

UC Merced

Proceedings of the Annual Meeting of the Cognitive Science Society

Title

Substituting One Mystery for Another: The Role of "Self-Explanations" in Solving Word Problems

Permalink

<https://escholarship.org/uc/item/02w2t3rn>

Journal

Proceedings of the Annual Meeting of the Cognitive Science Society, 19(0)

Authors

Neuman, Yair

Schwarz, Baruch

Publication Date

1997

Peer reviewed

Substituting One Mystery for Another: The Role of "Self-Explanations" in Solving Word Problems

Yair Neuman (MSYN@PLUTO.MSCC.HUJI.AC.IL)

Baruch Schwarz (MSSCHWAR@ PLUTO.MSCC.HUJI.AC.IL)

School of Education, The Hebrew University, Mount Scopus, Jerusalem, ISRAEL

Self-explanation" studies have usually been conducted in the context of learning by using quantitative methods (e.g., Chi, Bassok, Lewis, Reimann & Glaser, 1989). This study aims at studying the role of students' self-explanations in the context of a whole problem-solving process by using qualitative (or interpretative) method.

Method

Six Grade 9 students participated in a multiple case studies design. Each of three mixture problems was presented and the student was asked to solve it while thinking-aloud. The session was video-taped and protocols describing the solution process of the problems were structurally analyzed.

Data Analysis

Students used a solution strategy that involves transformation of a sentential representation of word problems to a tabular one and construction of a solution equation based on the table. Based on the protocols analysis three main content categories were identified (1) *Mapping of data* from a sentential representation of a problem to a tabular one; (2) Self-explanations of three types: (2a) *Categorical explanations* involving the inference of semantic categories that direct the mapping of numeric expressions from the word problem to the table, (2b) *Deductive explanations* involving the inference of a new proposition out of existing propositions, (2c) *Defining explanations* involving the definition of a new variable. (3) *Mathematical operations* that refer to simple mathematical operations.

Results and Discussion

It was found that the major source of difficulty in solving the problems was the phase of drawing the table out of the word-problem, rather than the phase of extracting the solution equation out of the table and that categorical explanations, mediated this transformation. Hiebert and Carpenter (1992) point to the notion of "understanding" in the sense of adapting a general solution scheme to a specific problem. In this study, most students "understood" how to solve the word problems in a procedural sense, but could not adapt the general procedure to the concrete instances. It is shown that the most important role the explanations have carried out during the problem solving process is to mediate between the general solution scheme and the concrete instance by directing the mapping of data from one sort of representation to the other, and that failing to self-explain this adaptation predicts difficulties in solving transfer problems.

References

- Chi, M. T. H., Bassok, M., Lewis, M., Reimann, P., & Glaser, R. (1989). Self-explanations: How students study and use examples in learning to solve problems. *Cognitive Science*, 13, 145-182.
- Hiebert, J. & Carpenter, T. (1992). Learning and teaching with understanding. In D. A. Grouws (Ed.), *Handbook of Mathematics Teaching and Learning*. New York: Macmillan Publishing Company.