A Design Studio Program that Applied Groupware to Stimulate Students' Interactions
A Case Study of Junior Studio

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Since 1996, Kumamoto University has repeated several experiments to apply web-based collaborative design techniques to a junior design studio to stimulate students' interaction in the class and to enhance their design abilities. As it became evident after a two-year experiment that writing web pages and uploading them to a web server was a barrier of communication for students, the authors developed a web-based groupware called GW-Notebook, and started using it in 1998. In the fall semester of 2000, the authors tested the groupware in a revised version, and a new program of studio instructions that assumed the use of the groupware. This paper, referring students' answers to two sets of questionnaire respectively carried out in 1997 and 2000, discusses the effectiveness of groupware and the instruction program.

Keywords: *design studio; groupware; www; information sharing; design communication*

Background and Objectives

A conventional design studio consists of asynchronous works of students or student groups, and individual consulting of their projects by advisers. Though there are critiques in a class, such asynchronous working styles prevented from mutually stimulating their imaginations and design activities through daily communication. Since some of students began to work with a PC at home, advisors faced difficulties following the progress of students' activities.

Reviewing several successful examples of web-based collaborative design studio projects conducted by a group of schools at remote locations (Wojtowicz, 1995; Yee, 1998), Kumamoto University started in 1996 several experiments to apply such techniques to a studio as a solution to the communication problems of conventional studios.

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the authors developed a web-based groupware called GW-Notebook (Morozumi, 1999), and started using it in 1998. It has been another goals of systems development to provide an environment for productive or creative design communication among students and teaching staff in a way that the conventional studio cannot realize. The revised version was introduced to the junior studio in the fall semester of 2000, in which a new instruction program that applied various utilities of the groupware was also tested (Morozumi, 2001).

It is the objective of this paper to discuss a model of communication in the studio, and a tested program of studio instruction, as well as to review performances of GW-Notebook as a center of communication in the studio. This paper introduces the students' answers to questionnaires conducted soon after each studio as basis for discussions.

A Model of Communication in a Studio

A web system was used in those studios to present information common to the class, such as schedules, reference material for the project, manuals and instructions of tool usage. It was also used as a pin-up board for asynchronous communication, first to present and share design documents among class members and, second, to exchange comments, questions and answers among class members, instructors and teaching assistants. It is also used as a media of presentation and a reference for synchronous discussions during class hours by projecting its pages with a couple of PC-projectors.

Students accessed the system through the Internet. Most of them worked in the collaborative design studio (public computer space of the department), but some worked with a PC at home. The instructors and teaching assistants worked from computers in each office when they had time during off-studio hours.

Students first archived sketches, models and survey data in a personal page. When they needed to discuss designs for the purpose of organizing a presentation as a team, or to share collected data in a team, they transferred documents from a personal page to a team page.

To encourage asynchronous design discussion, students or instructors used a bulletin board or wrote comments in the comment section of a web page located beside each document. Students downloaded data files from pages to their own PC to use them as a basis for work in the next stage. When students organized an off-line meeting, they used a team-minutes page to keep records of discussions.

Major Features of GW-Notebook

In 1996 and 1997, students and instructors in the studio wrote programs with HTML whenever they needed to add new web pages. After analyzing design communications in these studios, the authors developed the GW-Notebook:

a) It is written with VB script as a special web working in an ASP environment linked to Microsoft Access. It can be used from Windows 95/98/2000/NT PCs by just accessing the designated URL with a popular web browser.

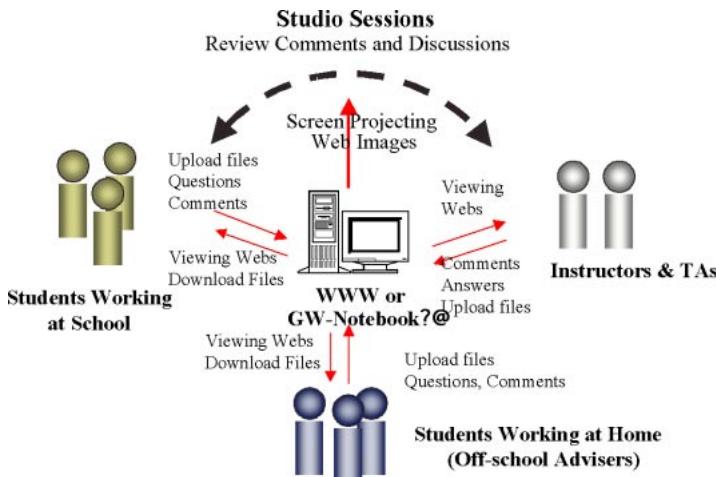b) It has applied a simple web structure with minimum pages of fixed format selected for design

