NEW MEDIA IN TEACHING AND LEARNING HISTORY OF BUILDING TECHNOLOGY

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Numerous scholars in the field of education established that *relevance* is one of the important instructional components that influence students' interest and motivation to learn (Bergin, 1999; Frymier and Shulman, 1995; Schumm and Saumell, 1995). Relevance can be achieved by juxtaposing personal experiences with professional scientific principles (Pigford, 1995; Blanton, 1998). In addition to the relevancy of a course substance Blanton (1998) recommends that instructors should introduce the material in an organized system that is relevant to the learner's life.

Teaching a survey course of history of building technology posed two questions that triggered my search for innovative teaching methods. First, how to make a meaningful and relevant survey of 4000 years of building technology across different regions in the world to 150 students of architecture and construction science. The second question was what kind of teaching/learning techniques to use to make the course relevant in a class format of a formal lecture.

At the substantive level, relevance is established by linking past developments in building constructions to current salient examples of building technology. For example, showing that the current veneer methods in construction were actually developed centuries ago by the Romans, or demonstrating the link between today's design-build firms and the Master Builders of the Middle Ages, or explaining the influence of 'fast track' construction methods that were developed by Paxton in 1851 in construction of the Crystal Palace on building contemporary high-rise structures. Thus, the course provides a relevant framework to comprehend the contemporary in the perspective of history.

At the pedagogical level, digitized multi-media presentations and a visually saturated class web-site introduce relevant modes of information dissemination to the computer savvy generation of students. The *digitized presentations* not only replace the traditional mode of slide presentations, but enables animation of historical events that are at the background of advancements in building technology. The class *web-site* that I constructed offers students an inexpensive access to a systematic visual representation of the course material. Moreover, the web-site is in sync with today's studying habits of students – i.e., surfing the net.

The paper focuses on the pedagogical level and illustrates the development of experiential teaching and learning techniques in the cyberspace era (i.e., multi-media presentations, computer simulations and web surfing) within a context of this core survey course. The paper concludes with data on pattern of use of the class web-site by the students and their evaluation of its contribution to the class objectives.

Teaching with digital presentations

The catalogue describes the course on history of building technology as chronological development of civilization and building technology from prehistoric cultures to present; the study of classic and modern materials, structural devices past and present, machine-produced products, prefabrication, construction methodology and servicing. The specific objectives of this course are to understand the evolution of building technology and to comprehend the contemporary building science in perspective of time and history. These objectives paraphrase Huss (1895: p.2) insight that *"[T]he methods of the constructor must necessarily vary according to the nature of the materials, the means at his disposal, the requirements which he must satisfy, and the civilization in the midst of which he is places."*

The substance of this course requires exposure to hundreds of visual images, which illustrate the pertinent topics taught in class. The images help students to comprehend architectural styles, construction and finish materials; structural and mechanical systems; construction methods; size and scale; and details of given historical structures. While there are quite a few textbooks for core courses such as history of architecture that include a vast collection of pictures (Fletcher, 1996 ; Kostof, 1995), and while some of these texts address needs of more specialized courses (such as history of sacred buildings technology), instructors often have to compile their own set of resources (Verkerk, 2000). In my particular case, teaching a course on the history of building technology, it was quite difficult to identify a single textbook to be adequate for the course objectives. Thus, it became necessary to develop a digitized image database that would serve as the resource for lecture presentations and for a class web-site. Furthermore, to accomplish the goals of relevancy in teaching and learning I decided to upgrade the traditional "visualization instrument" — the slide projector – to computerized technology.

In the traditional teaching mode of visually enriched courses the instructor uses two slide projectors to show the hundreds of slides that were compiled over the years. The inclusion of two slide projectors in the classroom enabled a visual comparison of two images on the screen. Students revisit of the class presented slides was performed via posting the slides in a light cabinet or on a light table in the library.

The use of slides and slide projectors pose several limitations. Conventional techniques of slide preparation (e.g. photography) do not accommodate flexibility in editing and/or manipulating the images in order to highlight or emphasize substantive points. Furthermore, the traditional slide projector's presentation is not too friendly for handling flexible sequencing of the slides. In addition, the light cabinets/tables do not allow students to study at their own pace and to explore more than one specific set of slides at the same time. Nor does this techniques trigger or stimulate self search of additional resources beyond the specific set of confined slides..

