

# INVESTIGATION OF ELEMENTARY SCHOOL TEACHERS' KNOWLEDGE AND BELIEFS IN MATHEMATICS TEACHING FROM A QUESTION CONTAINING EXTRANEOUS INFORMATION

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Research has shown that the elementary school students' points of view on solving the word problems are as the following: "The task can be achieved by applying familiar mathematical procedures", "The text contains all the information needed and no extraneous information may be sought", etc (Verschaffel, 2002). This paper investigates whether elementary school teachers have enough knowledge and appropriate beliefs to manage the situation when the students erroneously solve a question that contains extraneous information. The research subjects were 134 in-service elementary school teachers and the data was collected on the open-ended question:

There are seven red marbles, three purple buttons and five green marbles inside Ken's box. What's the fraction of the green marbles to the total marbles? The correct rates for 5<sup>th</sup> and 6<sup>th</sup> graders of this marble question are 36% and 39%, respectively. The percentages of 5<sup>th</sup> and 6<sup>th</sup> graders whose answer is 5/15 are 36% and 41%, respectively. Please explain the implications of the above research data to the elementary mathematics curriculum, teaching and learning.

The results surprisingly found that there were 46.3% of the elementary school teachers in Taiwan who could not distinguish the extraneous information. There are two causes: (1) The teachers' concept on fraction is not solid and clear; (2) The teachers are affected by their beliefs on word problem. There were 23.1% of the elementary school teachers who were affected by the superficial structure of the question and they misinterpreted a question of fraction into a question of probability. Compared to those teachers who could correctly judge the marble question as a question on fraction, they have worse understanding on pedagogical knowledge. And on how to improve the students' low achievement rate of this particular question, they could only offer the suggestion that teachers should make clearer instructions to make students better understand the question.

This research shows that an ambiguity on mathematics concept and/or an inappropriate belief would affect a teacher's pedagogical knowledge and understanding of the students' cognitions in mathematics. The more we are certain on the relationship between belief and knowledge on mathematics teaching (Fennema & Franke, 1992), the more we can design some effective professional development courses for mathematics teachers.

## References

- Fennema, E., & Franke, M. L. (1992). Teachers' Knowledge and Its Impact. In D.A. Grouws (Ed.). *Handbook of Research on Mathematics Teaching and Learning*. 147~164.
- Verschaffel, L. (2002). Taking the Modeling Perspective Seriously at the Elementary School Level: Promises and Pitfalls. Paper presented in the 26<sup>th</sup> Conference of the International Group for the Psychology of Mathematics Education, Norwich, England.