Expertise and Collaborative Design

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This paper describes the preliminary results of a study evaluating the effects of computer mediation on collaboratively solving architectural design problems. Pairs of final year architecture students were asked to work on a landscape design problem via computer terminals. In one condition they were allowed to communicate with an electronic whiteboard and a chat-line while in the other, the chat line was substituted with video-conferencing (real-time video and audio). Although much recent work on collaborative problem solving has emphasized the importance of social-psychological variables, this study finds that it is essentially the participants' task-specific *knowledge* that guides the flow of the collaboration.

Experienced architectural designers working collaboratively on a problem should behave like typical experts in any other area of expertise (see Bedard and Chi, 1992, for an account of expert/novice differences). It is clear that, in addition to the problem-solving process, collaboration will also involve personality, emotion, culture, and many other social / psychological factors. We suggest that these do not play an important role in shaping (or reshaping) the combined expert knowledge. Therefore, although context effects, socio-cultural variables, and other non-knowledge level individual differences will influence many aspects of the collaboration (e.g., as suggested by Harrison and Minneman, 1995), they should not alter the process implicit in the knowledge level of the participants

The results of this study were very clear. Subjects made no attempt to construct explicit plans for structuring the collaboration or the task, either in the video conferencing condition or in the chat line condition. Instead, subjects simply began work and dealt with issues, such as the division of labor and the design process, in an *ad hoc* manner. However, despite not having a formal agreement on how to proceed, subjects seemed to flow naturally from one task to the next. Not once did our subjects reach an impasse in deciding the direction of the design. Disagreements were extremely minor and quickly resolved. In addition, we found a strong tendency for different pairs of subjects to approach the problem in the same way, indicating an implicit agreement across subjects as to how to proceed.

In order to evaluate the quality of the finished product we had the results independently graded by two lecturers from the University of Hong Kong Architecture Department. Subjects were graded according to the percentage of the required design tasks they completed, the degree to which they satisfied the technical requirements of the tasks which they did complete, and the overall quality of their design. A reliability analysis revealed an Alpha coefficient of 0.877 indicating that all three measures were tapping the same the same construct, which we assumed to be a general competency for the task. Taking an average of the three measures to create an overall score, the two groups (video conference versus chat line) showed no difference, both producing a mean overall score of 6 out of 10. Although the number of subject pairs was too low to rule out any effect for the conferencing technology we could rule out the existence of any large systematic effects.

The pattern of problem-solving found in this study reflected the knowledge the subjects had (from their architecture classes) regarding how to solve this kind of problem. So, although the collaboration *looks* very situated, it is, in reality shaped and guided by the collaborators' individual knowledge of the task.

References

Bedard, J. and Chi, M. (1992). Expertise. *Directions in Psychological Science,* 1, 135-139.

Harrison, S. and Minneman, S. (1995). Studying Collaborative Design to Build Design Tools. *The Global Design Studio*, M. Tan and R Teh (Eds.), Centre for Advanced Studies in Architecture, National University of Singapore, Singapore.