Figure 1. Web based communication model in a studio

communication, such as a Data Page, Bulletin Board Page or Team Minutes Page. Once the project name, team name or member name is registered, the system automatically generates Notebooks, Pages and the indices necessary for each (fig 2).

c) There is a utility to help upload files to a web page. When one uses Internet Explorer, one can select a file to upload in the Explorer window displayed. A directory-utility assists the user to archive files to folders defined according to their classification system.

d) It handles document files, spreadsheet files, graphic files, or CAD files of all types. Data Page and Team Minute Page have utilities to display graphic files in both thumbnail image and display size image. With the help of a plug-in, user can display DWG, DWF and DXF files and even manipulate several utilities such as viewing, layer control and shading on a web page. For other files, the system displays file name, but the user can start related applications by just clicking file names displayed on a web page.

e) Students have their Personal Notebook as the start point of their work. When they need to organize a presentation as a team, or to share collected data in a team, they copy documents to a Team Design Page with the help of transfer utility.

f) To encourage a synchronous design discussion, students or instructors use Bulletin Board, or write comments in the comment section of a Data Page located beside each document.

g) When instructors or students want to retrieve documents, they could use a utility to form thumbnail lists of documents retrieved referring to owner, file name and key words, which allow displays of mouse-clicked documents.

Figure 2. Page Structure of GW-Notebook 2000

Design Studio 1997 and 2000

Designing a 400-room size hotel complex as a core or urban resort in Kumamoto City was the theme in the fall junior studio of 1997. In the first month, students in groups of five or six analyzed the site conditions and existing prototypes. After the three weeks of individual work for the initial design proposal, students formed teams of three or four, and then developed a final proposal in teams.

The studio of 2000 took the revitalization of a 200m x 500m old residential area that lies behind a downtown shopping street in Kumamoto City as the starting point of their studies, and asked each student to design a building on a vacant site or to replace buildings they thought unsuitable for the area. The major steps of the studio were the following:

a) A group of three or four students studied the total area and uploaded reports on physical and social features of the area.

b) Each student produced a visual scenario of citizens' lives and activities in the area assuming three original characters to stimulate student imagination (Jozen, 2000). In the next stage they were asked to develop visual images of interesting scenes, reorganizing the visual scenario uploaded by classmates, and studied design programs for individual projects, such as location of sites, activities they want to pursue, and type and size of buildings.

c) Concurrent with individual studies, two committees were organized to establish urban design guidelines for the area and to propose traffic systems and open space networks, reviewing the ongoing studies by individual students through GW-Notebook. They were also asked to make suggestions to students and coordinate their designs. Some changed the sites or the types of building during the discussion.

d) The instructors asked students to integrate each design with proposals by other students working in neighboring sites and to design in-between spaces of buildings.

e) Each student and the committees refined final proposal documents and submitted them in the form of sheets, or CAD models.

Discussions

Advantages of the web system as a center of communication (fig 3)

a) Though students worked on days other than the studio-meeting day following each schedule, some especially at home computers, they could maintain necessary communication. In both cases, only a few students did not review web pages as often (Q1). Some answered, "Works of other students presented on web pages helped them find solutions or develop their imaginations", because "they could observe them carefully when they have time, without disturbing others."(Q2/Q3)
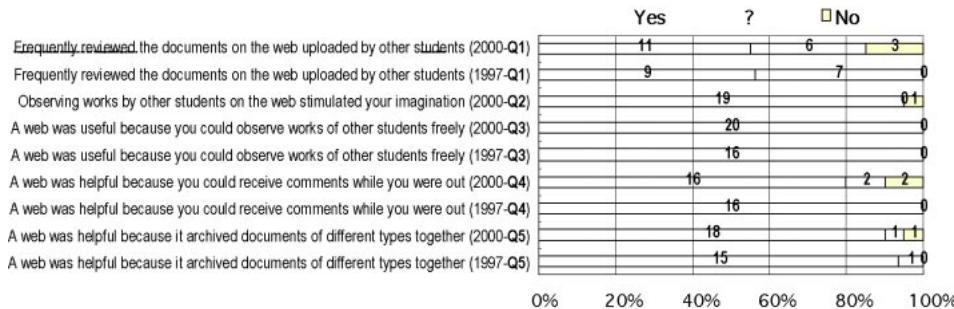

