Where Should “You” Go in a Math Compare Problem?
Research Evaluation

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The purpose of this study was to examine the cognitive effects of self-referencing in Math word problems in 100 3rd, 4th, and 5th grade students (Ailly, H; Simpson, J; and MacKinnon, G. E). More specifically, the researchers were interested to see whether using the word “You” in a math problem can help the students solve math tasks faster and more accurate.

The rationale behind conducting this study was the fact that many 3rd, 4th, and 5th graders have troubles dealing with math word problems which involve CU (compare unknown) and RU (reference unknown) techniques. In general the students have much harder time with RU problems (Peter has 4 apples. Peter has 3 more than John. How many apples does John have?) since these types of problems require translation of the type (If Peter has 4 apples and he has 3 apples more than John, then John has 3 apples less than Peter or he has 4 minus 3. John has just 1 apple). This type of mathematical translation appeared quite hard for the students and this gave basis for the researchers to try and see whether using self-referencing (therefore freeing some of the work memory) can help students solve such problems faster and more accurate.

Review of the literature shows the use of information from formal studies in the same area. Many of the studies have the goal to bring more clarity about the cognitive process resulting from math word problems. The years of publication range from 1982 to 1995 with the majority of works being written in the 1982 – 1988 range. There is a continuation in the findings of this study with those found in previous studies that self-referencing changes the way students process information and that students tend to shift anchor point to wherever the self term is positioned in the math problem (d’Ailly, 1995).
The procedure used in the study involved one hundred students as follows: 32 students from 3rd grade (16m/16f), 34 students from 4th grade (21f/13m), and 34 students from 5th grade (21m/13f). All participants were individually tested twice. Also a Twinhead Computer was used to time the speed with which the students solved the problems before and after using self-referencing. In addition, a software program was used to randomly choose and assign the math problems to the students. There were two tasks assigned to the students – a working memory task which took about 5 min. to complete, and a number of math problems which took approximately 25 min.

This study found the following:

- RU math problems are indeed more difficult than CU problems.
- Self-referencing does have a significant positive effect on children’s encoding process in solving these problems.
- When the self-reference word “You” was involved in the problem, children asked for fewer repeats, solved the problems faster and more accurate.
- For CU problems the placement of the “you” word did not make a difference. Overall self-referencing significantly improved student’s outcomes.
- For RU problems improvement was observed only when “You” was placed as the known term. If placed as the unknown term, self-referencing appeared to have neither positive nor negative effect on the outcome.

In conclusion the results from this study coincided with the results from previous studies (Briars & Larkin, 1984; Carpenter & Moser, 1982; Kintsch & Greeno, 1985; Riley et al., 1983) and confirmed the positive effect of self-referencing in math problems. Since there is a clear connection that self-referencing can have a significant improvement on math task-solving, the authors suggest that more related research should be conducted with the purpose to bring more light into the cognitive process of young students.
References