Current computer technology provides an efficient route to upgrade the presentation technology. It serves as a convenient tool to scan the slide collection, to edit, and to arrange the digital images for each lecture topic. The new digital media not only replace the traditional mode of slide show, but enable to control, edit, and enrich the presentation with additional communicative features. It helps post several images on one slide; include clear text and dimensions where needed; incorporate arrows and circles in different colors to accentuate important features of the image(s); draw diagrams near or

on top of the image(s); make comparison of several images at once; and utilize animation features in the presentations. This mode of presentation increases the students' attention and provides an organized and systematic framework for the visual material and the lectures. Hence, it makes the lectures more vivid and relevant: *"I just wanted to mention that I found the course very interesting, and found myself wanting to come to class"* (a written comment by one of the students, summer 2000).

The new method of digitized teaching has altered the way I teach and present the pertinent material for the class. It has eliminated almost completely the use of the traditional blackboard and chalk. The traditional method of learning has been changed by constructing a class web-site, which replaces the traditional viewing slides in the library.

The class web-site as a facilitator for learning
The question of how can students master the knowledge when there is no one textbook that comprises of all images taught in class, can be addressed by constructing a class web-site. Using the web as a learning tool provides the students with an easy, convenient, and inexpensive access to the digitized images. Moreover, the students can surf the net at their own pace - *"[T]he web-site was useful because I was able to view the slides at my own convenience"* (a written comment by one of the students, summer 2000). They can explore the class visual information in the same way they use the web to explore the world.

Boettcher (1999) defines four levels of courses that use class web-sites. Her definition is based on the level of intervention of the web in traditional methods of teaching and learning. The first level of courses using the web is the "web presence course" where the web is utilized at a minimum and includes only the course description, references, and information on the teacher. The second level is the "web-enhanced course" where the course material is distributed and the web serves as a communication tool between the teacher and the students. The third type of course that uses the web is the "web centric course" where the communication had shifted from the classroom to the web and therefore calls for fewer classroom meetings. And the fourth level is the "web course" in which the class developed into a distant learning course. In this level the web replaces the classroom and provides modes of interaction with the material and the instructor.

My class on history of building technology can be considered as the "web-enhanced course" where the distribution of course materials on the web enriches the learning process of students. The class web-site includes the pertinent images for every lecture topic, the course syllabus, schedule, reading assignments with a link to the main library electronic reserves, and reviews. Lecture topics are organized chronologically (see Figure 1) and include information on the *ancient world* (prehistory; Mesopotamia; Egypt; Greece; Rome), the *middle ages* (Byzantine; early Christian/Romanesque; Gothic; Vernacular), the *free world* (Renaissance; Industrial Revolution), and the *modern era*. Figure 2 illustrates the organization and the framework of each lecture topic on the web. The digitized slides are posted as thumbnail images in the order they are presented in the lectures. Although these screens illustrate

one lecture topic at a time, the list of all lecture topics appears on the side and enables the user to select another topic without going back to the main screen of the lecture topics. Clicking on a thumbnail image enlarges it, and students can observe the details of that image and read its title.
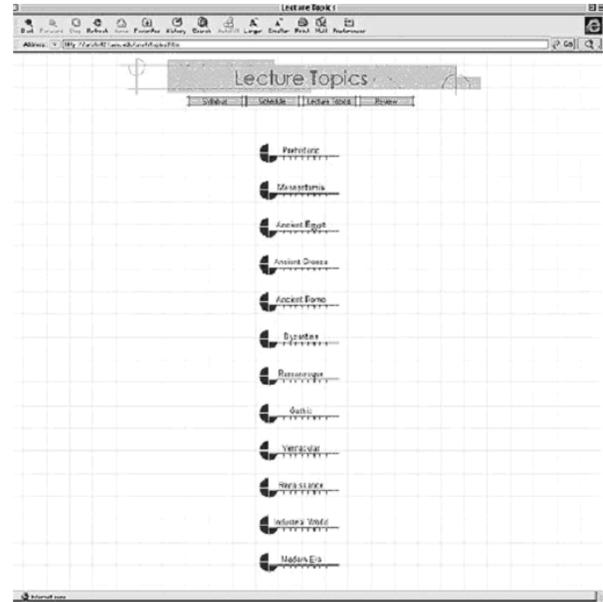

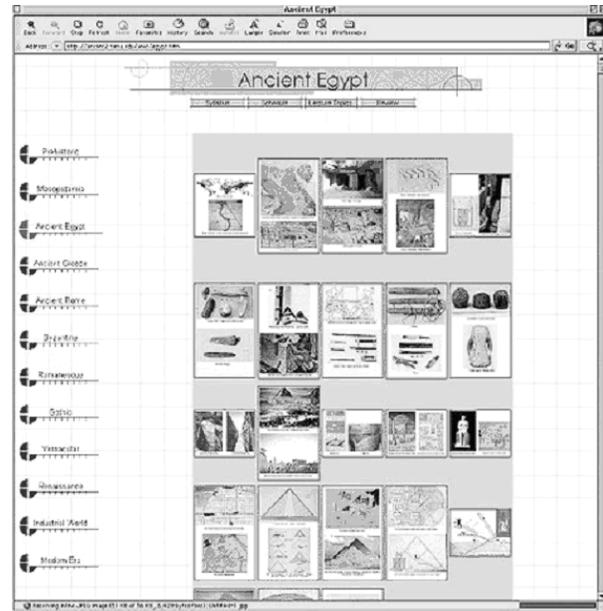*Figure 1: The list of lecture topics on the web*

