A Classification of Approaches to Web–Enhanced Learning

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INTRODUCTION

The World Wide Web has become a mature platform for the support of learning at universities. Several patterns have emerged, both in the nature of use, and in understanding the conditions associated with successful adoption and application of web-enhanced learning (WEL). This article summarizes, in the form of nine scenarios, the ways in which the Internet is being used to enhance learning in traditional universities. It also discusses the changes needed if universities are to benefit more widely from WEL.

BACKGROUND

The Web is used by universities to make courses available to students who are distant from campus (distance learning, DL) and to enhance learning by students who attend courses on-campus (web-enhanced learning, WEL). Universities may be classified on the basis of the modes of learning that they offer. Virtual universities offer access to courses by DL only. Traditional, or campus-based universities, offer courses that are based on formal lessons held in classrooms or laboratories (classroom-based learning, CBL), but may also offer courses by DL, or flexible learning (FL), a combination of DL and CBL.

WEL is the use of the Web to enhance CBL in traditional universities. WEL provides students studying in the classroom with access to electronic resources and learning activities that would not be available to them in traditional classroom-based study. The simplest forms of WEL provide access to the Web from within the classroom, using the Web as a platform for real-time demonstration or as a digital library. More sophisticated forms of WEL blend activities in the classroom with Web-enabled learning activities that promote collaborative learning among students, even when they are distant from the classroom.

Figure 1 illustrates the relationship between the modes of learning offered by universities. WEL is represented as that portion of CBL that uses the Web to enhance learning.

Figure 1. The relationship between Web-enhanced learning (WEL) and other modes
When it is used to blend in-classroom and out-of-classroom activities, WEL shares the characteristics of DL and FL.

WEL differs from flexible learning in that the focus of the lesson remains the traditional classroom. With FL, classroom-based learning is mixed with learning at a distance. In the most common form of FL, distributed learning (also known as blended learning or mixed mode learning), students participate in formal lessons both in the classroom and at a distance, according to a schedule prepared by the instructor. Some flexible learning may be enhanced by use of the Web, for example, to provide discussion forums in which students studying at a distance and in the classroom may participate together, but use of the Web is not necessary for flexible learning.

This article is concerned with integration of online learning and classroom-based learning to achieve effective and manageable WEL for campus-based students. The focus is on change across a university system rather than in an individual classroom. We argue that WEL adds the most value when it is used to enable new forms of learning, and in particular, online collaborative learning by students working at a distance from the classroom as well as within it (Rudestam & Schoenholtz-Read, 2002). This value can only be obtained through attention at the institutional level to the organizational transformation required to implement, support, and sustain WEL (Bates, 2000).

### WEL SCENARIOS

Nine distinct scenarios for use of WEL can be identified (Table 1, based on Klobas & Renzi, 2003). They can be divided into four groups: information provision scenarios, in which the Web is used to provide information to students and others outside the classroom; classroom resource scenarios, in which the Web is used to extend the classroom, either by providing access to resources in the classroom or by enabling lessons to be broadcast outside the classroom; interactive learning scenarios, which range from interactive virtual classrooms to the use of the Web to support collaborative learning among students working at a distance; and an experimental scenario, in which the Web is used to experiment with technology and pedagogy in ways not envisaged by the preceding scenarios. Any or all of the scenarios may be used alone or in combination, in a single course or by a single university.

#### Table 1. A hierarchy of WEL use scenarios

<table>
<thead>
<tr>
<th>Scenario</th>
<th>Label</th>
<th>Use</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Catalog</td>
<td>Provision of static, and primarily logistic, information about the course</td>
</tr>
<tr>
<td>2</td>
<td>Notice Board</td>
<td>Distribution of course materials in electronic form</td>
</tr>
<tr>
<td>3</td>
<td>Class Resource</td>
<td>Provision of additional materials and references in response to student and teacher experience in the course as it progresses</td>
</tr>
<tr>
<td>4</td>
<td>Classroom Resource</td>
<td>Use of the Web for demonstration or as a digital library during classroom sessions</td>
</tr>
<tr>
<td>5</td>
<td>Streaming Video</td>
<td>Broadcast of classroom sessions</td>
</tr>
<tr>
<td>6</td>
<td>Virtual Classroom</td>
<td>Synchronous interactive classroom sessions that include video and voice communication among instructors and students</td>
</tr>
<tr>
<td>7</td>
<td>Interactive Web</td>
<td>An interactive environment outside the classroom</td>
</tr>
<tr>
<td>8</td>
<td>CSCL</td>
<td>Computer Supported Collaborative Learning</td>
</tr>
<tr>
<td>9</td>
<td>Experimental</td>
<td>An experimental environment for innovative use of the Web</td>
</tr>
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Information Provision

