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Web-based Teamwork in Design Education

Abstract

Web-enhanced collaborations can be used throughout the design curriculum to increase interaction and critical thinking. Several kinds of architectural projects are well suited for Internet sharing: 1) case studies, 2) site analyses and 3) component sharing. Through these projects, students learn to work cooperatively while contributing to class resources and research efforts. Web template pages for the projects set standards for presentation and shape content organization. The visible nature of a class web page highlights early examples and publicizes achievements and difficulties. The collective class effort provides an accessible source for comparison, development of evaluation criteria and identification of exemplars. When students are encouraged to build on each others' work, they reward strong efforts by their selections. Through careful planning of teamwork organization and technical preparations, Internet exercises can maximize cooperative learning.

Resumen

Las colaboraciones efectuadas a través de la Red se pueden incluir frecuentemente en el programa del diseño para aumentar la interacción y desarrollar el pensamiento crítico. Varios tipos de proyecto se adaptan bien al trabajo de equipo en la Internet: 1) el estudio de caso 2) el análisis de sitios 3) el compartir componentes. Gracias a estos proyectos, los estudiantes aprenden a trabajar en grupos mientras contribuyen a los recursos y a las investigaciones de la clase. Las páginas en la Red para los proyectos establecen el estándar para la presentación e influyen en la organización del contenido. El aspecto visual de una página hecha por una clase pone en relieve las tentativas tempranas y publica los resultados exitosos y las dificultades. El esfuerzo colectivo de una clase provee una fuente accesible de comparación, el desarrollo de criterios de evaluación, e identificación de ejemplares. Cuando se anima a los estudiantes a compartir ideas entre sí, se reconoce y se recompensa a los mejores ejemplares por su difusión. Mediante el planeamiento cuidadoso de la organización del trabajo en equipo y las preparaciones técnicas, los ejercicios en la Internet pueden llevar al máximo el aprendizaje cooperativo.

I. Introduction

Design schools mistakenly emphasize individual work even though design practice revolves around group work. Specifically, the building design process can include over 50 kinds of participants and consultants, but architecture schools rarely teach interdisciplinary teamwork (Cuff 1991). To foster team projects, students must learn how to use clear and precise language, delineate responsibilities and organizational structure and cultivate appropriate attitudes and responsibilities (Middleton 1967). Web projects can help develop these abilities by supporting information sharing and formalizing group interaction.

Web projects can develop teamwork skills while acting as conduits for communication within schools and beyond the campus. Peers, families, professionals and specialists can view class Web pages and potentially contribute to the learning process. This paper will describe how Web-based design exercises can stimulate productive interaction and open the educational process.

2. Background

The exercises come design studio and digital media classes from University of Hong Kong (1993-1996) and University of Oregon (1996-2000). Originally I lead small groups of advanced students in Virtual Design Studio remote collaborations. (Wojtowicz 1994) Since 1995, I have introduced Web authoring in large required courses and have assigned web reports for almost all my classes. During this time, the Web has become ubiquitous, Internet authoring has been simplified and new collaboration applications have emerged. (Craig and Zimring 2000)

Most recently my colleagues and I have experimented with the Web as a group learning resource that promotes interaction between parallel design studios and between outsiders and students. By analyzing assignments, observing individual progress, surveying student and instructor attitudes and examining produced work, we can understand how our exercises enable or constrain learning.

3. Web-based exercises



Figure 1. Template page for rowhouse analysis by A. Scott Howe with diagram graphics and resulting student project (right) by Gary Held and Susannah Tallman

The following exercises have been effective for developing smooth teamwork, fostering content-rich products and promoting technical competency. The first two, case studies and site analyses, are analytical pre-design exercises used in co-teaching beginning design studios. They stimulate learning by requiring students to gather, select, relate and present appropriate information. The third, component sharing, is a generative exercise in which the Web enables students simple design interaction.

3.a Case studies

With colleagues, I have assigned building case studies focused variously on types (i.e. townhouses and libraries) or technology (pre-manufactured structures). We have found that even novices can be guided in creating attractive, informative building analyses. An instructor-generated template page organizes the structure of the report and shows how headlines, graphics and text can be arranged. Standard file formats and naming conventions facilitate cataloging. Graphic examples guide beginners in parsing aspects of a design into useful, succinct diagrams. Instructors involved in Spring '99 and Winter '00 classes agreed that the Web was helpful in sharing information among first year students and instructors. (Cheng 1999). (Figure 1)

Precedent case studies allow a range of participants to contribute to a broader store of knowledge (i.e. Zimring 1995) Students benefit both in creating case studies and in reviewing the resulting database. By structuring a Web-site and staging hand-in requirements, the coordinators can steer the participants' explorations.

3.b Site analyses

In Fall 1999, Web pages supported cohesiveness in a large team-taught site analysis. 85 second year undergraduates analyzed six adjacent city blocks prior to designing two projects there. Students worked in teams to examine different topics and produce drawings, physical models, and web pages. The work was divided so each section provided unique contributions, generating peer pressure for successful completion. Site documentation was specialized by product and territory, site analysis by topic. To encourage understanding of the whole district, students were not told where their design projects would be located.