Figure 2: An example of a lecture topic's thumbnail screen on the web

Since the course is structured as a frontal lecture within a classroom setting rather than a distant learning class, the web-site consists of the lecture images and does not include the lectures notes. The potential development of this web-site into a "web centric course" or "web course" (Boettcher 1999)

depends on answers to major policy questions concerning the role of the internet and web-based courses in architectural education. These policy questions have intriguing implications for the interface of substance and teaching technology and in particular for the instructor in the cyberspace era.

In this particular class-web each lecture topic provides relevant links on the internet and additional references of books and journals on the topic. Hence, interested students can explore specific topics beyond the level addressed in the classroom. It should be noted that some of the additional links include virtual walks in and around historic monuments (e.g., a walk around the Gothic Cathedral of Amiens, France). Such virtual experiences augment the conventional "still images" and facilitate students' comprehension of scale, size and details of given historical structures. Some other links include video clips of construction methods (such as the Nova program on erecting the Egyptian obelisks). There is no expectation that all or most of the students will embark on these new routes, but some do, as illustrated in the following statement: "*I appreciate also the additional links, it gave me the ability to further research the material, it was a great tool for the class*" (a written comment by one of the students, Summer 2000).

Pattern of use of the class web-site
At the end of each of the three semesters I taught this class students responded to a questionnaire that examines their reactions to the new media. The questionnaire included items that probe about general (i.e., "non educational") use of the web; its use in other classes; and finally items that relate to the specific use of the class web-site. The data reported in this paper were compiled in three semesters (summer 1999; spring 2000; summer 2000) and therefore the results should be considered as suggestive. In summer 2000 the students were also asked to add "free styled" spontaneous comments on the class web-site. It should be mentioned that since I teach this course only with digitized methods I cannot compare and assess if test scores suggest a change in learning and retention of ,aterial

 Figure 3 describes patterns of the general and education-related web use of students in my class. The first cluster of three columns shows that the frequency of general personal use (non-educational) of the web increased from 78% of the students in the class of summer 1999 to 84% of the class in summer 2000. This trend demonstrates the increased relevance of the net to students' life. The same increased pattern of browsing the web is expressed in the percentage of students who use the class web-site (last cluster of columns in
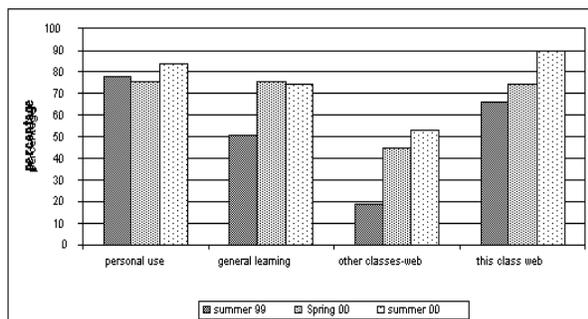
the Figure) — 66% in summer 1999; 74% in spring 2000; and 89% in summer 2000. The data in Figure 3, clearly suggest that more and more students use the web as a source for general learning (i.e., they acquire information for other classes). In addition, the students' responses indicate an increase in the number of class that have a web-site. In the summer of 99 less than 20% of the students in my class participated in other classes with presence on the web, while in the next summer more than 50% of the students experienced classes with a web-site.

Figure 4 illustrates how the students used the class web-site. As expected students' reports indicate that they have used the web more frequently before exams (between 78% and 84%) than before or after regular lectures. In addition, it seems that the exposure to the digitized class presentation triggered more visits of the class-web after lectures (between 49% and 74%) than anticipatory viewing before the lecture (between 25% and 63%). Finally, within each category of use "before lecture", "after lecture" and "before exam" there is a pattern of increase of the use of the class web site.
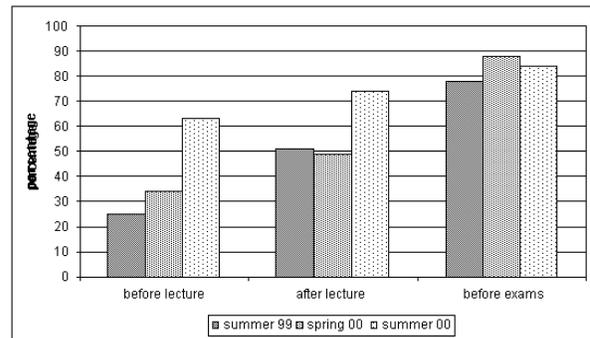

