

Designing for Web Teaching

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The purpose of this short paper is to provide some guidance for academics who may be considering the use of the WWW in their teaching, or who may be under pressure from their institution to do so. After five years of being involved in designing Web teaching systems and in using the Web in my own teaching, I've come to some tentative conclusions about how we may approach it's use.

Classroom teaching versus Web teaching - a blinding truth.

The face-to-face environment of a classroom probably contains the maximum potential for effective teaching and learning. This is so because the maximum number of available channels of communication are available for use by both the lecturer and students. This doesn't mean that other learning environments can't be effective, it just means that cannot contain as much potential for communication. In face-to-face teaching, the lecturer can bring to bear all the elements of speech; volume, tone, pace, momentary silence, and so on. The lecturer can use speech to excite, encourage, or criticise. Also, the lecturer has available a great range of body movements that can be used to accentuate, to control, or to direct attention. If this weren't enough, the lecturer can call upon a wide range of supplementary aids. Writing on a whiteboard, use of an overhead projector, a video recorder to play a film, a tape recorder to recordings, and computer generated materials. And the lecturer can move between all these communication media intuitively in response to student reactions that can directly observed. Not only that, but the lecturer can switch between teacher activities and student activities, again as the situation demands. He or she can find out if students are learning, and can supplement the teaching material in ad hoc ways when students experience difficulty with it.

By comparison, the Web is an impoverished teaching medium. The number of available channels of communication are extremely limited. The learning material is mostly text supplemented with images, and less often, sound and video, and the cost of producing good quality teaching resources can be very high. The immediacy of the classroom is completely lost, as is the inter-active nature of good classroom teaching. It is difficult for the teacher to know how well students are learning the materials and it can also be difficult for the student to obtain quick clarification of a question concerning the topic.

The Web as the most expensive printer ever.

Unless the use of the Web in teaching is considered seriously, there is a high probability that it will simply be used as a means of storing handouts and class schedules - and nothing more. If this is how the Web is used, students will print off the handouts and that will be the extent of their use of the medium, in which case the wonderful potential of Web technology will be reduced to printing. This almost guarantees that use of the Web will increase the cost of teaching without any increase in the quality of the students' learning experience. All the PCs, servers, routers, networks, browser software, Web page production, and so on, not to mention lecturers' time, is being diverted to allow handouts to be printed. Since this already happens in conventional teaching, all of this is just added cost. Purchasing integrated Web teaching software packages such as WebCT and TopClass will not change this. The use of the Web as a repository of teaching notes, teaching schedules, and other course administration items is not Web teaching. While this will usually add a degree of convenience for teaching staff and students, this is essentially an administrative use of the Web rather than an educational use, and it is necessary that academic staff and senior administrators understand the difference. Don't

believe students will be enthusiastic about the cost printing course notes and schedules being transferred from the department or institution to them.

The iron rule of large numbers.

It is often assumed by educational administrators that the application of Web technology to teaching will somehow enable larger numbers of students to be taught than is possible with conventional classroom teaching, and this fallacy is so widespread that it needs to be addressed directly. A lecturer with 150 students in a conventional class cannot possibly interact with many of them on a regular basis. Time does not allow this to happen. Neither can a lecturer with 150 students registered on a Web-based course interact with each of them on a regular basis. Interaction is limited by the amount of time available to the lecturer for this activity, and the technology does not create more time. It is the number of students that sets limits on the amount and quality of lecturer-student interaction.

Electronic interaction takes more time.

A lecturer in a classroom can answer a large number of student questions as they arise, and very efficiently because all the students are learning, not just the student who raised the question. The lecturer can make sure the student now understands. Electronic interaction is qualitatively different. The lecturer must understand the question raised in the first place and this is often not possible immediately because the student's question was muddled. It may take two or three e-mails or postings to a Web page to fully understand the student's difficulty. In fact, the Web makes communication with students **more difficult** for lecturers, not easier.

