STRUCTURING GROUP INTERACTION IN MATHEMATICS COOPERATIVE CLASSROOMS: THE EFFECT OF METACOGNITIVE INSTRUCTION VS. WORKED OUT EXAMPLES

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The purpose of the present study is three fold: (a) to investigate the effects of metacognitive instruction versus worked-out examples on students' mathematical reasoning and mathematical communication; (b) to examine the extend to which the two methods exert different effects on group problem-solving behaviors; and (c) to compare the long-term effects of the two methods on students' mathematical achievement. Both the metacognitive instruction as well as the worked-out examples were embedded within cooperative learning settings.

Worked-out examples specified all the steps needed to solve the problem and provided complete explanation regarding the sequence of actions required. The metacognitive instruction was based on the IMPROVE method (Mevarech & Kramarski, 1997) implementing metacognitive questioning in small groups. The metacognitive questions focus on : (a) the nature of the problem/ task (b) the construction of relationships between previous and new knowledge; and (c) the use of strategies appropriate for solving the problem/ task.

The study was conducted in two academic years. Participants for the first year of the study were 122 eighth-grade Israeli students who studied algebra in five heterogeneous classrooms with no tracking. In addition, problem-solving behaviors of eight groups (N=32) were videotaped and analyzed. A year later, when these participants were ninth graders, they were re-examined using the same test as the one administered in eighth grade. Within cooperative settings, students who were exposed to metacognitive instruction outperformed students who were exposed to worked-out examples on both the immediate and delayed posttests. In particular, the differences between the two conditions were observed on students' ability to explain their mathematical reasoning during the discourse and in writing.

REFERENCES

Mevarech, Z.R. & Kramarski, B. (1997). IMPROVE: A multidimensional method for teaching mathematics in heterogeneous classrooms. American Educational Research Journal, 34 (2), 365-395.