

# Impact of English text difficulty on English Learners' math word problem solving

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## Abstract

The study was conducted to evaluate the impact of English text difficulty on math word problem solving by middle school English Learners. Results indicated that when math word problems were written in challenging (Grade 8 readability) English text, students were less likely to identify the required math operation, made significantly more errors in problem solving, and viewed the problems as significantly harder than the same word problems written in easy text (Grade 3 readability).

## Project objective

Prior work indicates that English Learners perform less well in math on average than English Primary students. However, the independent demand of comprehending English text during math problem solving has not yet been clearly established. The study was conducted to evaluate directly the impact of text difficulty on math word problem solving by English Learners.

## Study method

*Participants.* 41 middle school students identified by the district as English Learners were included in the study.

*Materials.* Each student viewed a booklet containing 8 word problems with easy (Grade 3) or hard (Grade 8) English text, crossed with easy (simple addition) or hard (multi digit division) math. Problem versions were counter-balanced across students.

*Task.* Students were asked to listen to each problem while following the text, identify the required math operation, rate the difficulty of the words, rate the difficulty of the math, solve the problem with assistance from the interviewer as needed, and choose the most difficult problem in the booklet.

## Key findings

Text difficulty affected students' perceptions of and performance on the difficult math word problems:

- Students rated the hard-math problems as significantly more difficult when written in hard text than when the same problems were written in easy text.
- Students needed more actual assistance from the interviewer to solve the hard-math problems written in hard text than when the same problems were written in easy text.
- Students were significantly more likely to choose a problem as "the most difficult" if it was written in hard text than easy text.

## Conclusions

The results provide quantitative evidence of the negative impact of challenging English text on math problem solving by English Learners. The demands of text comprehension appear to reduce the cognitive resources available for identifying the appropriate math operation, setting up the problem representation, and monitoring progress to the solution.

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