Start at the very beginning

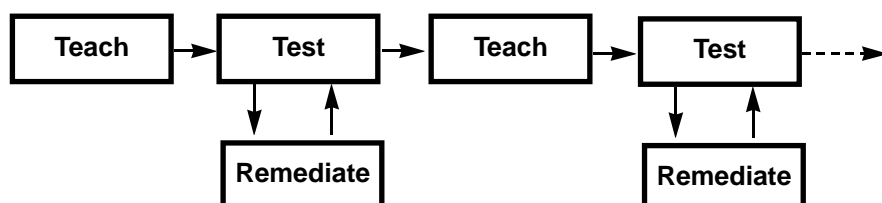
Your philosophy of teaching - teaching for Mastery or Constructivism?

Although the education literature sometimes seems like a huge supermarket of competing philosophies and theories, the two major approaches to teaching are teaching for Mastery, and Constructivist teaching strategies.

Teaching for Mastery.

This approach to teaching contains a set of assumptions about what is being taught, the role of the lecturer, and the role of the student. What is being taught is regarded as the important concepts and ideas associated with a subject, and the student role is to demonstrate understanding these of ideas and concepts. The lecturer's role is the expert who presents these concepts and ideas in ways that help the student come to grips with them. Presentation must be clear, the explanation logical, and the progression of concepts is well structured. To be deemed to have mastered the subject, the student is required to meet a specified level of achievement on a standard test given to all students. Teaching for mastery is a teacher-led approach to student learning.

The basic approach in teaching for Mastery is as shown in the diagram below.



One big advantage of adopting a Mastery approach in WWW teaching is that the Teach-Test-Remediate cycle lends itself to being computerised and automated. Self-scoring tests incorporating pointers to supplementary remedial exercises can be readily built into Web designs, and this makes a Mastery approach feasible for the first time with large classes.

Constructivist approaches to teaching.

In contrast to the mastery approach, constructivism is a student-oriented approach to learning, and there are many different labels given to these approaches, e.g., Student-centred, Discovery Learning, Active Learning, etc. Depending on the specific constructivist method, students may be able to design a personal curriculum, may be able to decide their own pace of study, are more likely to be assessed using project work and portfolios instead of conventional examinations, will spend more time in hands-on experience rather than passively listening to the lecturer, and so on. The emphasis of the lecturer will be on conceptual development and/or skills development, rather than on covering the material in the syllabus, and in creating a challenging, yet supportive, teaching and learning environment. Web technology makes vast amounts of teaching and learning resources available and is eminently suited to taking the student out of the classroom to interesting and relevant resources located in many parts of the world. Students can work singly or in groups on Web-based projects and assignments. However, constructivist approaches place greater demands on both lecturers and students, but the learning environment is likely to be more supportive and less dominated by students' fear of failure. (It also needs to be remembered that a great deal of the materials on the Web have not been scrutinised for validity, and students are often not able to test the truth of claims being made in Web documents. Materials made available on campus have all been validated before lecture notes, journal articles, or books are read by students.)

You should be able to see that a lecturer's teaching philosophy provides a fundamental educational structure that will permeate all activities in the teaching of a subject. The WWW is a technology that can be successfully deployed to achieve teaching aims for either a mastery approach or a constructivist approach, and Web technology has no in-built preference for any particular educational ideology.

What kind of subject is it? - Content-oriented or Performance-oriented.

As we all know, academic subjects vary greatly. Some consist almost entirely of factual material students need to know before they can become a member of a profession (eg, physics, medicine, engineering), while others are more concerned with developing the student's professional performance skills (performing arts, fashion design). This isn't to say that any subject can be described as entirely factual or entirely performance, but many subjects have a bias in favour of one or the other. and we have to know the kind of subject we are considering for Web application.

(1) Content-oriented subjects.