Frequently reviewed the documents on the web uploaded by other students (2000-**Q1**)
Frequently reviewed the documents on the web uploaded by other students (1997-**Q1**)
Observing works by other students on the web stimulated your imagination (2000-**Q2**)
A web was useful because you could observe works of other students freely (2000-**Q3**)
A web was useful because you could observe works of other students freely (1997-**Q3**)
A web was helpful because you could receive comments while you were out (2000-**Q4**)
A web was helpful because you could receive comments while you were out (1997-**Q4**)
A web was helpful because it archived documents of different types together (2000-**Q5**)
A web was helpful because it archived documents of different types together (1997-**Q5**)

Figure 3. Students' answers to questionnaires Part-1 conducted in 1997 (n=16) and 2000 (n=20)

Figure 4. Students' answers to questionnaires Part-2 conducted in 1997 (n=16) and 2000 (n=20)
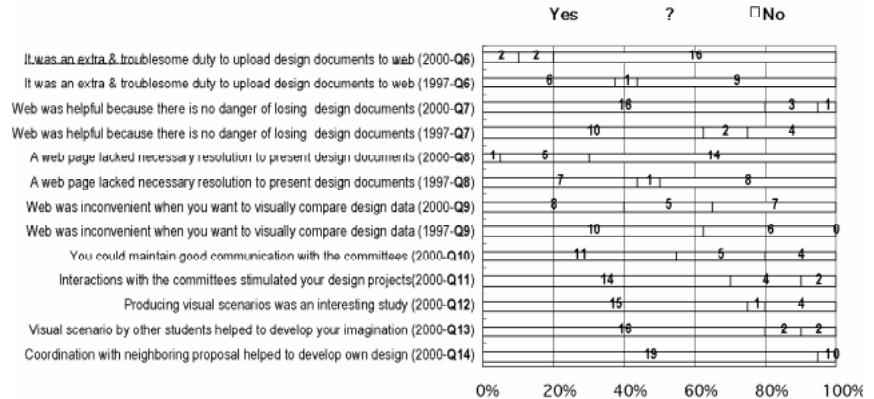
b) There were many cases where the Bulletin Board helped students to communicate with the instructors while waiting for the next studio meeting (Q4).

c) At review sessions, students could effectively display design documents, projected to large screens. It is an important advantage that students could use any documents produced in defending comments from instructors or classmates, because they could easily display documents uploaded on a web (fig 4).

Advantages of the use of GW-Notebook

d) Twenty students uploaded 1795 files to the GW-Notebook during the last project. In the first one or two weeks, some students made mistakes in operations of the GW-Notebook, but they soon became accustomed to it. It has almost eliminated busy web maintenance work of the system administrator.

e) The number of students who felt it an extra and troublesome job to upload files decreased with the use of the GW-Notebook (Q6). It is significant that all students could concentrate on design work in the studio 2000, while at least one student in each team of three or four worked primarily to write and manage the web system before starting the GW-Notebook.

f) In a conventional studio, designers often lose sketches or they sometimes face difficulties in accessing documents made by other members. Students have evaluated the capability of webs as convenient and reliable archives of design documents. The percentage of students answering positively increased in the studio 2000 (Q7). It is probably because they could easily upload files on a designated web page, and because they were freed from taking care of links among documents. The directory utility gave students a convenient environment for archiving data.

f) The comment section, juxtaposed with a graphic image of data, gave students and teaching staff a convenient space for asynchronous discussion. Many discussions developed in those comment boxes. Some pointed out that asynchronous but timely comments by advisors and classmates through the comment space helped develop their studies. In the later stages, several students came to upload much more frequently, asking short but timely comments of advisors.

g) As students could display CAD models on a web page and also use viewing utilities, the percentage of students who felt a web page lacked necessary resolution decreased in the year 2000 (Q8).

Utilities of GW-Notebook that allow students to open as many windows as needed to display different design documents also has reduced to some extent those who felt that the web is inconvenient when they want to visually compare different documents (Q9).

Effect of Studio Instructions

g) The committees system needed a leadership of some members to guide and integrate proposals of each student. It was only 11 out of 20 who felt good communication was maintained with the committees, but 14 answered that interaction with committees stimulated their designs projects (Q10/Q11).

h) Students submitted interesting visual scenarios and combined them with others analyzed and collected from the GW-Notebook. Sixteen students answered that visual scenarios by other students helped them to develop individual proposals in the initial stage (Q13).

i) Though they were annoyed by the file sizes when quoting 3D models of neighboring sites, the students studied various building designs, drawing super sections or building 3D models of related areas. Nineteen students answered that efforts to study neighboring projects helped develop own work. Some commented that such investigations gave them a lot of suggestions and coordinating with others help make decisions and resolve design problems (Q14).

Considering student's answers to the questionnaire as well as the level of proposals submitted, it is possible to consider that the use of the GW-Notebook and the studio instructions worked well, though some revision of instruction programs is needed.

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