

ALGORITHMIC MENTAL MODELS AND METACOGNITION

Aviva Barash

Beit-Berl College & Tel-Aviv University

Research in mathematics education has focused in recent years on students' conceptions and reasoning processes in mathematics. One explanation to students' mathematical misconceptions is the existence of intuitive mental models acting uncontrolled in the reasoning process (Fischbein, 1987). Dealing with algebra, we refer to algorithmic mental models, basic algebraic procedures that tend to become mental models. For instance, students who know the correct formula: $(a+b)^2 = a^2 + 2ab + b^2$ consider, inspired by the model of the distributive property, that $(a+b)^2 = a^2 + b^2$ (Fischbein & Barash, 1993).

Relying on recent research dealing with the affect of metacognitive methods on mathematical performance (Tirosh & Tsamir, 1997; Swan, 1998), we tried to rule out students' mistakes made due to the influence of tacit algorithmic mental models, by using metacognitive skills. For instance, using the "conflict method" (analysing the incorrect answers, raising a conflict, solving similar problems), to increase students' awareness of the existence of the models and control their impact. This was the main idea of our study unit: "Multiplication formulae and their use in reducing algebraic fractions"

One hundred and ninety four students in the 9th grade answered a pre-test to explore their formal knowledge of multiplication formulae and their error frequency in reducing algebraic fractions. Then, the study unit was applied. The same students, answered, a year later, a mathematical knowledge questionnaire, in order to examine the influence of the intervention program. The findings assert the hypothesis that learning by metacognitive methods, improves the formal knowledge of multiplication formulae and reduces the use of mental intuitive models which conflicts with formal knowledge.

I believe it is very important, that algebra teachers are aware of the impact of algorithmic mental models and recognise the importance of metacognitive skill applications. In my presentation I shall deal with the theoretical frame, the findings and some examples from the study unit based on general and specific psycho-didactical aspects.

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