USING THE WWW FOR DESIGN TEACHING

ROBERT F. WOODBURY  
School of Architecture, Landscape Architecture and Urban Design & Key Centre for the Social Applications of Geographic Information Systems, The University of Adelaide, SA 5005 Australia

AND

TENG-WEN CHANG  
School of Architecture, Landscape Architecture and Urban Design, The University of Adelaide, SA 5005 Australia

Abstract. In this paper we show how we have used the World Wide Web in teaching design-related subjects at The University of Adelaide and discuss how our use of the Web has transformed both the subjects we taught and our thinking about design instruction. Since 1995, we have used the Web in teaching three subjects. We have progressively gone beyond the delivery of subject material on the Web towards using the Web as a vehicle for fostering new forms of communication among students and academics.

1. Introduction

Many instructors in architecture around the world are now using the World Wide Web (WWW) as an aid in teaching. From our perusals of the WWW, the majority of these are using the WWW as an electronic substitute for the traditional forms of a syllabus, lectures, tutorial notes and handouts. There are more innovative uses, such as electronic design studios (Wojtowicz, 1997; Day et al., 1997; Dave, 1995; Cicognani et al., 1996), formal galleries of student work (Woodbury and Chang, 1996a; Woodbury and Chang, 1996b; Woodbury and Chang, 1996a; Coyne, 1996), large-scale urban models(Fuchs, 1996; Danahy, 1997), distance education (Peter, 1996; Fox, 1997), student collaboration and communication through devices such as bulletin boards, chat rooms and the like (Rehak, 1997). Several projects are underway that promise to foster inter-university collaboration in teaching through WWW communication and resources. Other projects aim at sharpening at create comprehensive subject support through the WWW(Rehak, 1997).

These developments are taking place against a background of similar developments in most disciplines, to which architectural educators would be well-ad-
vised to attend. Perhaps the fastest moving (and best funded) of such
developments is happening in corporate personnel development programs in
which training resources are being directed towards self-paced programs deliv-
ered over the WWW.

These developments are relatively new chronologically though many are
stunningly mature. Even in very recent conferences, for example ACADIA 95
and 96, and CAAD Futures 95, the WWW received relatively little attention, yet
the sophistication of many of the available resources speaks of great effort and
insight on the part of the numerous authors. Apparently, practice outstrips re-
search in this area.

We believe that, as of mid-1997, the role of the WWW in instruction in archi-
tecture remain in the early stages and that both its form and content will change
dramatically in the coming months and years. Accordingly we present this paper
to document for the record one set of efforts in WWW-based teaching and to re-
fect on what might be learned from our early experiences in this area.

2. Three Subjects

Undergraduate study in architecture at The University of Adelaide is through a
two degree structure. The first degree, of three years duration, the Bachelor of De-
sign Studies (Architecture) mixes features of the common studio-dominant model
of architectural education and a liberal arts education. The second degree, of two
years duration, the Bachelor of Architecture is professionally oriented and entire-
ly project-based. Students enrolled in it take only one subject, called Architecture.

Two of the three subjects (CAD-I/II/III and Computational Composition) de-
scribed here are taught in the Bachelor of Design Studies\(^1\). The third subject is
Architecture 1D, which is in the first year of the Bachelor of Architecture.

2.1. CAD I/II/III

2.1.1. Subject Description
The first subject, which we last taught in Semester 1 1995, is a design-oriented
CAD subject. It is structured around a set of assignments, each of which presents
students with a small scale design problem that they must solve using the Auto-
CAD commands and techniques that they have learned previously in the subject.
Parallel to the assignments is a lecture series on CAD that slips in an introduction
to computation, but which draws most of its illustrative examples from the stu-
dents' experience in the lab.

\(^1\)In 1995 CAD I/II/III was an elective subject which included students from all three
years of the first degree. Computational Composition is a portion of a mandatory first
year subject called Design + Form.
2.1.2. Web Resources

As our first Web page (and amazingly, the first instructional Web page in The University of Adelaide), we only provided minimal information on-line and a list of relevant Web resources. The operating system and network we used was Unix, at the time, this simplified the process of creating Web resources.

