

WEB BASED DESIGN AND COMMUNICATION PEDAGOGY

Group pedagogy and the implementation of web-based technologies within the design process

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Introduction

The success of the international Zollhof project in Düsseldorf, Germany, in which virtual communication played a crucial role, was the catalyst for introducing interdisciplinary digital methods in the field of teaching. The firm of Frank O. Gehry and Associates, Santa Monica, California, served as an initial field of experimentation in order to bring together a heterogeneous group of project partners to participate in the design and construction phases of the Zollhof project. The design development, construction document, and construction phase was considerably enhanced by the employment of digital media as a communication and information tool. Parallel to the design process in the office in Santa Monica, a line of information flow and management had to be established to connect the local design team with consultants that were located in Europe and specifically in Germany. This line of communication required the team to send precise descriptions of project steps to the participants abroad, as well as receiving and processing a flow of responses returning to the Santa Monica office in very short intervals. By advancing and documenting each design and development step, the project progression was clearly documented by the project teams and thus understandable to everybody involved. The process demanded a highly articulated project description in text and images that were refined and exchanged daily. This helped to strengthen the cooperation between the design team and the project consultants and started to dissolve the role of the prime architect or designer toward a more team-related and democratic structure. All participants had quick access to all necessary information, which set aside the vertical hierarchy in favor of transparent communication tools and platforms.

Phase one. Lufthansa Cooperation Center and the Straw Bale House

Based upon this experience, the author questioned the role of traditional studio teaching by proposing a method that would enable students to share their knowledge and information with students and consultants at other universities and locations. The benefits of inter-college, transparent communication turned out to be the key element in developing an interdisciplinary Internet design studio network at the Institute for the Industrial Production of Buildings at Karlsruhe University of Technology: the *Netzentwurf* (net design). Pedagogically, the main issue addressed by the early *Netzentwurf* structure was the enhancement of cooperation between all participating students, their teachers and consultants, and the request for a straight project process by demanding regular project documentations in weekly intervals. The desired result would be the improvement of information flow, knowledge distribution and sharing among participants. The use of the Internet platform would provide a high level of transparency to everybody involved in the process, and even interested individuals from outside the studio environment would be able to globally trace the process at every moment to comment on the projects.

The project of the Lufthansa Cooperation Center as one of the early *Netzentwurf* projects started out with a simple concept, using elementary techniques such as common Internet browsers, pure html, and some plug-ins as a display description language. The studio structure included a three-day introductory course in html at the beginning of each term. This provided students with basic techniques of web page design and layout. In order to acquire a certain confidence in handling these digital tools, students were required to get familiar with further web and graphic-related software during the ongoing process.

Another studio requirement was the virtual contact to an extern consultant: The so-called 'Net-Nanny'. Net-Nanny could be a person from the field of architecture or any other related field; it had to be located outside the university. This would foster an understanding of the Internet as a communication tool and provide students with additional feedback for their projects.

The weekly to bi-weekly project documentations on the *Netzentwurf* web site were demanded to support a straightforward project progress. It enabled students and teachers to participate in the project progress and to track the development of every single project. Before mid term and final reviews, Lufthansa as the virtual project client in Frankfurt would annotate the projects.

During the studio process, many of the students were struggling from the additional workload of the technical necessities. It turned out to be a major problem to run technical web site development parallel to the design process,

especially in the first weeks. Students were overwhelmed by the demand to develop project concepts and to document those regularly on the web. Although not necessary to use digital tools for the design process within the Netzentwurf setting, the documentation requires an understanding of the web tools from an early phase on.

Later in the semester these problems decreased; most participants developed hybrid projects that used classical and well-known methods for their design development. The work then was presented in a digital manner on the web site. Except for Net-Nanny contact and project tracking, the Internet was rarely used as a communication tool. This was due to the fact that students were occupied with the project progress itself. Being located at the same university, there was no need to use the web for virtual communication. The possibility to use the Internet as a platform for interdisciplinary work was not even considered at this stage of the Netzentwurf.

Nevertheless this studio produced some good results, in which the project authors used the potential of the Internet-based process to acquire information, communicate their ideas, and to develop new graphical languages that emerged from the possibilities offered by web-based technologies.

