probably a broader range of assessment techniques than currently used at universities is needed to uncover differences in learning. Assessment needs to be reconsidered in most university courses that use the Web and this presents a fourth challenge of how to best use the Web for good assessment.

Most educators would regard good assessment as being valid and authentic and allowing students to apply their learning to higher order, integrated problem solving activities. Authentic means that assessment is part of the learning process, presents a problem worth solving, is a real life test, is multi-stage and non routine, requires a quality product, and the criteria are well known to the student ahead of time.

Traditionally assessment at a university usually involves pen and paper tests. Most current web-based assessment, particularly that built into web management systems such as TopClass (WBT Systems, 1998) involve multiple choice questions. These tend to focus on atomistic knowledge—
that is, knowledge portrayed in parts, out of context, and unrelated to the body of knowledge as a whole. “Decomposition of important knowledge and skill into disconnected bits and the decontextualisation from meaningful situations...virtually ensure their inability to validly assess complex activities” (Resnick, 1987, p. 523).

Using the Web for more valid assessment could mean practices like providing opportunities for assessing students’ procedural skills, allowing students to critique set problems, and allowing students to make up their own questions. All of this is technically possible through the Web.

The repertoire of responses now capable of being accepted by web-based programs is increasing, thereby increasing the potential for assessment of higher order learning. For example programs can now recognise key words in text responses, users can click on areas, move objects, slide scales, and manipulate apparatus, and all these actions are capable of being recorded and reported. On an individual level it is possible now to record rich information in a database format about the development of a student’s thinking which would very valuable in longitudinal assessment of conceptual development in students. Such information could be easily gained through computer tracking of student performance in interactive multimedia “micro-worlds” based on authentic simulations and scenarios.

Traditionally the usual summative function of assessment is to generate a grade and the usual formative function is to make known to the lecturer how to improve their teaching. In a constructivist environment one main function of good assessment is to assist the learner in finding out what they do or do not know. This means that if constructivist environments are used by lecturers through the Web, assessment practices will probably have to change from the traditional assignment/exam system to one that is based on giving students greater opportunity to portray what they know. The challenge then is to construct assessment systems that allow this to take place.

To meet this challenge, assessment needs to be changed from methods, which focus on recognition, recall, are based on course objectives and measure surface learning, to assessment focussed on students’ own conceptions, which is holistic, measuring deep learning, long lasting knowledge, and allowing students to express interpretations. The challenge of good assessment has the potential to be met by the Web. Using the interactive and multimedia capabilities of the medium can lead to many creative assessment strategies and this could be a very fruitful development and research area.
LEARNING TO LEARN

The fifth challenge facing the use of the Web in universities is to how best use the Web to encourage good learning behaviours in students. Most good learning behaviours rely on metacognition and this is universally regarded as an essential attribute of good learning. Metacognition can be defined as “one’s knowledge concerning one’s own cognitive processes and products or anything related to them” (Flavell, 1976, p.232). Good learning behaviours include taking risks, challenging the lecturer’s assertions, and constructing the big picture as new material is encountered. Lecturers can encourage good learning behaviours by sharing control with students, providing opportunities for choice, promoting exploratory talk, and raising students’ awareness of what constitutes quality learning (Baird & Northfield, 1992). All this is now technically possible through the Web.

Encouraging metacognition develops students’ knowledge of the nature of their learning, of their effective learning strategies, and of their learning strengths and weakness. Students who are aware of these attributes can be given some control over their learning leading to better cognitive and affective outcomes. Further, conceptual change requires metacognition and metacognition assists recognition, evaluation, and revision of personal views (Baird & Northfield, 1992).

The Web has potential in this area to meet this challenge if appropriate instructional design strategies are employed in the development of material for the Web. It is unlikely to occur if lecturers just mount their printed course material and use the Web as a convenient delivery medium. If the design of courses allows individual exploration coupled with reflection and the comparison of a student’s views with others, as well as the encouragement of good learning behaviours, then metacognition can be enhanced and good learning can result.

CHANGE

A final challenge to the use of the Web is faced by lecturers themselves. Using the Web means that lecturers will have to change their usual practice. Change to embrace the Web and to meet the above challenges would probably be driven by a belief that learning in their courses is not as good as it could be and that assessment could likewise be improved. Recognition
that a constructivist approach has learning benefits and that a lecturer
doesn’t have to explain everything before students learn it, can also drive
change. Lecturers need encouragement to try the new and to know that their
knowledge and expertise is valued. Change is likely to involve professional,
personal, and social development as proposed by Bell and Gilbert (1994).
The same authors proposed that change is enhanced through giving teachers
space to decide for themselves the nature and pace of change within broad
frameworks (p. 496).

If lecturers accept their freedom to use different pedagogical approaches
then their choice of pedagogy is likely to depend on the social and political
factors in the setting, on which approach best matches outcomes desired and
on an understanding of the characteristics of learners and their needs.
Attributes of the learner such as age, gender, cultural background, where the
learning is going to take place, the social, and political milieu in which the
learning is to occur, and the usual technical factors to name but a few
examples, should all be considered. For these reasons it likely that the use of
the Web for distance education students is likely to be restricted initially to
being just a delivery platform as good instructional design and long develop-
ment time is required to meet the above challenges. It is far more likely that
the above challenges can be met when the Web is used to support the
internal delivery of courses as lecturers can more easily implement the
different approach required. For this reason the Web is most likely to be
used in good teaching and learning in internal courses.

CONCLUSION

The challenges above are mostly the same challenges that face anyone
involved in the learning business. To a large extent they are not unique to
the use of the Web in teaching and learning and are mostly independent of
such use. Despite this they need to be reiterated within the context of Web
use because of the usual excitement and high expectation that accompanies
any new technical advance for use in teaching and learning. Be it calculator,
TV, cassette recorder, videodisc, or computer, its use needs to be tempered
with reference to sound pedagogical principles. The Web is the latest in a
long line of technology which can be used in teaching and learning and it
coincides with change at universities in teaching approaches. We need to be
reflective about the direction and nature of such change and to keep the
focus on pedagogical concerns.
References


Bell, B., & Gilbert, J. (1994). Teacher development as professional, personal, and social development. *Teaching and teacher education, 10*(5), 483-497