The first group of scenarios (1 to 3) represent incremental changes to traditional classroom-based learning: In these scenarios, the Web is used as an information delivery mechanism that provides students with some flexibility in the time and place with which they access some of the information required for the course. The scenarios range from simple publication of course catalog information to use of streaming video to permit students to ‘attend’ classes outside the classroom. The information and communications technology (ICT) infrastructure, training, and skills required for successful use of each scenario range from simple in the case of the catalog scenario to more complex in the case of the streaming video scenario.

The simplest, and most common, of WEL scenarios consists of provision of basic catalog information about a course: course description, list of textbooks, name of teacher(s), class schedule, allocated classroom(s), and examination procedures. Most university Web sites contain at least a subset of this information. This is a simple scenario to manage. The university needs a web server and the staff to maintain it. The information posted in such catalogs is often pooled or available from a single source. Because it is static, and seldom needs to be updated more than once a semester, the effort involved in maintaining currency is quite low.

In Scenario 2, notice board, teachers use the Web to distribute course materials in electronic form. Such material might include: educational material used by teachers in the classroom (slides, case studies, newspaper articles, site URLs related to the course content), past exam scripts and solutions, and official University communication. The content may be made available all at once before the course begins in the online equivalent of a coursebook, or from time to time during the life of the course (for example, lesson slides may be put online after each lesson).

Use of the Web in Scenario 3, class resource, is more dynamic than in Scenario 2. The teacher selects new material to add to the course Web site during the course, in response to questions asked, interest expressed, and other experiences of how the students are responding to the course as it is delivered. In courses with multiple classes (sections), each class may share the material available on the common course notice board, but may have quite different additional resources.

Effective adoption of Scenario 2 and Scenario 3 requires more extensive ICT infrastructure than Scenario 1 to permit students to access the course web sites on a regular basis. At Scenario 2, some universities make staff available to load materials to the site on behalf of the teacher, but at Scenario 3, the teachers need the IT and the training to be able to load their own materials. This level therefore marks a significant shift in the resources required to support WEL. At the same time, it marks a significant shift in the value added by WEL; at this level, WEL provides the opportunity to quickly and easily provide students with access to current material of direct relevance to their learning and experience in the course as it unfolds.

The Web as a Classroom Resource

In Scenario 4, classroom resource, the teacher may use the Web to access reference materials, presentations and demonstrations from sources outside the classroom. In this scenario, the Web provides convenient access to resources that might previously have been drawn from other sources or accessed in other ways by the teacher. While relatively simple for the teacher, this scenario requires provision of secure access to appropriate IT and Internet infrastructure from within the classroom.

Scenario 5, streaming video, requires more substantial investment in technology, including quality recording equipment in classrooms and the staff to operate and maintain it, high end servers, and high speed networks to all locations where the video may be viewed. There are many systems available on the market. The University of Toronto has developed a system called ePresence which allows students to navigate inside the lesson and assists with management of an archive of lessons (Baekker, Moore & Zijdemans, 2003). Lectopia, developed by the University of Western Australia, offers a high level of automation in recording and publishing, making it unintrusive for teaching staff (Fardon, 2003). For effective use, teachers need to learn how to structure and present visual aids that will be suitable both in the classroom and for presentation by video. The primary uses of streaming video, to allow students the option of ‘attending classes’ from outside the classroom and to review the teacher’s presentation of different material (Creighton & Buchanam, 2001), represent only an incremental change in the nature of education.

Learning Through Interaction

Use of the Web is more dynamic in the Interactive Learning scenarios, which involve interaction between the teacher and students, and among the students themselves.