For the website, group representatives defined template graphics and fleshed out class pages according to an instructor-generated structure. Representatives guided their classmates in producing standard-format web reports. Drawings were posted to the website as small images linked to image files that would print out at 1/8"= 1'-0", with some links to two-dimensional CAD files.

Information was shared both digitally and face-to-face, since the students worked in six adjacent studios. Rather than dealing with digital files, some students preferred the immediacy of tracing photocopies. Some did not post CAD files since it was easier to exchange Zip disks or use network file sharing. (Figure 2)

Teachers arranged interaction between classes: 1) All products had to match their neighbors. 2) Drawings and models and Web reports were shared in science fair fashion. 3) Students could use any of the six blocks to locate their subsequent design project, a pedestrian amenity (bicycle strand, coffee stand, magazine kiosk, or restroom).

Through the large group project, students learned how to work together. The Web facilitated communication of coordination guidelines and encouraged their use.

3.c Component sharing

By making components accessible, the Web can help participants build on each other's work. For example, Fall '96 my students and Prof. Jerzy Wojtowicz's Vancouver students designed variants of a partner's folding screen. They had to interact to interpret and transform each other's designs. (Cheng 1998)

Fall '99, 180 architectural computer graphics students designed building parts and uploaded them as symbol libraries. By clicking on icons, students could download the libraries. Communication naturally evolved even though no interaction was needed. The icons gave students examples of component assembly. Many students exchanged components with acquaintances, stimulating interaction in a potentially anonymous situation.

Winter '00, an advanced class pooled all resources in visualizing designs by Bernard Maybeck. Each student selected a monument to interpret from photographs and drawings.



Figure 2. Site analysis website: cover page (left), block index (right back) and block documentation (right front)



Figure 3. Component sharing: library elements (from top: Samuel Adams, Yu-Chinn Chou, Ann C.Y. Wu, Octavianus Ludiro); rendering of Maybeck's Berkeley Hillside Club with downloaded furnishings (Arief Prasasti)

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For course websites, see (<http://darkwing.uoregon.edu/~design/nywc/HTML/teaching.htm>)

In successive assignments, students could share Web graphics, model elements, building models and rendered images. Professor Ellen Yi-Luen Do's University of Washington class loosely collaborated, contributing furnishings and fixtures to the online collection.(Figure 3)

Student evaluations and outside critics confirmed that this class was successful. Stimulated by architectural content, students learned technical skills. They received remote and live feedback from specialists in computer graphics as well as architectural history. Authors of well-crafted lighting fixtures were rewarded by seeing their components re-used repeatedly. In the hands of others, their work was celebrated by presentation in new contexts. The public nature of the class work encouraged a high level of development.

4. Analysis

In each exercise, individuals create a group Web resource. Analyzing case studies, documenting site information and creating shared symbol libraries benefits the community. (In contrast, creating portfolios benefits primarily individuals.) Compiling efforts into a compendium adds value to an individual's labor. The exercises avoid some difficulties we found in Virtual Design Studios: pre-design teamwork goes more smoothly than design teamwork because students have less ego invested. In sharing components, students build on each other's work in a simple way, eliminating time-consuming trust-building and negotiation (Cheng 2000). Frequently, strong students post to the Web first, providing models for classmates.

Table I. Summary of Web-based exercises.

Task	Advantages	Disadvantages
All Web Collaborations	+ Facilitate large group sharing + Guide content organization and presentation + Permit easy comparison, discussion of quality criteria	- Difficult to optimize for hardcopy, large group presentation and individual browsing - Computer monitors discourage markup and use of scaled images
Virtual Design Collaborations	+ Exercises design sharing, in possibly complex ways	- Difficult to develop high level of trust
Individual Portfolios	+ Records student progress + Records results of teaching initiatives	- Little intrinsic value to peers
Case Studies	+ Requires students to generate different digital representations for different building systems	- Generates copyright problems from scanning published sources
Site Analyses	+ Large group can analyze and share comprehensive set of topics + Students learn from re-drawing components	- Detailed scale drawings hard to compare on monitors
Component Sharing	+ Enables easy duplication and transformation of others' work + Requires synthesis from understanding component roles	- Interaction can be minimal

A class Website facilitates large group sharing, including dissemination of guidelines. Instructors can embed organization, procedures and schedules. Rules, responsibilities and tasks can be posted as well as student responses. Students can help peers comply with guidelines and understand performance standards.

Showing potential benefits of a technology and enabling effective use is a major challenge (Cheng 1999). Since Web authoring takes time from architectural design, a balance must be made. The Web design process must be streamlined, with enough time for aesthetic control.

To maximize Web-supported learning, activities and incentives need to be planned. Web reports can stimulate dialogue between classes in live presentations or online. Students can be assigned to ask questions or find answers in their peers' reports. If Websites are aimed at potential beneficiaries, such as clients, students could enjoy outside input. Engaging outsiders is important because architectural students need to see the context of their learning. (Boyer and Mitgang 1996, Dutton 1991).

To summarize, Web projects can facilitate teamwork and communication skills by collecting and disseminating information about team structure, workflow and individual responsibilities. By revealing group standards and individual contributions, Web projects encourage community responsibility.