Figure 4: The use of the class web-site

Figure 5 portrays the students' evaluation of how helpful was the class web-site for their understanding and mastering the material. Between 71% and 84% of the students considered browsing the class web-site before the lecture as helpful. The response concerning the usefulness of the web becomes more enthusiastic when the students browse the web after the lecture (86%-100%) and before the exams (90%-95%). It should be mentioned that since I never taught this course without digitized methods I cannot compare and assess if test scores
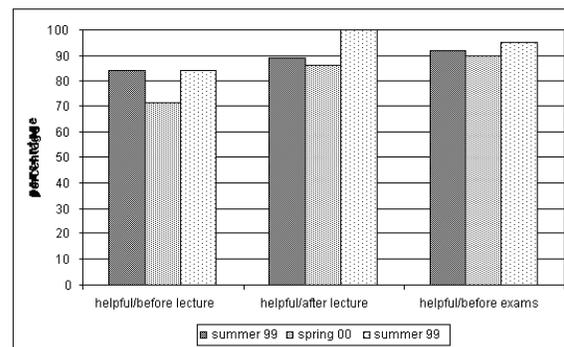

Figure 3 : The general use of the web

Figure 5: The contribution of the class web-site to master the knowledge

suggest a change in learning and retention of the material. However the general positive evaluation of site suggests that the digitized methods are very helpful as written by one of the students (summer 2000): *"I think this type of course is only feasible with the help of such a web-site to review the material. Otherwise the tests would prove near impossible"*.

Summary and discussion

The challenge of competing for students' attention and motivation in core survey courses can be met by making the subject matter and teaching methods relevant and meaningful to students' lives. In this regard the paper attempted to describe a particular case of how the use of new digitized media in teaching a survey course on history of building technology made the class more relevant to students' life and increased their motivation to learn.

In this particular example the new media consist of digitized presentations in the classroom and incorporation of a class web-site that conveys course information, digitized images related to the lecture topics, and reviews for the exams. The assessment of students' responses concerning utilization of the web-site indicates an increased usage of the class web as part of their learning habits - - surfing the net. Their comments suggest the "captivating" aspect of the web: *"Class was great...truly enjoyed it...web-site was super helpful...thank you :)"* (a written comment by one of the students, summer 2000). Moreover, the students report an increase in the use of the web in other classes. Thus, it seems that the inclusion of the web as part of our courses will soon become the standard rather than the innovation. In preparation for this new educational era further investigation of the actual pattern of use and the contribution of the class web-site should be conducted. Such research may include server traffic statistics. Comparing these numbers with the answers to questionnaires will add to the validity of this line of research.

The new media not only replaces the traditional teaching and learning methods but also changes the way of instruction, caters to the current computer savvy generation of students, and makes learning more relevant to their life.

One can argue that the introduction of new media into the classroom requires more preparation, more work and computer skills. While this argument is inherently true, we should consider the fact that computer literacy became part of the requirements in every aspect of our life. Furthermore, today's powerful and user-friendly computers make the new tasks feasible and rewarding. The upgrading of the teaching methods creates a dynamic, up to date, and relevant learning environment.

Finally, as mentioned earlier, the introduction of digital media into teaching and learning introduces basic questions about the role of classroom meetings and the function of instructors. We are part of a transitional era where the digital techniques are replacing the traditional methods. Therefore, schools of architecture as other disciplines are required to debate the issues of web-based courses and the development of distant learning based on tele-communication systems.

Notes

1 The course is a requirement in the Construction Science curriculum. It is offered as one of the history courses in the Architecture curriculum. In addition the course fulfills an elective requirement for humanity courses at the undergraduate level.

2 The Master Builder of the Middle ages was in part the architect, in part the engineer, in part the constructor who supervised the design and construction of important public/religion buildings and in addition served as one source of responsibility. In contemporary practice of design-build, the "Master Builder" is replaced by a team of specialists providing professional services to the owner under one "Master" contract (Dorsey, 1997).

3 The class web-site is password secured ONLY to students who register to the class. The site's URL and its password can be obtained by request.

4 Currently, the class web includes a site meter which provides an unobtrusive assessment of the visits to the site, and the server traffic statistics

5 Typical comments were introduced throughout the paper.

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