In the WEL virtual classroom scenario (Scenario 6), the Web is used to transmit complete classroom lessons using synchronous video, voice, whiteboard, and other utilities. Teachers and students from different locations may share lesson components, ask questions, respond and interact with one another in a variety of ways. For campus-based students, a virtual classroom provides the opportunity to share classroom experiences with teachers and students in classrooms located on other campuses (Hiltz & Wellman, 1997). Universities
considering this option for WEL should weigh the considerable costs of investment in ICT infrastructure, training and course redesign against the return to students.

At Scenario 7, interactive web, the interactions are somewhat passive, based mainly on the use of course forums, resource contributions, self evaluation tests, delivery of assignments, and secure online exams. This is the most common application of online learning platforms. Teachers require considerable training and support to adopt this scenario effectively. Students also require preparation, both in use of the functions of the technology, and in how to use the provided functions to improve the quality of their course experience and learning.

A more complex interactive scenario is CSCL (Computer Supported Collaborative Learning, Scenario 8), an environment where at least the online component of teaching and learning is based primarily on interactions among students working in groups. This scenario includes collaborative group learning activities that go beyond those possible with simple course forums. Such activities may include group projects which involve sharing materials or preparation of joint documents. This scenario offers greater potential for improving the quality of learning at universities than any of the preceding scenarios.

Indeed, the power of WEL to change the quality of education is based on its potential to make collaborative learning possible. WEL makes a difference when it is used to enable students to learn collaboratively (Friedlander, 2002; Klobas & Renzi, 2003; Lammintakanen & Rissanen, 2003; Rudestam & Schoenholz-Read, 2002). Students, themselves, describe the value of participation in learning communities of peers (Hamilton & Zimmerman, 2002), while educators claim that participation in collaborative learning not only results in better quality learning of course subject matter, but also in changes in the world view of the students and their capacity for lifelong learning and contribution to society (Klobas, Renzi, Francescato, & Renzi, 2002; Rudestam & Schoenholz-Read, 2002). Furthermore, collaborative learning that makes a difference does not need expensive technologies. CSCL does not require the investment in ICT infrastructure of Scenario 6, and can be implemented with simple asynchronous conferencing software (Hazemi & Hailes, 2002; Hiltz & Turoff, 2002).

Experimental Scenario

The final scenario, experimental (Scenario 9), provides an environment for teachers to experiment with new applications of the Web in the classroom, new Web-based technologies, new educational strategies, and the interaction between these innovations. While current thinking focuses on CSCL as the most advanced form of WEL, the existence of an experimental scenario reminds us to be open to further changes in learning theory and technology. For example, the debate about how to assess both social interaction and learning in CSCL is still open and practical examples of assessment (Chan & van Aalst, 2004; Roberts, 2006) can still be considered as experimental. It also reminds us of the need to evaluate new approaches to learning associated with WEL.

FUTURE TRENDS

Universities across the globe, in developed and developing countries, have been quick to adopt technologies to support WEL, including the infrastructure to support widespread use of the Web as an information resource, and university-wide platforms to support online learning. But this rapid adoption of technology has had relatively little impact on the education of campus-based students (Middlehurst, 2003, as cited in Collis & Van der Wende, 2002; Observatory of Borderless Education, 2002). Those changes that have occurred have been incremental rather than transformational. The Web is most frequently used in a “distributive” mode to provide access to resources—as a substitute for, or complement to, notice boards, distribution of handouts, and use of the library—rather than to provide access to new forms of learning. Thus, the Web is being used to automate rather than to transform university education. Few attempts to go beyond this simple automation have been successful (Pollock & Cornford, 2000). Those universities that are making greater use of the Web are not distinguished from the others by virtue of their information technology infrastructure, but in terms of their focus on students, markets, and policy. Those looking to ‘stretch the mould’ of the future university emphasize flexibility in the location of learning, and have policies in place for quality, future markets, and costs and efficiency (Collis & Van der Wende, 2002) along with systems for training and supporting teachers (Trentin, 2006).

Radical changes in our approach to university education are therefore needed if universities are to benefit from WEL. Bates (2000) claims that “If universities and colleges are successfully to adopt the use of technologies for teaching and learning, much more than minor adjustments in current practice will be required. Indeed, the effective use of technology requires a revolution in thinking about teaching and learning.” (p. v). That revolution, according to Rudestam & Schoenholz-Read (2002), “demands a reexamination of our core beliefs about pedagogy and how students learn” (p. 4) based on theories of constructivism and collaborative learning (Leidner & Jarvenpaa, 1995). Change on this scale requires vision and leadership, as well as appropriate resources.

