

SOLVING ADDITIVE WORD PROBLEMS THROUGH CAUSAL DIAGRAMS IN ELEMENTARY EDUCATION

Emilia López-Iñesta, and María T. Sanz

Universitat de València

Problem-solving refers to mathematical tasks that have the potential to provide intellectual challenges for enhancing students' mathematical understanding and development (NCTM, 2000). It also involves several cognitive operations such as reading and understanding the problem statement, detection of quantities and relationships between them, conversion of vernacular to mathematical language, execution of a designed plan and reflection on the solution obtained (Polya, 1945; Puig & Cerdán, 1988). In particular, solving addition and subtraction word problems requires mathematical skills and text comprehension techniques.

In this work we show a teaching model for primary or higher-level students, to improve the comprehension of an additive word problem (AWP) through reading mechanisms based on the division of the problem statement in different propositions using different colours and a graphic representation of causal diagrams (Puig & Cerdán, 1988).

The process is as follows: when reading a problem statement, the student must learn to detect the propositions or fragments of the text determined by an action verb. After this, a list of the quantities present in these fragments must be obtained, distinguishing whether they are data or unknown quantities. Finally, the student must try to obtain the relationship between the quantities identified through the action verbs mentioned. In this last phase, causal diagrams will be used to proceed to the numerical resolution.

The results of a preliminary exploratory study carried out with 16 students from 11 to 12 years old with three AWP's showed better results than those presented by Riley et al. (1983). In fact, the proposed method improves the probability of success in all cases and even the students who had not finished or correctly done the causal diagrams had improved their understanding of the problem statement.

References

- NCTM (2000). *Principles and standards for school mathematics*. NCTM.
- Polya, G. (1945). *How to solve it*. Princeton University Press.
- Puig, L., & Cerdán, F. (1988). *Problemas aritméticos escolares*. Síntesis.
- Riley, M., Greeno, J., & Heller, J. (1983). Development of children's problem-solving ability in arithmetic. In H. P. Ginsburg (Ed.), *The development of mathematical thinking* (pp.153-196). Academic Press