THE EFFECT OF ASKING FOR INTERMEDIATE QUANTITIES WHEN SOLVING MULTI-STEP WORD PROBLEMS

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In this study, we use HINTS, an intelligent tutoring system for the arithmetic and algebraic solving of word problems, that stands out for its ability to provide tailored assistance and its high level of granularity (Arnau et al., 2014). We explored to what extent a problem statement that includes a larger number of questions related to unknown intermediate quantities can be useful to develop students' ability to solve word problems. This quasi-experimental mixed study lasted eight once-per-week sessions and involved fifth-grade students divided in two groups. There were 27 students in the intervention group (IG) and 28 in the control group (CG). First, students of both groups completed a pre-test to evaluate their initial level in the resolution of word problems. Then, students used HINTS to autonomously solve word problems. However, while the statements of the problems presented to the CG only asked for the final unknown quantity, statements in IG included extra questions related to intermediate unknown quantities. Finally, both groups took a post-test with equivalent problems to the pre-test ones. In addition, a case study was conducted with five of the CG students who had had the most difficulties during the post-test. Regarding the quantitative results, the comparison of the pre- and post-tests reveals a significant improvement in both groups' ability to solve word problems arithmetically. In this sense, the use of HINTS could increase the competence of the participants to carry out one-step analytical processes supported using conceptual schemes. However, the non-existence of differences between groups would lead us to conclude the inclusion of intermediate unknowns in the statement has not resulted in a higher level of students' ability. The case study shows that, after failing to solve problems in their short version with HINTS, some students quickly solved them with the intermediate questions.

Acknowledgements

References

Arnau, D., Arevalillo-Herraez, M., & Gonzalez-Calero, J. A. (2014). Emulating Human Supervision in an Intelligent Tutoring System for Arithmetical Problem Solving. *IEEE Transactions on Learning Technologies, 7*(2), 155-164. https://doi.org/10.1109/ TLT.2014.2307306