To avoid the problems of the first weeks in the following studio settings, the organizers detached the technical phase from the conceptional design development. To foster the use of the Internet as a communication and information tool, the design task was the development of a Straw Bale House. The chosen site was located somewhere between San Francisco and Yosemite National Park, the owner of the site was willing to cooperate with the studio participants. Information about the construction of straw bale structures were available only in California to an acceptable extend. Thus the studio setting provided a natural requirement for the use of virtual communication.

During the first weeks of studio, students were required to research construction methods, materials, and to analyze the site; at the same time they were able to learn the basics of web-based design. The first studio assignment was a common database of straw bale construction methods, available materials, code requirements, fire protection, etc., that was installed on the Internet. Although the database did not necessarily qualify for graphics, the common creation helped the students to understand and learn web-based tools and group work processes. The database's content was a rich and important source for the following design process. Here, participants were able to better concentrate on the design of their buildings itself. They used the Internet platform to communicate with consultants in California and to solve problems that were related to the topic of the straw bale house.

In conclusion it can be said that the aspect of communication was substantially improved in the Straw Bale House studio; so was the outcome of the presented architecture. This was not only due to the separation of

technical and creative process, but also to the topic itself, which required information gain and communication over the Internet. However, due to the general local structure of the studios, communication processes were still limited.

Graphically, the Netzentwurf had so far included projects that understood the Internet as a tool to present ideas in a sequence of slides, comparable to the simple use of programs like Power Point. On the more advanced side, there were projects that understood the potential of the Internet medium as a challenge, using interactive, layered structures that had to be explored by the visitor through sophisticated navigation systems. In the Straw Bale House studio, the general graphical representation of the projects had improved due to the possibility to access and learn from previous Netzentwurf projects.

Phase two. Future Inc.

To foster the aspect of virtual communication within the Netzentwurf setting, the project: Future Inc. was carried out in parallel with the Universities of Technology in Cottbus and Karlsruhe. The schools are located approximately 750 km apart. The same methodology and program were used for all students, providing two different building sites in two locations. As in the previous studios, the first weeks were organized to learn the technical basics, and to analyze and research project related information and the sites themselves. Students from both schools documented their sites and analysis' on the common web site. As in the Straw Bale House studio, this information source was accessible to everybody.

Involving groups from different schools, the starting position for that studio seemed to be better than in previous settings. However, the expectations in terms of virtual communication processes were not fulfilled. Compared to the Straw Bale House studio, the organizers even noticed a regression in idea exchange and communication. This was due to the fact that the project groups were not distributed between the two universities. The students chose conventional communication methods and preferred to physically meet for the exchange of their ideas. Only the adoption of the Internet as a sophisticated presentation tool improved, because some students used programs like flash to push the standard for a good presentation.

Regardless of the Netzentwurfs' capability to support a possible and intense communication flow between participants, at this point the studio organizers had to realize that the provided communication tools were not able to replace the physical interaction between team members to its full extent. The tools had to be seen as an extension of human interaction, not as a replacement thereof [Rügemer and Russell 2000].

Phase three. Holzmühle, Hanover Expo 2000, [IM]Pulse

In order to overcome these difficulties, the following Netzentwurf studios were organized as a true cooperation between the Universities of Technology in Karlsruhe, Cottbus and Kaiserslautern. Students were now able to choose from three different design tasks in three different locations, two of them were architectural projects that dealt with the redesign of a historical mill building and a pavilion for the 2000 Hanover Expo. The third project was an urban project in the county of Saarland.

The groups were now evenly distributed between the participating schools and thus forced to develop their projects over the Internet. Students were able to participate in remote projects without leaving their own institution, receiving instructions and architectural criticism only from the school that was organizing the specific topic. Therefore the use of the Netzentwurf platform was mandatory. To avoid problems with the initial formation of groups, each university organized kick-off workshops. These physical workshops turned out to be a key issue for all following Netzentwurf studios, because their setting helped to overcome the social barriers that exist in studios where group members do not meet physically.

