

Reading comprehension as a prerequisite for successful strategy of word
problems solving in mathematics

DISSERTATION

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ABSTRACT

The dissertation describes the results of an interdisciplinary research study examining the linguistic aspects of word problems in mathematics and the connection between comprehension of the text of word problems and the success of their solution. In the introduction the research is set into the framework of theoretical bases: the term word problem in mathematics and the concept of reading comprehension, including factors influencing the understanding of the text are characterized and the results of previous research studies are described. Subsequently the work presents a methodology, course and results of testing of pupils in three pilot studies and in the main survey and the conclusions from the semi-structured interviews.

The research is based on the linguistic analysis of 18 word problems with low solution success, taken from international research surveys PISA 2012 and TIMSS 2007, as well as on the level of comprehension of the text of these tasks in the 8th and 9th grade primary schools, modifying selected language phenomena and detecting the effect of these reformulations. 773 pupils from 13 elementary schools participated in the research.

The study concluded that:

1. Comprehending the text of a word problem is an important predictor of the success of solving this word problem, but it is not a single factor. A complete understanding of the text does not automatically mean that the problem is successfully resolved. Specific research results suggest that, although approximately 66% of 8th and 9th grade students understand the text of the word problem, only about 27% can solve it correctly. Thus, in almost half of the cases (47%) the failure of the solution really consists in the misunderstanding of the text; in the remaining cases (53%), the failure rate is related to the difficulty at another level of the process of solving the verbal task or to another psychological or situational factor.

2. The linguistic characteristics of the word problem can influence the difficulty of the word problem, respectively the success of its solution. The success of the solution has been increased (a) if the text of a word problem has been simplified by adjusting of more potentially difficult language parameters, (b) if the task text has been more clearly structured, (c) if the numerical data that are not needed for the solution have been removed, (d) if the ambiguous wording have been reworded, respectively explicitly expressed. The success of the solution of the word problem has been reduced if the task has been extended by an explanatory text with elements of scientific style.

KEYWORDS

reading comprehension, word problems in mathematics, linguistic analysis, linguistic factors affecting the difficulty of word problems, text length, text structure, occurrence of redundant numerical data, explicitness of the wording