Problem solving should activate, motivate and provide training
12 May 2022, by Atle Christiansen

Problem solving dominates teaching

Problem solving is the most common teaching method in mathematics lessons in this country. That is why Opheim chose the design and use of mathematics problems as the topic of her thesis.

She conducted a case study of four teachers at two different vocational schools and collaborated with them for a year. First she asked them what kind of tasks they were missing. Then she came up with drafts for mathematical tasks for each individual teacher.

In her thesis, she analyzed the entire process—from drafts via discussions with the teacher, testing in the classroom, new discussions with the teacher and review of the student response—to gain a deeper insight into how teachers work with mathematics tasks.

"The teachers I worked with wanted to tailor the tasks to the needs of the individual student group. They asked me to create tasks that addressed the specific challenges the students had with mathematics," says Opheim.

The goal is more than learning

"The main purpose of mathematical tasks is to teach the students mathematics. But there are a number of other smaller goals that the teachers want the tasks to aim for," says Opheim.

The problem-solving tasks should solve various challenges in the classroom. Opheim summarizes the challenges in three points: (1) activate (2) motivate and (3) provide understanding.

"The teachers focus on the purpose of the given tasks, for example that they should activate the students, and make them look for different mathematical connections. The mathematical tasks cannot always address everything at the same time..."
but can, to varying degrees, motivate, activate and
challenge the students," she says.

**Discussions as a learning method**

Opheim refers to the so-called social turn in
mathematics education research. The social turn
emphasizes that teaching and learning are not
individual processes but take place together.

That makes discussions and the presentation of
mathematical approaches important. This social
learning theory is one of the theories used by
Opheim and other researchers at the UiA Centre
for Excellence in Education, MatRIC (Centre for
Research, Innovation and Coordination of
Mathematics Teaching).

"That kind of teaching is an example of theory that
it is not easy for the teacher to apply in the
classroom. Such teaching requires strong
mathematics skills and broad knowledge about
various teaching methods and also the ability to
control discussions in the classroom," Opheim
says.

When the math problem solving required classroom
discussions, some of the teachers did not want to
use them. The reason was precisely that
discussions are difficult to carry out in practice.

Opheim points out that classroom discussions may,
for example, be obstructed by a linguistic distance
between teacher and students. There may be large
linguistic differences between a middle-aged
teacher and a sixteen-year-old who wants to
become a hairdresser.

**Obstacles to using problem-solving tasks**

"The teachers are aware of what they are good at
and less good at and wanted math tasks that would
balance this out," Opheim says.

Teachers need to feel confident that the tasks will
work in the given class before presenting them.
Opheim found that there were three aspects in
particular the teacher might struggle with:

1. How to teach problem solving (didactics).
2. How to discuss the solution strategies
   (communication).
3. Whether the teacher was confident in the
topics used in the task (mathematics
   competence).

"An important finding in my research is that the
mathematics tasks will help the student to learn
mathematics, but that the tasks must also be such
that the teacher can use them to develop the
classroom culture and his own teaching
competence in mathematics," Opheim says.

More information: Mathematical Tasks from the
Teachers' Point of View A Multiple Case Study of
Teachers' Goals in Norwegian Vocationally
Oriented Classrooms. uia.braga.unit.no/uia-
xmlii/handle/11250/2984236

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