

Summarizing, Explaining, and Diagramming: The Differential Effects on Text-Base Representations and Mental Models

Janice D. Gobert

Department of Science Studies
Western Michigan University
Kalamzoo, MI 49008
janice.gobert@wmich.edu

This program of research, broadly described, addresses the nature of middle school students' models and model construction processes in the domain of plate tectonics (Gobert, 1996). The studies described herein investigated the differential effects of summarizing, explaining, and diagramming during reading on both text-base representations and resulting conceptual representations i.e., mental models. In Study 1, three groups of grade five students were compared: those who drew diagrams about plate tectonic phenomena at specific points in a text, those who provided summaries at the same points in the text, and a control group (read only). The groups were compared on: 1) the amount of semantic information they generated in their summaries and diagrams respectively during their reading of the text (Frederiksen, 1988), and 2) on a post-test which evaluated their mental models, i.e., understanding of the spatial and the causal and dynamic aspects of the domain. Results indicated that the summaries generated during the reading of the text contained more domain-related semantic information than the diagrams which were generated during the reading of the text. However, on the post-test measures assessing their mental models, the diagram group outperformed both the summary and text only groups in terms of understanding both the spatial as well as causal and dynamic aspects of the domain (Gobert & Clement, 1994). These results were interpreted as follows. The goal of summarizing supported the formation of a good text base from which information could be easily recalled for the summaries (Schmalhofer & Gladanov, 1986). The diagramming tasks, which required the text information to be re-represented into a visual modality, facilitated the formation of richer, mental model representations which better supported inferencing, as measured by the post-test (Larkin & Simon, 1987). These findings lead to an empirical question as to whether another type of non-visual, but high-level inference task, like diagramming, would elicit similar results.

Study 1 was replicated, however, a series of explanation tasks (instead of summarization tasks, as in Study 1) were elicited during students' reading of the text and compared to a group who generated diagrams. Results demonstrated that there were no significant differences between the diagram and explanation groups in terms of either the domain-related semantic information they generated during their reading of the text, or on their understanding of the spatial or causal and dynamic aspects of the domain as measured by the post-

test. The results from the two studies are discussed with regard to the effects of the three types of tasks, i.e., summarizing, explaining, and diagramming on the formation of both text base representations and mental models (Craig & Lockhart, 1972; Lockhart & Craig, 1990; van Dijk & Kintsch, 1983).

References

- Craig, F.I.M., and Lockhart, R. (1972). Levels of processing: A framework for memory research. *Journal of Verbal Learning and Verbal Behavior*, 11, 671-684.
- Frederiksen C. (1988). Text comprehension in functional task domains. In D. Bloom (Ed.), *Learning to use literacy in educational settings*. Norwood, NJ: Ablex.
- Gobert, J. (1996). *Fostering children's model-based reasoning through student-generated diagrams and explanations*. Presented at the Fall Meeting of the National Academy of Education, October 24-25, 1996, Chicago, IL.
- Gobert, J. & Clement, J. (1994). *Promoting causal model construction in science through student-generated diagrams*. Presented at the Annual Meeting of the American Educational Research Association, April 4-8. New Orleans, LA.
- Larkin, J. & Simon, H. (1987). Why a diagram is (sometimes) worth ten thousand words. *Cognitive Science*, 11, 65-100.
- Lockhart, R., and Craig, F.I.M. (1990). Levels of processing: A retrospective commentary on a framework for memory research. *Canadian Journal of Psychology*, 44(1), 87-112.
- Schmalhofer, F., and Gladanov, D. (1986). Three components of understanding a programmer's manual: Verbatim, propositional and situational representations. *Journal of Memory and Language*, 25, 279-294.
- van Dijk, T. & Kintsch, W. (1983). *Strategies of discourse comprehension*. New York: Academic Press.

Acknowledgments

This research was supported by a Spencer Fellowship from the National Academy of Education. A portion of this research was presented at the Winter Text Conference, January 20-24, 1997, Jackson Hole, WY.