These are the subjects where students are mostly engaged in cognitive processes such as remembering facts, remembering formulas and procedures, calculating, comparing, analysing, solving 'thought' problems in the subject area, and so on. Subjects of this type involve lots of rational 'head' work and not much else. Many of the subjects that pose the fewest technical problems in applying Web teaching methods come from this category. Teaching and learning materials are easily developed based on existing lecture note, diagrams, PowerPoint presentations, and videos. Self-scoring tests having right and wrong answers can be created without difficulty. The one area of technical dif-

faculty is with mathematical symbols and formulas, which the HTML language cannot cope with, but this can easily be overcome by creating mathematical output in the form of graphic images. Specialised Web software such as Maple and Mathematica greatly reduce the difficulties in working with mathematics on Web pages.

(2) **Performance-oriented subjects.**

These are subjects where the aim is to develop talents and skills in the expressive domain, such as dance, music, creativity, etc. Here, the student is assessed, not by how well they have remembered formulas and procedures, but how well they express themselves before an audience in a theatre, conservatory, book, or how original and exciting is a product they have designed. Performance-oriented subjects do not usually have right or wrong answers, and effective teaching tends to be based on tutoring personal performance individually or in small groups rather than lecturing. For subjects in this category, the use of the Web as a serious teaching medium is usually not appropriate.

The above discussion posits two extremes of a continuum, and not many subjects will be 100% content or 100% performance. It needs to be remembered that many subjects outside the expressive arts have elements that can also best be regarded as performance, requiring the student to not only demonstrate understanding of essential knowledge and professional or disciplinary procedures, but also be able to demonstrate skilled performance of certain tasks. Examples of these are hands-on physiotherapy treatment, role plays in social work and management, machining in engineering training, typing in secretarial courses, translation, report writing, and so on.

Programme mode - distance, part-time, full-time?

Each programme mode offers particular opportunities and limitations with regard to applying Web methods.

Full-time programmes.

Full-time programmes offer the least potential for applying Web methods to teaching. This is true because students are on the campus every day, and have ready access to their lecturers, workshops and laboratories, library resources, student counselors, and so on. Students interact with their classmates every day, and because their course activities are on a face-to-face basis in classrooms, they have the maximum potential for interacting with teaching staff to resolve any learning problems. If class sizes are small to moderate, this represents the greatest potential for learning and the scope for improvements through using Web methods is likely to be limited.

It is more likely that the greatest benefit from using Web technology in full-time teaching will come from applying it to issues that have a long history of causing intractable problems in teaching. For example, a long-standing teaching problem can be found preparing students for practicals involving people or machines, as with physiotherapy or machining. In these cases, it is essential the students come to sessions with a good appreciation of the procedures they will be practicing, but this is usually very difficult or impossible to arrange. The Web is a wonderful medium for solving this problem. Video clips combined with short tests can be accessed by a student as many times as is required for the student to acquire the necessary under-

standing of the operations and equipment they will be using in the coming practical session. This use of the Web is most likely to result in a significant improvement in student understanding and skill development on the practical task. Using the Web can also be an effective way for lecturers to provide remedial teaching and on-line tutorials for the very weak students, and this is also likely to lead to significant benefits for those students.

So, for full-time teaching, the Web can be used to add to the quality of students' educational experiences by seeking out those issues that are known to cause problems, and then examining whether, and how, the Web could be used to alleviate the difficulty.

Part-time programmes.

Students can spend hours travelling to and from evening classes after a long day at work, and the demands of their jobs often mean they miss classes or arrive late. Tired students don't make the most receptive or alert students, and visiting lecturers from industry or commerce often have little time to produce good quality teaching and learning materials. Some students may have to go overseas on business for periods, missing classes and falling behind in their studies. These conditions provide fertile conditions for realising much of the potential for applying Web technology in teaching and learning in an area of higher education that is generally the poor relation of full-time courses. Intelligent use of Web technology in part-time programmes offers the potential for greatly reducing the amount of time students spend in lectures and substituting a proportion of sessions with tutorial and practical sessions. For many content-based subjects, there is probably no longer a good reason to bring evening students into classrooms quite so often as in the past.

With part-time courses, the Web brings benefits for students by improving access to teaching materials, and by improving the quality of these. This is less of a problem in full-time courses, and of course, all the problem-solution uses described for full-time teaching also apply to part-time courses.

