

International Conference on the PISA Conceptual Framework for Mathematics

Abstract of main points made by the international experts

[Conference site](#)

On September 6, 2020, the University of Haifa held an international conference on the topic of the implications of the PISA conceptual framework for mathematics on teaching middle school mathematics. Experts from Israel and abroad participated in the conference, as did mathematics tasks development teams from Israel, teachers, researchers, and decision makers. The experts from abroad were from countries that have been involved in this area for more than a decade and they shared their experience, lessons learned and insights.

The following experts participated in the conference:

1. **Zbigniew Marciniak**, a mathematics researcher from the University of Warsaw in Poland, formerly a State Minister at the Ministries of Education and Science of Poland. He led curricular reforms in the study of mathematics and has served since its inception at the Mathematics Expert Group of the OECD PISA research.
2. **Hui-Yu Hsu**, researcher of mathematics education at the Institute for Advanced Studies of Tsing Hua University in Taiwan.
3. **Merrilyn Goos**, researcher of mathematics education at the University of Limerick in Ireland.

Key points

In order to succeed in the 21st century, students must be prepared to contend with complex, non-routine challenges through the use of mathematics. Students in this generation do not readily accept the emphasis schools place on technical, meaningless routine learning. This change in reality and in students' mindsets makes it necessary for countries to modify the curriculum from concept-based learning to one that concentrates on thinking and application processes.

To this end, mathematics must be learned within a real and authentic context. Beware of using artificial contexts because students can discern between a realistic context and a forced context devised so as to correspond to a mathematical concept. Do not force the context, if a mathematical concept does not lend itself easily to an appropriate context, it would be preferable to teach it as an abstract concept.

When developing tasks, it is possible to start from the mathematical concept and to search for a context relevant to reality. This process is called "application". And conversely, it is possible to observe the real world and identify situations in which mathematics can contribute to making them understood and that it is possible to transform them into mathematical problems. This process is called "modeling".

1. **Poland** executed a profound change in its mathematics curriculum. The goal was to help students develop skills of planning, reasoning, modeling and assessment. The exams were revised to meet this change, including an individual final examination at the end of middle school which reflected applied tasks that require in-depth thinking. As a result, Poland doubled their percentage of excelling students in mathematics on PISA, and halved the rate of struggling students.
2. In **Taiwan**, school-based study was traditionally very conservative, focusing on learning concepts and technique. However, in recent decades, the universities in Taiwan had revised their entrance examinations introducing thinking and application tasks in order to align with global standards. Following the universities, high schools also changed their entrance examinations. As a result, middle school teachers started to add applied tasks in addition to the regular textbooks.
3. The traditional perception in **Ireland**, as in other English-speaking countries, is of numeracy and not of literacy. It is only in recent years that they have begun to use the approach of applied mathematics to solve real-life problems, this, in light of the PISA conceptual framework. In Ireland, the responsibility for developing literacy is shared between all teachers, not only teachers of mathematics.