Problem-solving helps pupils to learn mathematics

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Johan Sidenvall, PhD student. Credit: Mattias Pettersson

A primary reason as to why pupils are having difficulties learning mathematics is the excessive emphasis on learning procedures and working with routine tasks. The pupils' knowledge would improve if larger emphasis was placed on problem solving. In his thesis, Johan Sidenvall gives reasons as to why procedural teaching is predominately used in schools today, and how teaching could be improved. Johan

Sidenvall defends his thesis on 17 May at Umeå University.

"The possibilities for the pupils to learn mathematics are limited by the teaching they are normally offered in school. In order to improve the pupils' chances of learning mathematics, a larger portion of the lessons need to be dedicated to solving problems. The teachers can aid the pupils in their work by adapting the support they provide to the pupils' difficulties," says Johan Sidenvall, Department of Science and Mathematics Education at Umeå University.

In general, there is an overemphasis in teaching on learning procedures by heart, without a clear connection to mathematical understanding. As an example, this happens when pupils work solely with routine tasks and the teacher tells them how to solve problems in presentations or in individual calculations. This type of teaching is, to a certain degree, done at the expense of learning through problem-solving, which has proven more effective when learning mathematics. Knowing mathematical procedures is an important part of mathematics, but pupils will not gain a deeper mathematical understanding by simply managing these procedures.

One of the aims of Johan Sidenvall's thesis has been to understand why the teaching is dominated by learning by heart and working with routine tasks. In order to do this, he has studied the teaching given to pupils in upper-secondary school and analysed their textbooks, studying the extent to which pupils are faced with problem-solving tasks in teaching and how they work with the problem-solving tasks they encounter.

A second aim of the thesis was to investigate how the teaching could be improved. For this purpose, a teacher support was devised with the intention of aiding the teacher in helping their pupils in problem-solving processes without removing the challenge.

The results have implications for how teaching can be designed in order to help pupils learn mathematics in a more efficient manner, how textbooks can be used and designed, and how the results can be used in continued and regular teacher training.

Johan Sidenvall has been working as a teacher for 15 years, in secondary and upper-secondary school. He is now a lecturer in Hudiksvall Municipality, working with teaching, development and research.

More information: Solving problems: On students' opportunities to solve problems and how teachers can support this process. umu.diva-portal.org/smash/record.jsf?pid=diva2%3A1303310&dswid=5190

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