In this subject, we created one single Mosaic-style homepage (see Figure 1) comprising a standard syllabus, handouts and a bulletin board. Every student had access to email through his/her unix account. The handouts were delivered as either postscript files downloadable from the Web or physical printouts.

![Figure 1: The homepage and the bulletin board for CAD-I/II/III.](image)

2.1.3. Student Evaluation of Teaching

The Advisory Centre for University Education (ACUE) at our university conducted an independent student evaluation of teaching for CAD I/II/III. None of the questions from that evaluation bore directly on the Web pages for the subject, so we report no student evaluation of teaching data for this subject.

2.2. COMPUTATIONAL COMPOSITION

2.2.1. Subject Description

This subject is one component of Design + Form, which is one of two mandatory subjects taught in the first year of the Bachelor of Design Studies degree. It aims inter alia at skills in representation, at instilling an ethos of making and at sharpening critical thinking. A summary of the aims of Computational Composition appears in the top-level Web page for the module.

Composition is making coherent physical form.

Computation is using computers to represent form.
In this module we encourage you to focus on composition. The exercises and assignment are designed to require a small amount of technical knowledge of computers. You should expect, and try, to learn mostly about the "Concepts" of the tutorials and treat the "Technics" or skills as a means to this end.

2.2.2. Web Resources

Our goal at the outset was to provide comprehensive Web resources through which most of the subject information would flow—in all directions. We created the following sub-pages, each of which reflect one kind of information flow.

- HOME—which contains a summary of the aims and objectives of this subject, (Figure 2);
- STAFF—contact information of staff involved in this subject;
- HANDOUT—for distributing the tutorial notes and the assignments;
- HANDIN—for students to electronically submit their work;
- SCHEDULE—for lectures, tutorials and assignment;
- READINGS—which are relevant to the subjects;
- BBOARD—which is similar in setup to the BBOARD in CAD-I/II/IIIs but with a more intuitive browser;
- GALLERY—which contains and formats all electronically submitted student work, (Figure 2);
- HELP—which links to on-line tutorials, both internal and external; and
- CREDITS—which placates the people who created the resources.

All of the Web pages share a common navigation interface, which we coded and maintained in a state of reasonable consistency by hand. All of the Web pages except the BBOARD, HANDIN and GALLERY are straightforward Hypertext Markup Language (HTML) files, which were created by direct editing of HTML source. The BBOARD is managed by a mailing list gateway which converts email into HTML format using a modified version of a public domain program called hypermail. HANDIN comprises three Common Gateway Interface (CGI) programs and a user password program. The security scheme is maintained by team password files, which are used by the CGI programs to validate student actions. Once validated, a user can upload files (the CGI program uses the Netscape file upload feature) from various sources (either text, graphics or CAD drawings), and immediately see the files handed in either on the HANDIN page or on the GALLERY. The GALLERY is maintained by a CGI program that searches the central archive directory and displays student work found there. A person viewing the GALLERY selects an assignment and a team, which the GALLERY CGI program uses to find the appropriate entry and format it for display on the Web.
2.2.3. Student Evaluation of Teaching

The ACUE conducted an independent student evaluation of teaching for Computational Composition. The following are the data relevant to the web-based aspects of this subject.

The learning goals for the Computational Composition module were clearly stated (strongly disagree (1)—undecided (4)—strongly agree (7))
Mean: 4.9 Standard deviation: 1.3

Using the on-line facility was... (very easy (1)—very difficult (7))
Mean: 4.6 Standard deviation: 1.4

The help function gave sufficient information (strongly disagree (1)—undecided (4)—strongly agree (7))
Mean: 3.8 Standard deviation: 1.3

I found the BBoard to be a useful way of communicating with staff and students (strongly disagree (1)—undecided (4)—strongly agree (7))
Mean: 5.0 Standard deviation: 1.3

