Revisiting Kihaus: Reflections on Collaborative Learning in an Architectural Design Studio

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Abstract

Kihaus was the name of a design studio which was setup for enabling collaborative learning in architectural design education. In this paper, we revisit Kihaus to discuss collaborative learning in design education, centered at issues regarding the sharing and creation of design knowledge in the studio.

Design knowledge can only be disseminated through exchange of information that is encoded and transmitted with design artifacts. An epistemic structure for design knowledge was practiced in the studio to encourage collaborative learning. Evidences of collaboration were identified and discussed.

1. Introduction

The prototype of architectural design education was established by Walter Groupius in the Bauhaus school. It was based on the concept that design education "*... was to rescue all the arts from the isolation in which each then (allegedly) found itself and to train the craftsmen, painters and sculptors of the future to embark on cooperative projects in which all their skills would be combined*", as stated in "Programme of the State Bauhaus in Weimar" [1]. Nowadays the list of collaborative works may have to be further extended to including engineers, developers, planners, users and more. Architectural design is the result of collaborative works, which needs knowledge from various disciplines to solve the ill-defined and complex design problem.

Craig and Zimring [2] found that collaborative learning in the design studio is not satisfactory. The exchange of information is usually unstructured and poorly encouraged. Design knowledge is deeply locked within the minds of designers. It can only be disseminated through exchange of information that is encoded and transmitted with design artifacts such as drawings and models [3]. The use of digital design media has changed the learning and interaction pattern of design studio in the following ways.

1. Design studio used to be filled up with drawings and models made with paper or other materials. Those artifacts are information carriers that encourage peer interaction on design concepts and knowledge for the project. When all students use computers instead of paper for the design project, peer interaction is limited to rare occasions where contacts can be made in front of monitors or projectors.

2. Digital media has changed the way students perceive the learning status of others. Design artifacts are foot prints of the design project. Students get to know the progresses of others through drawings and models spreading everywhere in the studio. When these foot prints are locked within computers, it is more difficult for students to realize their status, and thus, coordinated behavior is getting less likely to emerge.

3. The communication pattern of design presentation using digital media is different from that which uses paper drawings and models. Computer drawings and models are presented sequentially, controlled by the presenter. In addition, seats and lights in the room are also arranged to center attentions towards the presenting focus. Paper drawings and models are presented simultaneously, with lights setup to lit every of them. Viewers are allowed free access to all presented artifacts. Digital media may encourage convergence and paper drawings may encourage divergence of interaction.

4. Computer made artifacts can be copied and reused without sufficient comprehension to the content. Digital media enable efficient ways to exchange design information, but the communication might be only at the most superficial level in the worst case. Conventional media suffer with higher cost in reproducing and require higher level of comprehension to the content. When design artifacts are copied and reused by non-digital methods, it is more likely that the information receiver does learn something through the act.

5. Collaboration might be encouraged by the low cost of creating and reproducing digital media. Studies in game theory revealed that behaviors of interactive parties may shift between various equilibrant states when the value structure of gains and loses is changed. [4]

6. Digital technology enables communication in virtual spaces, where students can exchange information without being hindered by spatial and temporal displacement. Advances in mobile and

cloud computing propel thorough penetration of the virtual world into the real.

2. Kihaus

Kihaus was a virtual design studio setup to take advantages of digital technology for collaborative learning. It was implemented in an architectural design course in 2003, with the emphasis on using web technology to support design education. The result of the experiment was considered unsatisfactory [5], but with our revisit after almost a decade, we think that there are some interesting findings remained understated, especially when the evolution of technical background in the period that follows was taken into account.

The implementation of Kihaus was centered at the epistemological structure of design knowledge. Drawings and models had long been used to express design thinking. Christopher Alexander argued that conventional drawings are inadequate for design communication in early stages of a design project [6]. From there we step forward to ponder how design knowledge in the early stages could be externalized and organized with some structured formats so that collaborative learning in the design studio can be brought into explicit acts of sharing design thinking on a web mediated learning environment.

3. Formatting design thinking

Designing is considered as a series of processes that transforms problems to solutions, or from the targeted ends to means that could reach the ends. Each step in the design process requires information regarding the higher abstraction, the lower abstraction and the context that enables the transformation from the higher to the lower abstractions. The epistemic structure was adapted from design theories of Alexander [7] [8]. The term "design pattern" was borrowed from Alexander to name the basic unit for design communication. A design pattern consists of four parts, which are the objective, the context, the design feature and the set of related patterns. Students were asked to use design patterns for sharing design concepts and information. The presented pattern needs not to be completed. Unfinished patterns were welcome to be posted and shared, under the expectation that someone would latter take over and complete them.

