

Analysis of the Achievements of Israeli Students on the 2022 PISA Mathematics Test

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The PISA assessment is a key barometer for assessing students' preparedness for the world in the 21st century. Eighty-two countries took part in the 2022 PISA assessment. The main focus of the exam, explored through in-depth questions from various perspectives, was mathematics. The exam is based on a representative sample; in Israel, 6,251 fifteen-year-old students from 193 schools participated, reflecting the general population of Israel.

On PISA assessments, each participating student answers two sets of questions (chosen from mathematics, reading, science, and creative thinking questionnaires) over a span of two hours. Additionally, for another roughly half hour, they answer a series of background questions (attitudes, learning experiences, etc.). Some questions are multiple-choice, while others are open-ended. Over the years, more of the grading is being carried out by computers, and the selection of tasks for each student is adaptive based on their performance up to that point.

The Hebrew University proposed to delve deeper into Israel's PISA assessment results, focusing on the performance of students who reached the top performing levels (5-6) in mathematics. The raw item data was analyzed and compared with that of several other countries. The research also included a PISA simulation with 12 female students (secular, Arab, and ultra-Orthodox), followed by interviews to understand how they handled such tasks.

Main Findings

1. Israeli students who excelled on the 2022 PISA mathematics exam comprised 8.4% of test-takers, placing Israel in 22nd place among the participating countries (an improvement of nine places since the previous exam in 2018).
2. The group of top-performing students (Level 6) in mathematics grew from 2018 to 2022 by 20%.
3. The mathematics areas in which Israeli students excel relatively are "quantity" and "change and relationships." The areas where they struggle the most are "space and shape" (geometry) and "data and uncertainty" (statistics).
4. Israeli students perform better on multiple-choice questions, and struggle with open-ended questions graded by a human evaluator. Israeli students are significantly more likely to skip open-ended questions and have particular difficulty in the mathematical modeling phase.
5. Interviews with the female students who participated in the PISA simulation revealed the following:
 - Top-performing students not only demonstrated advanced mathematical knowledge but also had systematic work habits: re-reading the text without skipping, technological proficiency, using draft paper, switching quickly between paper and calculator, and between estimation and exact calculation.
 - The most challenging topic for the students, also for the top-performers, was geometry. They struggled with unfamiliar questions (e.g., arranging pictures based on a data table, word-heavy multiple-choice questions, and open-ended questions that required reasoning).
 - Arab students had particular difficulty with the text, describing the language as "strange," and faced fundamental misunderstandings of the text. Only after the question was explained were they able to handle the tasks. Ultra-Orthodox students struggled a great deal with the technology interface, and their transitions between tasks were not smooth.

