A WEB-BASED INSTRUCTION/LEARNING ENVIRONMENT FOR FIRST-YEAR ARCHITECTURAL DESIGN STUDIOS

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Abstract. Web-based learning systems have become popular in recent years. Their application in design education includes advanced design studios and design collaborations. However, basic design trainings, such as first-year design studios, are still conducted conventionally. This paper reports an effort to develop a web-based environment in order to support the learning and teaching processes of first-year design studios.

1. Introduction

Conventional design studios put the emphasis on final design juries. For a first-year design studio, however, the design process is much more important than a final design product. *How can we support that—emphasis on the process rather than product?* Furthermore, students learn from interacting with instructors, as well as with senior students and fellow classmates. Traditionally, these interactions are face-to-face interactions and are constrained by time and locations. *How can we encourage and increase the chance of these interactions?* With the Internet, interactions can happen anytime, in any place and with any person. After experimenting web-based environments in advanced design studios and other courses, we believe the technology can address the two questions posted previously to supplement teaching and enhance learning in first-year architectural design studios.

2. Related Work

The development of this web-based environment is inspired by many experimental virtual design studios around the world.

Experimentations of virtual design studios focus on design team collaborations and communications (for examples, see: Falk, et al. 2000; Kolarevic, et al. 1998; Russell and Forgber, 2000; Wojtowicz, 1994). These studios generally involve students from geographically separated universities to form design teams. In this setting, students may learn and experience that design is not a one-person effort rather it involves a team of professionals, such as other architects and consultants, and non-design professionals, such as clients and users. Furthermore, virtual design studios help students by exposing them to other ways of working since team members are usually from different countries or cultures (Dave and Danahy, 1998; Kvan, 1997).

So far, virtual design studios are primarily upper-level design studios where students have had experience with traditional studio settings, learned basic design communication skills, and tackled some architectural design problems before. Entry-level design studios, particularly first-year studios where students begin to experience studio learning and acquire basic design knowledge, are rarely discussed. Johnson (2000) suggests how internet tools can sustain studio culture. Kvan (2000) presents a web supplemented design studio for second-year students. We find their results encouraging and take the same approach: providing a simple-to-use web-based environment where first-year students may learn to convey and explore design ideas.

3. First-year Architectural Design Studio

Design studio is a setting that successfully integrates learning and application (Boyer and Mitgang, 1996). A typical design studio situates in a place where a group of people overseen by a faculty mentor (studio instructor). Activities in a studio involve individual desk work, desk crits, formal reviews and informal interactions such as casual socialization, occasional debate, and general discussion. Generally, first-year students are not used to this type of learning environment. Learning in the first-year design studio, therefore, includes acquiring design related skills as well as getting used to studio operations.

The first-year architectural design studio at our university covers four subject areas: human, environment, form composition and architectural elements. Short exercises (usually two to three weeks) are used to guide students into specific subject area by raising certain design issues. Contrast to upper-level design studios, the first-year studio introduces the multifaceted nature of design problems to broaden students' thoughts and encourage explorations while putting limited emphasis on design

products. Through short exercises, students learn to convey ideas through verbalization or graphical means. Through interacting with studio instructor, they gain tacit knowledge (Schön, 1987). Short exercise demands more interactions between studio instructor and individual student.

4. A Web-based Support

To support activities of our first-year design studio—short exercises and instructor-student interactions, we envision this web-based environment to have three types of users: students, administrators, and guest visitors.

Students are the primary users of this environment. They should be able to access course related materials, pin-up their works, and have discussions with others. We insist that the system's interface must be simple and user friendly to reduce learning barriers. To facilitate on-line pin-ups, the system provides a pin-up space for individual student to present and explain her/his work. Students post works through a file-uploading interface. Pin-ups are accessible by all users of the system, and every user can make comments on specific pin-ups (see Figure 1). The overall pin-up space is organized by design projects. Under each project, a student has her/his personal pin-up space. Students manage personal pin-up space through account-controlled accesses.