I found the Gallery to be a useful way of comparing ideas (strongly disagree (1)—undecided (4)—strongly agree (7))
Mean: 6.0 Standard deviation: 1.1

The novel style of presentation of this module has stimulated my interest in the subject (strongly disagree (1)—undecided (4)—strongly agree (7))
Mean: 5.5 Standard deviation: 1.2

I have found the module to be a valuable learning experience (strongly disagree (1)—undecided (4)—strongly agree (7))
Mean: 5.6 Standard deviation: 1.1

The module should be continued to be presented in this way (strongly disagree (1)—undecided (4)—strongly agree (7))
Mean: 5.6 Standard deviation: 1.5
2.3. ARCHITECTURE ID

2.3.1. Subject Description

Architecture ID is a project-based subject with both design and technical components. The Bachelor of Architecture degree is almost entirely taught in the project-based mode, which, in our Department, means that each studio is, in essence, an architecture school in miniature with the subject instructor playing the role of Head, and with many others contributing. Students get the technical information and knowledge at the moment of application. We have found that project-based learning works best when students are part of its planning and execution.

2.3.2. Web Resources

Unlike the other two subjects, in which the Web resources are clearly divided between those parts of the subject delivered by instructors and those to which students contribute, the Web resources for Architecture ID intend to blur the boundaries between instructor and student. As part of the subject, students collectively authored the brief for the project (a Montessori school) as a hierarchical Web document which simply appeared as another subject resource as it developed. In addition, each student presented a comprehensive yet concise summary of their design work in their personal gallery, including a self-critique using an Alexander-like pattern template.

![Architecture ID](http://www.aelmg.adelaide.edu.au/~rw/arch1d/)

**Figure 3:** The Homepage of Architecture ID and one example of brief entries (by Ain-slie Gaye Murray)

The Web resources in this subject presented considerably greater technical difficulty than the previous subjects, partly because the collaboration amongst all actors (instructors and learners) had to be orchestrated on two different networks (our staff network and a student service network) and with both UNIX and Macintosh operating systems. In order to provide real-time Web co-authoring, we create a complicated directory structure in which an automatically generated interface structure was maintained by us, and a corresponding content structure
was generated by students. The result is that an author of one specific Web page can author his/her own Web page in a private Apple Share work space, which work is instantly published on the Web through a UNIX-based server.

Again we designed a common interface structure which supports intuitive (we hope!) navigation through a hierarchical document structure. In these pages, this interface structure is automatically generated and maintained.

Figure 4: Examples of gallery entries by (a) Stuart Mossman, (b) Ainslie Murray, (c) Matt Raven, (d) Martin Ridge

2.3.3. Student Evaluation of Teaching
The ACUE conducted an independent student evaluation of teaching for Architecture 1D. The following are the data relevant to the web-based aspects of this subject.
The learning goals for the Computational Composition module were clearly stated (strongly disagree (1)—undecided (4)—strongly agree (7))
Mean 5.0 Standard deviation 1.2

Using the on-line facility was... (very easy (1)—very difficult (7))
Mean 3.9 Standard deviation 1.1

The help function gave sufficient information (strongly disagree (1)—undecided (4)—strongly agree (7))
Mean 3.5 Standard deviation 1.6

I found the BBoard to be a useful way of communicating with staff and students (strongly disagree (1)—undecided (4)—strongly agree (7))
Mean 4.1 Standard deviation 1.8

I found the Gallery to be a useful way of comparing ideas (strongly disagree (1)—undecided (4)—strongly agree (7))
Mean 5.4 Standard deviation 1.7

The novel style of presentation of this module has stimulated my interest in the subject (strongly disagree (1)—undecided (4)—strongly agree (7))
Mean 5.1 Standard deviation 1.6

I have found the module to be a valuable learning experience (strongly disagree (1)—undecided (4)—strongly agree (7))
Mean 5.9 Standard deviation 1.3

The module should be continued to be presented in this way (strongly disagree (1)—undecided (4)—strongly agree (7))
Mean 5.8 Standard deviation 1.5

3. Discussion

At this time we refrain from detailed theoretical exposition of how our Web resources affect design teaching. We believe that such theory is important, but also that, at this stage in the world-wide focus on the Web, it is important to publish empirical accounts which might form the basis of theory construction—by us and others. We do offer the observations from three positions, that of educational administrators, instructors and students.

