

# New math concept? To teach it, show it

By Carla Thomas McClure

The way teachers introduce new topics in mathematics can influence student achievement, according to a study published in *Evaluation Review*. Study results suggest that an effective method is a problem-solving demonstration.

## How did the researchers address this topic?

Citing a lack of research, Xin Ma and Constantinos Papanastasiou investigated the relationship between student achievement and the instructional methods used to introduce new topics in mathematics. They analyzed Canadian data from the Third International Mathematics and Science Study (TIMSS), which included a questionnaire that asked students to indicate how often their math teachers used one of six common instructional methods to begin a new topic. Using a stratified sampling procedure, researchers selected an 8th-grade class from each of 385 schools; TIMSS survey results and math test scores of 8,770 students were included in the data sample.

## Why did the researchers use Canadian TIMSS data?

Canada has no federal department of education. The absence of nationally unified curricular and instructional standards made it likely that the data sample would include a wide variety of instructional formats.

## How did they compare the effectiveness of various instructional methods?

The TIMSS student questionnaire named six instructional methods (see box, p. 11). Students were asked to indicate how often (almost always, pretty often, once in a while, or never) their math teachers used each method to introduce new top-

ics. Researchers analyzed student survey responses and student performance in mathematics as a whole, algebra, data analysis, fractions, geometry, and measurement. They used various individual, family, and school variables to control for teacher instructional effect on student performance.

## What were the study results?

The researchers concluded that the way mathematics teachers introduce new topics affects student learning and achievement. The most effective method was for the teacher to demonstrate how to solve a well-chosen example. The researchers suggest that such examples “create correct perceptions and outline correct procedures,” which helps students later on as they develop understanding of the new topic. Of the six methods studied, this was the only one that demonstrated a positive instructional effect on student mathematics performance when used frequently. The least effective methods were having the teacher explain the rules and definitions and having students look at the textbook while the teacher talks about it.

Methods that were found not effective when used excessively to introduce a new math topic were (1) discussing a practical or story problem related to everyday life, (2) working together in pairs or small groups on a problem project, and (3) having the teacher ask students what they know related to the new topic.

## Any surprises?

Yes. This study suggests that it’s possible to “overuse” the discussion of practical or story problems when introducing a new math topic. Student performance was positively affected in



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all mathematical areas when this method was used once in a while but negatively affected when teachers “almost always” used it.

**Do the researchers recommend that teachers always use a problem-solving demonstration to introduce new topics?**

No. It’s true that this study found a strong instructional effect associated with teachers using this method to begin a new topic “pretty often.” However, the findings indicate that a little variety can be beneficial. The researchers advise teachers to consider carefully which method best suits the new topic and to match the method to student needs, interests, and abilities.

**Reference**

**Ma, X. & Papanastasiou, C. (2006).** How to begin a new topic in mathematics. *Evaluation Review*, 30, 451-480. ◆

**6 INSTRUCTIONAL METHODS STUDIED**

**MOST EFFECTIVE**

1. Teacher demonstrates well-chosen example.

**NOT EFFECTIVE**

2. Class discusses practical or story problem related to everyday life.
3. Students work in groups or pairs.
4. Teacher asks students what they know about the topic.

**LEAST EFFECTIVE**

5. Teacher explains rules and definitions.
6. Students look at textbook while teacher explains.

The study also found that a little variety in presentation can be beneficial.

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