

## **REASONING AND INFERENCE-MAKING WITH ARCHITECTURAL PLANS.**

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My previous research (c.f., Gobert & Frederiksen, 1988) investigated, via a think aloud task, the nature of the semantic knowledge employed in the comprehension of a set of architectural plans by sub-experts (4th year students of architecture) and experts (professional architects). Using rigorous methods of propositional analysis based on a BNF grammar (Backus-Naur Form; Wirth, 1976), it was determined that there are eight specific types of semantic information required to comprehend a building from its architectural plans, and the nature of this encoding process is related to both specific prior knowledge of the building and to expertise. Important to the present study was the finding that the search strategies employed by experts resulted in representations of the building which were isomorphic to the building itself as a 3-dimensional entity. Sub-experts, on the other hand, used a "floor by floor" search strategy resulting in representations which were poorer in that they were more similar to the plans used to depict the building, rather than the building depicted.

The goal of the present research was to further investigate the interaction between expertise and the representational processes employed in developing a mental model of a building from its plans. In order to do this, prior knowledge about the building was manipulated by means of a text which presented an expert-like, "walk-through" description of the building, as well as exemplars of the eight types of semantic information required to comprehend architectural plans (Gobert & Frederiksen, 1988). The text was given to experts (n=30) and novices (n=30) in one of two conditions, namely, before viewing plans or after viewing the plans versus a control group. The dependent measures taken were: a think aloud semantic interpretation task, a 35 item comprehension test, and a problem-solving task requiring the subjects to produce two cross-sections of the building (thus, requiring inference-making). Results indicated that the text had positive effects for both the pre- and post-text conditions for both experts and sub-experts; however, these effects were stronger for experts who read the text before viewing the plans. The gains made by novices in this condition were non-significant for two types of comprehension items (2- & 3- dimensional comprehension); however, a significant effect was found for the novices in the post-text condition on a comprehension measure of architectural genre, suggesting that the text allowed the novices to make inferences about the building's architectural influences and era of design (Gobert Wickham, 1991). These results suggest that the novices were not able to develop a

comprehensive mental model of the building from the text, whereas, experts were able to make use of both types of information given (text and graphics) in order to develop a comprehensive mental model of the building, presumably by applying search, recognition, and inference operators (Larkin & Simon, 1987) on both the textual information as well as the graphic information sources (i.e., architectural plans) they were given. The data (analysis is on-going) will be discussed in terms of the benefits which the text afforded in: 1) directing search through the architectural plans; 2) facilitating inferences about the building, and 3) the interaction between the knowledge acquisition process (from text + graphics) with expertise in this domain.

## REFERENCES

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