The Kihaus studio took a period of 14 weeks, with 22 undergraduate students in the department of architecture. Each student was supposed to work on his own, but was encouraged to share concepts and information with others. The project is to design a building for an architectural design institute, on a site with an old building built in the era of Japanese occupation by the colonial government. Students mostly worked at their private work place. Twice a week in the meeting time they come to the studio to work and to discuss with others. A web site was used

as the virtual space for communication and to store information. With the database of the website, it is possible to trace the development of design patterns, from the initially very abstract and fragmented thoughts, to the solid models of the buildings they designed. In addition to design patterns, students recorded their progress with design journals. Every week they posted drawings and computer models onto the journal to keep a record of the current status of work. The journals were also used for discussion with the instructor and other students. Some episodes centered at the interaction of students' sharing ideas and information with design patterns and journals are described as follows.

On week 2 a number of students were interested in the courtyard and the surrounding corridor in the old building. They made sketches and described the quality of light and the spatial experience in that old building. Among them, two students drew the following sketches and posted them as pattern 11 (figure 1), and pattern 16 (figure 2).
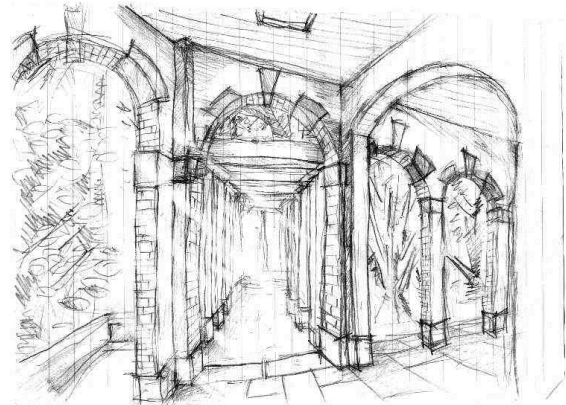

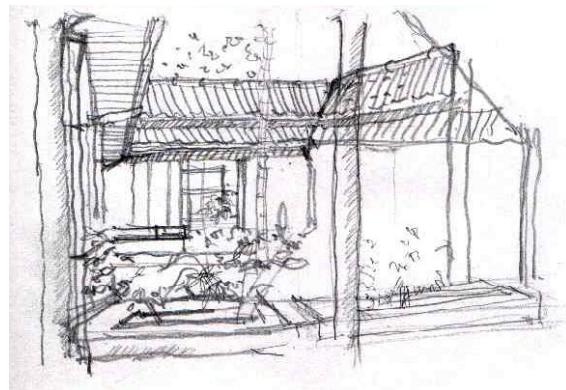Figure 1. Pattern 11, the corridor, by student A.

Figure 2. Pattern 16, the courtyard, by student B.

Some students noticed the rich vegetation in the site and posted quite some patterns to describe it. Pattern 17 (figure 3) by student C, titled the oasis, said that the site is like an oasis inside the desert of concrete constructions. This idea led him went on to a careful investigation of plants found on the site, drew a map of plantation and collected a lot of information for those plants.
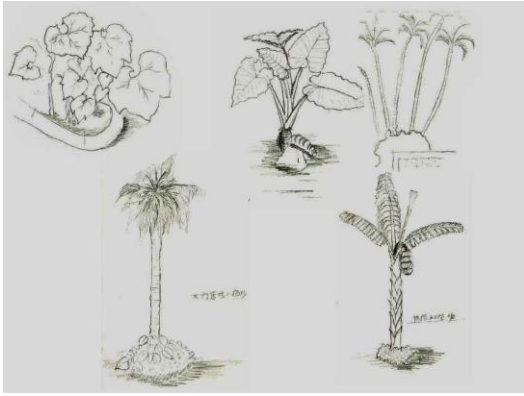
Figure 3. Pattern 17, the oasis, student C.

The above patterns showed only contextual characteristics that were recognized and shared. They do not comply with the complete structure of design pattern of Alexander's, but potentially can be used as materials to build full-fledged pattern consisting of all the four parts.

In parallel to the understanding to the site and the environment, some patterns were concerned with the design objective, regarding what users of the building would need. Student D posted a pattern called "Light in the night – the working habit of designers". He stated that designers like to work in the night and used a picture of Steven Holl's design (Bloch Building, Nelson-Atkins expansion project) [9] to show the interpretation of the design as a glass house emitting light in the night.

Student B posted pattern 123, indicating that the integration of the new and the old building might be a challenging problem of this project. He used Louvre Pyramid design by I.M. Pei [10] as an example to explain his concern. It was echoed by student E with pattern 146, the conflict of interfaces, together with some others to show their opinion and possible strategies to confront the problem they have found challenging and interesting for the project.

