

What Type of Mathematics Would Israel Want to Teach in Middle School?

Abstract based on a paper presented by Talli Nachlieli,

Boris Koichu, Jason Cooper, Anatoly Kouropatov and Boaz Silberman

The results of the 2018 PISA tests, published in Israel, aroused critical public discourse regarding the low level of achievements and the large gaps in mathematics. There was a sense that Israeli students are not properly prepared to meet the challenges of the future which awaits them. After the dust settled, a group of experts from the academy and the teaching field decided to gather together and take the matter in hand. Collectively, they sought to propose insights, to discuss dilemmas, to indicate directions and present them to the Ministry of Education's Mathematics Subject Committee.

The group held a series of workshops with the participation of about 50 experts from Israel and abroad. PISA's conceptual framework for mathematics was studied and changes to the mathematics curricula made in the Netherlands, Germany, Ireland, and South Africa were analyzed. In parallel, practice in the field in Israel was examined from the perspectives of curriculum, learning materials, school organization, and teacher training. Israeli experts proposed recommended directions for action.

Main insights

1. The Israeli curriculum does not devote enough attention to applied mathematics. It is important to integrate it alongside abstract mathematics – this, from a profound pedagogical viewpoint and not something that will be perceived as preparation for the PISA test. This change must be explicitly expressed in the curriculum, textbooks, teachers' professional development, and on internal and external tests.
2. Abstract and applied mathematics are two complementary facets. The integration between them must be carried out in a planned and balanced manner. In this process, care must be taken to use authentic contexts that relate to the students' world and to adapt the mathematical level to the ability grouping. For example, students can be encouraged to submit projects at the end of ninth grade which manifest the integration between these two aspects of mathematics.
3. There is a professional dilemma: When is the optimal time to make the integration? Because this is an advanced skill, there are teachers who argue that middle school is the time to build a strong foundation of knowledge and technique, and then to focus on the integration between abstract and applied thinking only in high school. On the other hand, there are teachers who point to the period in middle school as appropriate for such an integration which arouses motivation and instills meaning.
4. During the Coronavirus crisis, the weight of responsibility is transferred to greater self- and group-learning and interest-driven learning. In this period, there is a need and an opportunity for an integration of assignments from real-life contexts with problem solving using models and mathematical inference. Today's technology can enable personalization of learning opportunities appropriate to each student's abilities and difficulties.
5. In Israeli middle schools, mathematics is taught according to learning levels (ability groupings) due to the large gaps between students and the pedagogical need to provide a suitable solution. It is desirable for teachers to receive appropriate training in order to teach in a way that is suited to the learning level and it must be ensured that schools have a mechanism for mobility which encourages students to move up in their learning level.