While much of the literature points to CSCL as a necessary part of the radical change, issues associated with implementing CSCL illustrate how difficult such a change might be. There is, for example, still no agreement on how CSCL can
be assessed in a way that is feasible for the teacher and the university. There continue to be calls for assessment practices to support the shift toward social constructivist educational theories (Chan & van Aalst, 2004).

Bates (2000) calls for “fundamental change in the way our higher education institutions are organized and managed” (p. 5) because “history dictates that the introduction of new technology is usually accompanied by major changes in the organization of work” (p. 1). This requires leadership, vision, policies, planning and evaluation that emphasize the educational goals of WEL rather than just its technological characteristics (Bates, 2000; Collis and Van der Wende, 2002; Friedlander, 2002; Klobas & Renzi, 2003; Pollock & Cornford, 2000; Surry, 2002). To this end, a group of Australian and British universities have developed a model for benchmarking the use of ICT in teaching and learning (Ellis & Moore, 2006).

While they have put the necessary ICT infrastructure in place, universities have paid relatively little attention to development of the human resources needed for successful adoption of WEL (Collis & Van der Wende, 2002). Financial investment in training and skill development for teachers, students, and technical staff is required. It is not surprising, given arguments for attention to pedagogy rather than technology, that successful adoption of WEL is associated with training to develop teachers’ ability to design courses that use WEL to improve pedagogy rather than training that emphasizes the features of specific software (Klobas & Renzi, 2003).

Human resource issues associated with optimization and management of the ICT infrastructure also need to be addressed. This requires attention to engagement with the university’s partners in the supply and maintenance of the ICT infrastructure for WEL (Pollock & Cornford, 2000). The ICT infrastructure for WEL involves several layers of technology (internal and external networks, servers, and applications), and successful WEL requires skillful coordination of suppliers (Klobas & Renzi, 2003).

Changes in the reward systems for university staff are necessary to support the changes in work demanded by WEL (Bates, 2000; Collis & Van der Wende, 2002; Klobas & Renzi, 2000, 2003; Surry, 2002). Such changes in reward systems require short term financial investment, but in the longer term are associated with changes in the nature and structure of work in the university.

CONCLUSION

WEL provides traditional universities with opportunities to enhance the quality of the education they provide to students on campus. While most current approaches to WEL involve incremental changes to classroom teaching, greater value is obtained through application of WEL to improve opportunities for collaborative learning among students. Success therefore requires attention—at the most senior levels—to educational values, financial and human resources, and transformation of educational processes and organizational structure, as well as to technology. WEL will become a natural part of the educational model of those universities with the management commitment and skill to implement and sustain the transformation required, while other universities may find it difficult to survive.

REFERENCES


A Classification of Approaches to Web-Enhanced Learning


**KEY TERMS**

**Blended Learning:** See mixed mode learning.

**Collaborative Learning:** Learning that occurs through the exchange of knowledge among learners. Collaborative learning is a form of social learning.

**Computer-Supported Collaborative Learning (CSCL):** Collaborative learning that occurs via the medium of computer-based communication networks such as the Internet.

**CSCL:** See computer-supported collaborative learning.

**Distributed Learning:** See mixed mode learning.

**Flexible Learning:** Systems in which students may choose to complete some of their learning on-campus and some of their learning off-campus.

**Mixed Mode Learning:** Study that combines traditional face-to-face learning with learning at a distance in a structured program. The Web may be used to enhance learning during study by one or both of these modes. Mixed Mode is also known as Blended Learning and Distributed Learning.

**Online learning Activities:** Learning activities in which students interact with resources, or other students, or both, using the capabilities of the Internet or other computer-based communication networks.

**Social Learning:** Learning through social interaction with other people.

**Web-Enhanced Learning (WEL):** Use of the World Wide Web (Web) to provide students studying in the classroom with access to electronic resources and learning activities that would not be available to them in traditional classroom-based study. The simplest forms of WEL provide information about a course on the Web and access to the Web from within the classroom. More sophisticated forms of WEL blend activities in the classroom with Web-enabled online learning activities which promote collaborative learning among students even when they are distant from the classroom.