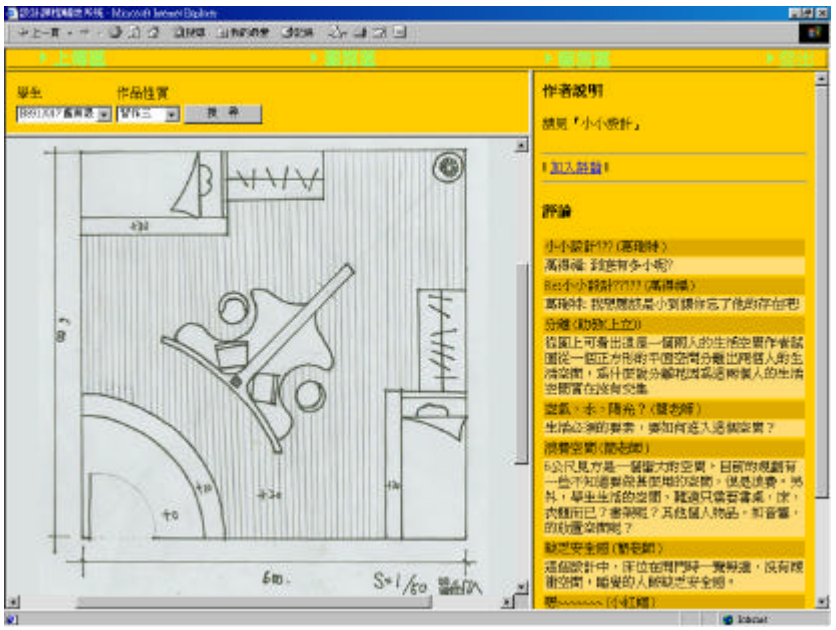

Figure 1. *Web pin-up with reviews*

Administrators are responsible for setting up user accounts and maintaining course related materials. We assume that administrators are studio instructors and/or teaching assistants. Course related materials (for a sample display, see Figure 2) may be stored as any electronic format and uploaded using FTP utilities since FTP provides a faster transmission speed when uploading.

Figure 2. *Course material*

Guest visitors, like students, may access course materials, review pin-ups although they may not post on the pin-up space. Not only can guest visitors browse and comment on a particular work, but they can also read others' reviews. We believe this will encourage informal discussions as well as comments from outside critics.

In addition to pin-up space and reviews, the system provides a general discussion board (see Figure 3). Students are able to chat about design course and related issues, or even talk about anything. The difference between pin-up review and discussion board is that the former aims at discussion on a particular design work, while the latter supports discussions on topics that are more general and not limited to design issues.

Figure 3. *Discussion board*

4. Prototype Evaluation

We have implemented a web-based environment to support the first-year architectural design studio in National Taiwan University of Science and Technology. An experiment was set up to study the impact of the system for a two-month period. Twenty freshmen participated in this experiment. They are separated into two groups. Students in the target group perform design exercises with the support of this web-based environment. The system records all interactions and transmissions in a database. The comparison group, on the other hand, is conducted conventionally (i.e. without the web-based support). At the end of this experiment, a questionnaire is used to gain further understanding of the differences between these two groups.

During the experiment, students worked on four design projects one by one (each project, on average, took two weeks). All four projects required students to make physical models and drawings. Both target and comparison groups are taught by one instructor and one teaching assistant (i.e. same number of mentors but different persons). The class met twice a week. In the target group, the instructor is the primary administrator of the web-based support. Students in the target group were required by the instructor to pin-up works before meetings, and occasionally the instructor brought a notebook computer to the meeting.

Results from the experiment show that, in the target group, the majority of students gradually form their habit to use the web-based support. The instructor appears to be the most frequent users and spend time quite evenly on reviewing pin-ups and replying to issues raised by students in the discussion board.

Results from the questionnaire indicate that students in the target group spend more time (weekly including on and off the class) working on the design exercises than those in the comparison group. In addition, the instructor-student interaction (in particular off the class) is more frequent in the target group than that in the comparison group. In general, the target group students find the system helpful: it encourages discussions between students and the instructor; and it reduces student anxiety (expressed by many students of the comparison group) because the instructor is not present. However, students also express that although the web-based support encourages discussions but they are mostly in verbal (textual) form. Discussions through hand-drawn sketches and hand-made models are possible but cumbersome because additional efforts are needed to convert these sketches and models into digital formats.

5. Conclusion

Our web-based environment is successful in engaging student-instructor interactions off the class. But it has limited effect in encouraging design explorations on-line. This may due to students' insufficient design communication skills. We are not sure. With the positive responses from the students in the target group, we intend to continue using this support in the first-year architectural design studio at our university.

In addition, our on-line critique mechanism (pin-up space and review) in prototype system has also been adopted by other courses with some success. For example, a design communication course uses on-line critique and voting to display and evaluate multimedia assignments. Furthermore, an upper-level architectural planning and urban design (APAUD) studio adds redlining support to enhance the on-line review. Figure 4 shows interface snapshots of web sites for these two courses. Anecdotal responses from students of these two courses are also encouraging.

Figure 4. *On-line critique boards with redlining support (front-left screen, APAUD studio) and voting mechanism (back-right screen, Design Communication course)*

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