

# Investigating Teachers' Pedagogical Beliefs about Mathematics, Science and Reading Literacy in the PISA Project

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The Programme for International Students Assessment (PISA) is based on a dynamic and forward-looking model of *lifelong learning* in which new *knowledge* and *skills* necessary for successful adaptation to a changing world are continuously acquired throughout life. PISA does assess students' knowledge, but it also examines their ability to reflect on the knowledge and experience and to apply that knowledge and experience to real world issues. The term "*literacy*" is used to encapsulate this broader conception of knowledge and skills. PISA covers the domains of reading, mathematical and scientific literacy (OECD, 2003).

The results of PISA show wide differences between countries in the knowledge and skills of 15-year-olds in literacy. Many factors contribute to variation in student performance. One of the important factors is teachers' *pedagogical beliefs* and *practices* about *authentic teaching* that *promote literacy*.

The purpose of the present study is to compare teachers' *pedagogical beliefs* vs. PISA's teaching targets. In particular, to investigate the question: Do mathematics, science and reading teachers differ in their *pedagogical beliefs* about teaching methods, as well as in their *practices* about planning, teaching and evaluating?

## Method

*Participants:* Participants were 372 teachers from 165 high schools who participated in the PISA Israeli project. In each school three teachers were chosen, one in each of the three tested-subjects: Mathematics, science and reading.

*Measurements:* A 22-item pretest measured teachers' *pedagogical beliefs* and *practices*.

Teachers' pedagogical beliefs were measured by *conservative beliefs* (such as, advocating frontal method and homogeneous classes), *progressive beliefs* (such as, the importance of authentic teaching, providing opportunity to students' experience) and *teaching effi-*

*cacy* (like, good teaching can overcome students' disadvantage).

Teachers' practices were measured by three components.

a. Considerations in planning: *Child-centered planning* (such as, children's ways of thinking) and *subject-matter-centered planning* (like, learning curricular).

b. Teaching methods: *Frontal teaching* (such as, the degree of using "blackboard teaching" and *New teaching* (like, overhead projector, computers).

Scoring: All the above variables range from 1 – low to 4 – high.

c. Evaluation: Teachers were asked to assign weights to each of the following consideration so that they add up to 100%: Test (students' ability and performance), Effort (student's learning investment), Need (student's need of encouragement in grade assignment).

## Findings and Discussion

In general, as it appears in our findings, the teaching practices of Israeli high school teachers is a far cry from the ideal expected to fulfill the PISA's teaching targets. While the teachers express relatively *progressive* attitudes, in their practices they tend to stick to the known, more traditional methods in both classroom teaching and students' evaluation. It is hard to tell whether this is a result of entrenched, hard-to-change behavior, or an outcome of systemic pressures – to "cover material" and prepare students for the standardized final tests that limits teachers' ability to experiment and implement alternative teaching practices. While teachers of various subjects do not differ in their declared attitudes, it seems that teaching specialty is a factor in shaping their practices. Mathematical teachers appear as the most conservative among the three specialty groups in both their planning and class practices as well as in their grading practices. However, the science teachers and not the reading group appear as the most non-traditional practicing group. A plausible interpretation of these differences, lie in the con-

textual conditions that may shape practices of science teaching. Science teaching has gone through considerable transformation in recent decades: Syllabi was renewed to include more “relevant” topics, the “subject” is now being defined as interdisciplinary and taught as such in some schools, and systemic guidelines advocate practices that combine class teaching, laboratory sessions and out of class learning, all of which create

an environment for more “*authentic*” teaching. If this interpretation holds, it has important educational and policy implications.

### **Reference**

OECD (2003) *Literacy skills for the world of tomorrow*. Further results from PISA 2000, Paris.