From an educational administrator’s position the WWW offers both opportunities and threats. The opportunities lies in potential efficiency gains through co-teaching subjects with other institutions, and by reducing staff contact time. To our knowledge neither of these promises have been yet realised from an efficiency point of view. Again from an administrator’s point of view, the WWW carries the threats of blurring institutional boundaries, challenging the common doctrine of comparative advantage and of losing control of the intellectual property of instruction, which was once the preserve of the institution that offered it, in our institution neither of these threats has become manifest but remain a concern for management.
From an instructor's point of view we would argue that there are several opportunities and at least one threat. Among the opportunities are the following.

The WWW offers an opportunity to experience directly the changing world of practice. The Web or its successors will be a crucial conduit for information flow in architectural practice and research in future. Developments such as Bentley's WWW support demonstrations hint now at radical ways in which collaboration and information access will be transformed in the future. The commercial organisation are, in general, moving faster than academia in this area and new ideas and software appear on the scene often.

The Web can open new forms of communication among students and their instructors. Institutionalised contact between students and instructors typically comprises lectures, tutorials, office hours and, in some places, email. Informal meetings in the hall also play an important role in many places. In our Web resources we included several other opportunities for instructor-student communication, including a bulletin board, but more importantly, a gallery of student work. Students submitted their assignments to this gallery, and we placed our evaluations directly on the gallery. Both student work and our evaluations were globally readable. This simple step had the effect of widening the effect of every word we wrote beyond the individual student to which it was directed to the entire class. We have evidence that many students visited the gallery after our evaluations were in place to read our comments on both their own and others' work.

The Web can assist continuous improvement in conducting subjects. Even though the phrase continuous improvement is a buzz-word from recent management theory, it is a useful concept in developing one’s teaching. Our Web resources help us create, in one place, a comprehensive record of what transpired in a given instance of a subject, giving us the material for ongoing review and improvement. For subsequent cohorts of students we plan to package the previous year's work to stand as exemplars which we will expect them to exceed. Other schools do this manually, notably the National University of Singapore, which regularly exhibits exemplary student work. The Web offers the opportunity to create a much more permanent and meaningful record of exemplary work.

The Web widens opportunities for assisting students. It is well-known that email, for instance, gives timid students a more comfortable way to approach academics. For some students the absence of face-to-face communication with email reduces the stress of asking questions, with the result that more questions get asked. Bulletin boards offer academics to answer commonly asked questions in a place that can be read by all, thus amplifying effort. These are not new. However, using the Web as a uniform interface to email, bulletin boards and other devices opens opportunities for providing more and perhaps better advice. It also has clear implications for the distance education that has increasing currency in many places.
The Web can assist self- and peer-directed learning. In one of our subjects (Architecture 1D) we used the Web as groupware so that a large group of students could jointly author an architectural brief. The authoring of the brief itself became part of the instructional content of the subject, including formal review sessions for the developing brief amongst students.

Against these, and from an instructor’s position is the threat of time. In mid-1997 it is still difficult and time-consuming to create WWW resources, though there is the promise of greater efficiencies through several academic efforts world-wide as well as commercial packages that can be adapted for education.

We cannot scarcely speak from a student’s perspective as we are no longer students and certainly not those who have suffered under our WWW ministrations. Nonetheless, we will venture that students might perceive the opportunity of more diverse avenues of learning and the threat of reduced pastoral care on the part of their instructors.

In summary, we see the Web as a medium for teaching that is more open that those otherwise available. By itself it does not improve teaching, but it does provide a new and unparalleled tool for developing new forms of instruction.

4. References


