

Core Teaching Practices for Applied Mathematics

An abstract based on a study by Talli Nachlieli, Michal Ayalon, Boaz Zilberman, and others

A team of researchers in the field of mathematics education observed lessons and conducted in-depth interviews with teachers who teach high order applied mathematical thinking in middle school classes. The goal of the research was to identify core pedagogic practices common to these teachers and to jointly articulate those shared teaching practices. As part of formulating the core practices, the research team studied similar efforts made in recent years in Israel and around the world.

Core teaching practices

1. Insisting on clear and explicit expression. The teacher demonstrates and expects the students to formulate concepts, processes, and arguments in a precise and clear manner. There is strict adherence to definitions, rules, reasons, justifications, and proofs of claims in writing and orally and in joint discussion.

2. Creating links between representations, ideas, and contexts. The teacher chooses tasks in which the students must cope with a problem which does not have a known procedure for resolution. The task requires comprehension of context, in-depth use of concepts and planning different solutions using diverse mathematical representations.

3. Engaging students in dialogue. Formal discourse between students takes place in class where they are expected to express ideas, relate and understand each other's complex arguments, to put forward claims, to cast doubt, and to convince one another.

4. Sharing pedagogical considerations with the students. The teacher reveals to the students the considerations that went into selecting the task and the teaching method chosen. The teacher shares with the students the dilemmas, alternatives, stages, expectations, and method of structuring the lesson and the mathematical discourse.

5. Designing a safe environment for emotions. The teacher allows students to be brave and to be fearful, to experiment, to explain their thinking, to receive feedback, to make a mistake and to learn from it and to reveal prejudices.

6. Analyzing and reflecting the lesson. Following the lesson, the teacher (alone and with colleagues) uses documentation that was captured during the lesson. The objective of this process is to develop expertise, to perfect teaching technique, and contribute to the shared advancement of the professional community.