Student B took a further step to present a computer rendered drawing on week 7 (figure 6), together with pattern 174 (figure 7), a light on the site, as a reflection to the related design problems and concepts.
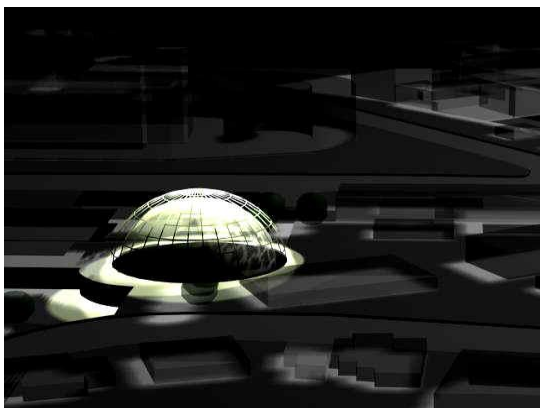

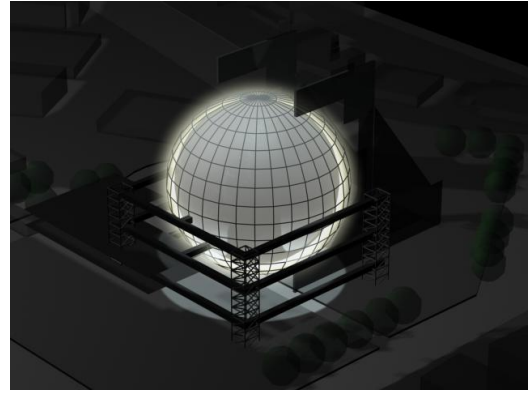Figure 6. Student B, week 7 design journal

Figure 7. Pattern 174, a light on the site, Student B

Seeing this, the instructor posted a message on the discussion board, showing information and examples of Bulkminster Fuller's Geodesic dome and his idea about synergy [11], hoping that the information would help students to develop their concepts further into real building structure. Students did not seem to be attracted, but manage to draw the structure of the sphere accordingly with the help of a computer program in week 11 design journal.

On week 10, student B presented the section drawing in figure 8, which shows a spherical glass building with a big atrium in the center, planted with palm trees, which could be easily found on the site. The atrium is surrounded by corridor-like working spaces. The sphere is leveled above the ground to allow more plants to be preserved on the site. The old building was demolished, but with its corridor preserved. From it we can see the influences from the above patterns proposed by the student and by others, which eventually led to final result of the design.
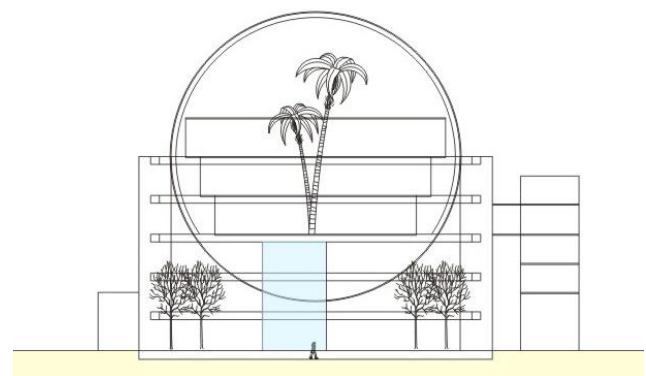

Figure 8. Week 10 design journal, student B

4. Reflections

We had wished a knowledge sharing culture in the design studio, and wished that students could integrate information from various resources to create new design concepts for their projects. The above discussion showed some evidences of collaborative learning in the studio.

Considering that there were 22 students with 14 weeks of work, the objective was hardly achieved. At the end of the project, there were totally 196 design patterns on the web site. Each student contributes 7.5 patterns in average.

With such a low figure of contribution, students' participation to the collaborative learning was not really enthusiastic. Half of students used design patterns to present their final work and actually combined design patterns from other students. However, most of them presented design patterns and project as if they were not much related. On the website discussion, not much interaction between students was observed. Comments on design patterns usually come from the instructor, but failed to inspire further discussion within students.

We considered three possible reasons for the inactiveness of students. First, many students were not convinced to the structured format of design patterns. Many were hesitate to shift from prior training of design presentation to the unfamiliar paradigm of pattern language. Second, design patterns were regarded as extra works in addition to the conventional design drawings and models. Little efforts were devoted to the structuring of their design thinking into patterns. Third, there was dilemma between collaboration and competition. Design creativity is evaluated based on originality, and therefore, creative thinking is not meant for sharing with other students who were competing with the same design project.

Weinberger [12] indicated that "…*social scripts can be substantially beneficial with respect to the individual acquisition of knowledge, whereas epistemic scripts apparently do not always lead to the expected effects* (in collaborative learning)…". The learning activities in Kihaus were perhaps over emphasized on the epistemic aspect. Course scripts that set more emphasis on social interactions might be greatly beneficial to collaborative learning in design studio. Our experience showed that it was difficult for students to understand the epistemic structure of design patterns before they were requested to use it. Social activities that help to inspire interaction should be given higher priority than that of the comprehension of epistemic structure.

The website did somehow served as a virtual studio that enables some interaction. These students did not work side by side in the same place as in the more conventional design studio, but models and drawings posted on the website were actually used as communication media to mediate collaborative learning. Evidences of collaborative learning were found in the design patterns and journals. However, the measurement of effect and comparison to the conventional learning environment were not done. The measurement of the unique added value of interaction has been one of the central aspects to the analysis of collaborative learning [13]. It might be reasonably expected that with further study, the collective works of students could be measured by analyzing the evolutionary trail of patterns, and their contribution to students' design projects. It is expected that the Kihaus design studio can be refined to satisfactory sophistication for bringing insight into collaborative learning in architectural design education.

6. References

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