Distance learning programmes.

The greatest potential benefits are likely to be come from applying Web technology to conventional paper-based distance learning programmes. A richer mix of teaching resources can be made available through the Web, as well as on-line registration, course structure, assessment schedules, tutor feedback, lecturer-student interaction, student-student communication, electronic assessment submission, etc. All these elements provide a substantial increase in quality of learning experience and institutional responsiveness that paper-based distance courses cannot match. Student enrolled on distance programmes will usually be mature adults seeking career advancement through education. They will usually be paying course fees out of their own pocket and expecting high quality learning resources and ready access to tutors and other students, and in this they are often disappointed.

The Web makes it possible to provide a much wider range of teaching resources than could only be provided at great cost in the past, and in this respect the expense of quality distance education can be reduced. Student feelings of isolation is one of the great problems in distance education, and using the Internet can bring significant improvements to the amount and quality of student-lecturer and student-student interaction.

We can see that the range of advantages in using the Web increase as we move from full-time to part-time to distance programmes, and the the potential benefits are cumulative at each stage. This means that generally, benefits that can be achieved in full-time teaching can also

be realised in part-time courses as well as any additional benefits; and benefits gained in part-time can also be achieved in distance learning programmes in addition to any benefits specific to the distance mode.

Adding value through Web teaching - concluding comments.

What will your use of the Web do to improve student learning? You need to be able to answer this questions before you begin the costly process of developing Web resources. If you cannot write down exactly what benefits are likely to be realised, don't proceed. Ask yourself why you're having difficulty answering this question.

Consider the differences between supplementary Web resources, and mandatory Web teaching activities that are built into the structure of the subject or programme. The first is voluntary, and so you shouldn't feel disappointed if few students take advantage of them. The second is mandatory and so you also need to incorporate methods that indicate which students have participated. Students like the structure provided by timetabled classroom teaching. They like knowing that they can ask the lecturer questions, and they like knowing that they're part of a group. In my experience, most full-time students don't object to some teaching and learning being done through the Internet, but they don't want to become distance students in disguise. They like the flexibility that some Web teaching activities brings, but they don't want all teaching to be done this way. Students have a 'value-for-money' approach to teaching where classroom teaching activities are a central part of how 'value' is defined. Part-time students are likely to be enthusiastic about having greater access to subject materials and about the prospect of more tutorials and fewer lectures. Distance students who have no other options will greatly welcome any resources that increase the quality of teaching resources and increase interaction with staff and other students. For web teaching activities to be taken seriously by students, these activities need to be a part of the formal assessment for the subject, and students should know this in advance.

Some important points to bear in mind are;

- If the Web is being considered for use in conventional programmes, there is a good chance that unless great care is taken in deciding how it can compliment the classroom teaching, the result could easily be a significant fall in the quality of teaching and learning.
- Web teaching has become an industry, and software and hardware producers have a commercial interest in presenting Web technology as the answer to all the problems of education. But this is patently untrue, and lecturers and institutional managers need to be sufficiently conversant with the pros and cons of classroom and Web-mediated teaching to see beyond the marketing talk. Also, careers in education are being built on Web teaching, and so within education a new professional interest group is developing. This group will continue to push for greater adoption of Web teaching as this increases opportunities for career advancement for members of this group.
- The Web is a passive medium, and of itself provides no structure for the learner. Web teaching resources just sit on a server, they don't 'care' whether the student accesses them or not. The student must make a conscious decision to access them, must do something to access them, eg, walk halfway across campus to use a computer in a stu-

dent computer room. Classroom teaching, by contrast, provides the learner with a great deal of structure, and many students welcome this, particularly those who are passive or have a strong tendency to procrastinate.

I hope this paper has helped illuminate some of the issues that need to be addressed by teachers and administrators in higher education as they try to assess the potential for applying WWW technology in their teaching. As with all other matters in education, the issue is complicated and Web teaching applications can only be educationally sound if they are based on a sensitive appreciation of the particular teaching context being considered.

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2nd November, 2000