To improve the communication process not only on the level of consultation, but also on the level of idea exchange, simple videoconferences like iVisit and a whiteboard function was introduced to the process. Parallel to conventional communication channels, virtual net-meetings and information and idea exchanges through email improved positively. Consultation took place at the project's institution, with students participating in web conferences over the Internet. Among themselves, the groups successfully organized virtual meetings for the exchange of ideas and the development of their projects.

Although the communication processes fulfilled the expectations of a web-based design studio, new social problems arose within the project groups. This was partly due to excessive demands on some of the group members, partly to heterogeneous group constellations, and very different perceptions of architecture. Because group members only became familiar to one another through the project process, those problems could not be solved through the initial physical workshop only. As a consequence, the studio teachers had to undertake the role of mediators in the communication and group process in order to keep the groups together.

The final project presentations of this interdisciplinary studio took place as a large, common event in the public space of the German Architectural Center (DAZ) in Berlin. It lasted two days and gave students the opportunity to receive their architectural critique from a large jury that consisted of all teachers from the participating universities and invited guests. For the students, this public presentation was important because it underlined the idea

of the Netzentwurf to go public with the projects, but extended this public presentation into the real space.

Phase four. The Liquid Campus

The experiences of well-chosen face-to-face round table meetings, as well as the understanding of the advantages of a horizontal project hierarchy within a design team that were made in the project of the Virtual Campus for the ETH World [Rügemer and ag4 2001], lead to the further development of the Netzentwurf structure. It culminated in the Liquid Campus Project, in which seven universities participated [Elger and Russell 2002]. At that time, approximately 500 students from universities all over Mid-Europe had participated in the Netzentwurf studio, making use of the provided platform and communication tools and the very rich source of web-based architectural graphics that were collected over the first years. The Liquid Campus project not only used digital tools for communication and the design process, but it certainly employed the parameters of digital communication and distance learning/teaching to define and develop the design topic itself. The exercise was to develop a virtual campus for a global university. That campus would have manifestations in the virtual as well as in the real world. To support this whole approach, the studio structure was understood as performing a situation of distributed practice.

As an instant reaction to the previous projects, as well as to deepen the communication between the involved groups, the organizers kept the concept of interdisciplinary design groups that were distributed among participating schools. Additionally, the main instructor for each group was located at another remote university. Through this setting, students were even more obligated to use web-based technologies in order to communicate and push their projects. This studio setting provided a high degree of prearranged interaction, opening up the dialogue among all participants from the initial phase.

This was supported by the required physical face-to-face meetings: a three-day introductory workshop, a newly introduced midterm review, and a collective final review that was held in the public space of the Museum of Communication in Frankfurt four months later. The project teams that worked over the Internet to produce their collaborative project solutions comprised three students and their tutor. An interesting phenomenon was the form of communication methods and tools used by the students: Besides digital tools like email, ftp-transfer, and video conferences as the main communication channels, every type of idea-exchange was employed, including telephones, faxes, and even highway restaurants at half-way points that served as actual meeting spaces.

The three-day introductory workshop, which was held on the island of Rügen in the Baltic Sea, actively supported the students in finding their group partners. The program contained several assignments, tasks and site visits that had to be solved as group activities. On the last day of the workshop, the new groups had to present their project research and analysis in a common presentation. The bandwidth of presentations ranged from professional and objective project descriptions to very improvised, conceptional approaches, to architectural performances that were presented by the newly formed groups. The organizers were amazed by this variety of project presentations and by the digital standard that was accomplished by the students through mobile digital technology.

Comparably to the Holzmühle and Expo project, the analysis phase was used to run the technical introduction parallel. At this point of the development, participating students had a generally well-founded understanding of web technologies; therefore the introductory classes could not only discuss basic knowledge but also advanced issues.

Through the prearranged, interactive studio structure, students and teachers used the provided Internet communications tools very intensively. Especially the application of simple web conferences turned out to be the backbone for the project process between physical meetings. In a very organized manner, the groups met several times a week in the Internet to exchange ideas, discuss project issues and develop strategies for the further project process. This success was caused partly by the prearranged necessity for virtual consultation.

