

## POETIC: ADDRESSING THE REVERSAL ERROR WITH AN INTERACTIVE WEB-BASED SOLUTION

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The reversal error—reversing the simple relationship between two variables in a mathematical word problem—is a long-standing issue in mathematics education. Students at all education levels have frequently encountered this difficulty in their learning of word problems (Clement, 1982; Philipp, 1992; Weinberg, 2009). A typical example of the reversal error is in the “student-professor” problem (e.g. There are six times as many students as professors at a university), where students commonly write the incorrect relationship  $6S=P$ . However, this difficulty is not restricted to early algebra learners. We have observed this phenomenon while investigating common errors in constructing mathematical optimization models in an college undergraduate engineering course.

In this study, we developed a web-based interactive education tool, POETIC, to help students visualize the variable relationships inherent in the task, using what we call the Test-Case and Room-Metaphor approaches. The former approach allowed the students to input numerical values to test their equations and receive instant feedback, while the latter provides feedback in the form of a visualization of the equation. To verify their effectiveness, we conducted crowdsourcing-based comparison studies with 200 participants and found that interactive visualization of equations can reduce the occurrences of the reversal error. We expect that these results can be expanded to more complicated mathematical word problems, such as mathematical optimization modeling problems.

### REFERENCES

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