The most severe problems during the process were of social and group dynamic nature. Although communication techniques were much more advanced by now, almost all students were struggling somehow from problems that come with virtual communication and cooperation. Especially the lack of direct physical communication and discussion made it hard for the participants to sometimes express themselves and to communicate their ideas. By demanding the additional physical mid term meeting, all participants had an extra chance to deal with these issues and to solve most problems during the process. All of the 46 students enrolled in studio made it through the project.

The success of the final presentation is basically explained by the student's self-organized final charettes, in which the groups met a couple of days before the deadline in various locations. They produced their final results in physical cooperation. The presented work covered a large spectrum between the real and the virtual architecture. The presentation setting in the Museum of Communication reminded the group of the differences between built and virtual architecture. Nevertheless, it has to be mentioned that the organization of and the participation in such a studio setting demands a considerably

higher amount of energy both from the students as well as from the studio teachers and organizers. However, the results of those projects and the very specific work experience paid off with the additional effort.

Phase five. Suomi and Das Fest: A shift towards design build.

In conclusion, the didactic method of the Netzentwurf Studio is based on a certain rhythm of contemplative work periods, including small group discussions, evaluations, weekly web based project presentations (work-in-progress), and common virtual events and discussions. This is supported by face-to-face meetings within the design groups and the studio settings. The final presentations take place as large, common events in public spaces, depending on the spatial location of the studio participants.

Each phase differs from the others and clarifies the participants' ideas and design enabling them to focus on the project's main issues. Through the permanent, rhythmical back and forth between creative and contemplative phases on one hand and resuming and demonstrative phases on the other, as well as the need for constant communication between the spatially divided group members, participants are forced to maintain a continuous design process over the whole period of studio time that supports their project improvement.

Another important aspect within the Netzentwurf Studio is the issue of graphic representation on the Internet based platform. For most of the participants, it turned out to be a challenge to reduce the most complex project information onto a single, but interactive sheet of virtual paper that is projected against a screen. Over the years, participants understood this given obligation in a positive way. On one hand, they use their project websites as a sequence of slides that lead them through their own presentation. On the other hand they develop amazing multi-layered virtual structures that enable the visitor to understand the projects to their full extent, providing a general level with an illustrative graphic language, and a deeper level that explains details by using the interactive possibilities of the web-based tools. This necessity demands and fosters an abstract mindset for the general project approach and its representation. Students also develop a strong sense for conceptual work approaches, without disregarding the necessity for the detail. Beyond that, participants have to develop a user-friendly and intuitive, often multi-layered navigation for their projects, so visitors are able to navigate through the project content.

The most recent Netzentwurf projects have a strong tendency towards design build projects. This includes little pavilions, shelters and temporary installations built as a final result of the studio effort. In these studio settings, the aspect of communication is more and more presupposed as natural and

participants handle those processes already in an intuitive manner. As in previous projects, the studio structure is based on initial workshops. After the groups are organized, they pursue the goal to develop a structure that can be built as a group effort towards the end of the studio. Apart from the actual design process, sponsors have to be found, structural engineers or external consultants have to be involved and informed, and code issues have to be considered. These Netzentwurf projects deal with professional-like projects and introduce today's applied tools and processes in a natural way into the studio setting. The students are involved in challenges that are equal to real building processes.

Conclusion

Encouraging further exploration of such types of web-based design studios has the potential to develop new methods of teaching. The learning effect within the Netzentwurf studio is more versatile than in a regular studio setting. The amount of work a student has to contribute exceeds the amount of work in a regular studio, but successful Netzentwurf participants are much better prepared for the kind of work challenges they are going to face upon completion of their studies. They are able to verbally and graphically communicate their projects in a clear and convincing fashion. The use of the Internet platform provides a high level of transparency to everybody involved in the process. The process strongly supports an interdisciplinary approach and working method, making participants familiar with the tools of distance cooperation. It provides them with an important set of soft skills and an extra portion of technical knowledge that is necessary to prepare students for current and future work situations and challenges.

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Links: All Netzentwurf studio projects can be found at: <http://www.netzentwurf.de/>