

MATHEMATICS PERFORMANCE OF 15-YEAR-OLDS ACROSS CONTENT AREAS

Key Findings: Canada, France, Germany, Italy, Japan, Russian Federation, United States

In the United States, 15-year-old students in PISA 2003 generally scored lower than their peers in Canada, France, Germany, and Japan on each of the four mathematics literacy subscales: space and shape, change and relationships, quantity, and uncertainty.

The Program for International Student Assessment (PISA) assessed 15-year-old students in mathematics literacy in 2003. In the United States, 15-year-old students had an average score of 483 on the PISA 2003 combined mathematics literacy scale (figure 7). The U.S. score was lower than the average score of 500 for the participating Organization for Economic Cooperation and Development (OECD) countries (data not shown) (Lemke et al. 2004). Among the G-8 countries reporting data,⁷ the U.S. score was lower than the average scores for Germany, France, Canada, and Japan and higher than the average scores for the Russian Federation and Italy.

For the most part, U.S. 15-year-olds scored lower than their peers in Canada, France, Germany, and Japan on the four mathematics literacy subscales, with each subscale representing a different content area: space and shape, change and relationships, quantity,

and uncertainty. (There was one exception: no measurable difference between the United States and Germany on the uncertainty subscale.) For example, the U.S. mean score of 472 on the space and shape subscale was lower than the mean scores for Germany (500), France (508), Canada (518), and Japan (553). Among the G-8 countries, students in Japan earned the highest score on the space and shape subscale, followed by students in Canada.

On the change and relationships subscale, 15-year-olds in Japan and Canada earned the highest mean scores: 536 and 537, respectively. Students in the United States had a mean score of 486, outscoring only students in Italy (452). Similarly, on the quantity subscale, students in Japan and Canada earned mean scores of 527 and 528, respectively, outscoring students in all other G-8 countries. Students in Germany and France scored 514 and 507, respectively, and students in the United States had a mean score of 476.

On the uncertainty subscale, students in the United States received a mean scale score of 491, outscoring students in Italy and the Russian Federation, who had mean scores of 463 and 436, respectively. Among the G-8 countries, students in Canada earned the highest score on this subscale, followed by students in Japan, with scores of 542 and 528, respectively.

Definitions and Methodology

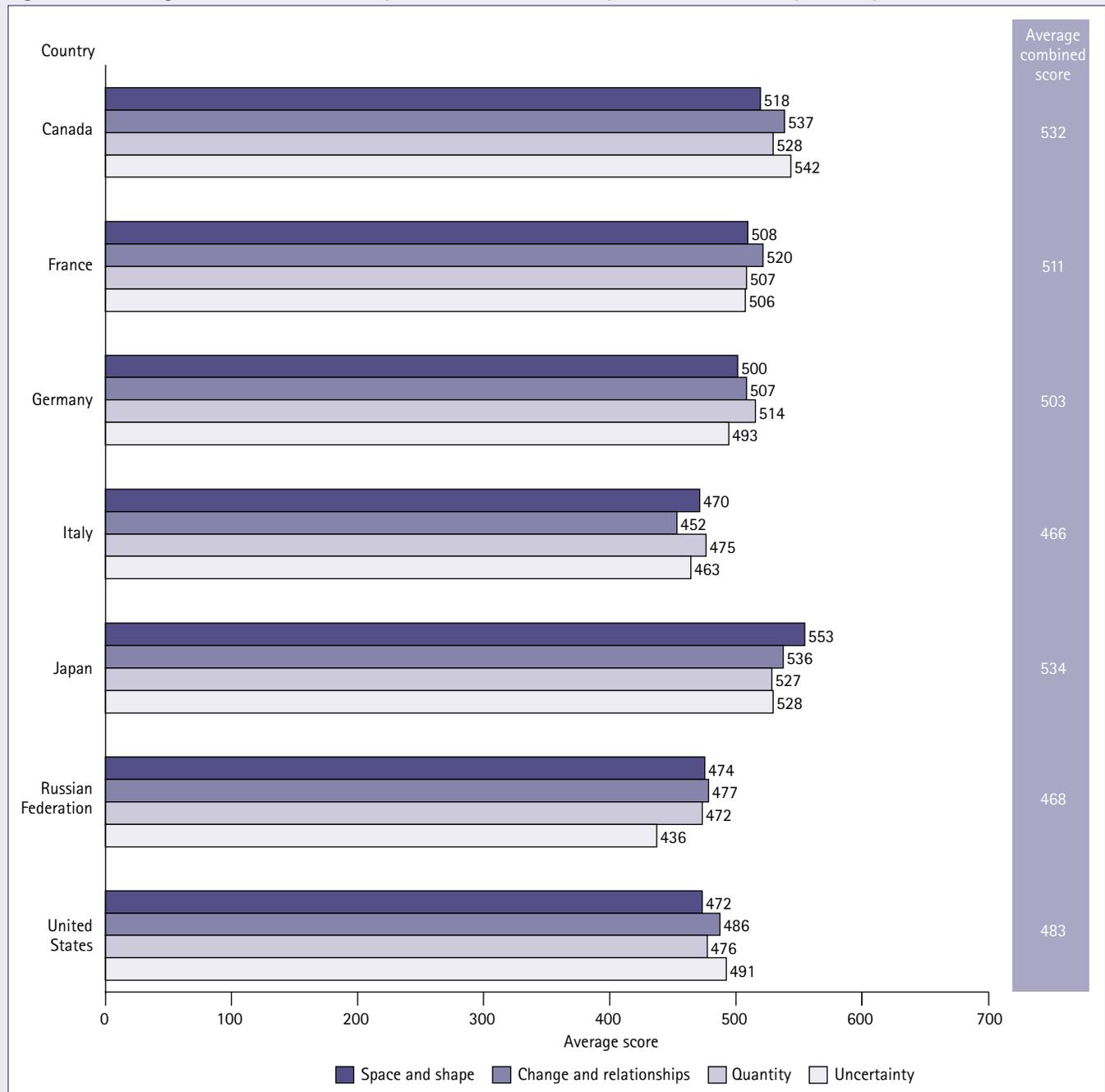
PISA defines mathematics literacy as “an individual’s capacity to identify and understand the role that mathematics plays in the world, to make well-founded judgments and to use and engage with mathematics in ways that meet the needs of that individual’s life as a constructive, concerned and reflective citizen” (OECD 2003). In PISA 2003, students were assessed on their mathematical knowledge in four content areas (space and shape, change and relationships, quantity, and uncertainty), as well as the processes that need to be performed to solve mathematical problems in these four content areas and the real-world situations in which students encounter such mathematical problems. The space and shape subscale is related to spatial and geometric phenomena and relationships. The change and relationships subscale pertains to mathematical manifestations of change, functional relationships,

and dependency among variables. The quantity subscale is related to numeric phenomena and quantitative relationships and patterns. The uncertainty subscale focuses on probabilistic and statistical phenomena and relationships.

To facilitate the cross country comparison of achievement scores on the PISA 2003 combined mathematics literacy scale, an OECD average was calculated whereby all the participating OECD countries contributed equally. The data were then standardized to set the OECD average at 500, with a range from 0 to 1000 and a standard deviation of 100. Since the individual country means were weighted averages of the student scores, this standardization implied that about two-thirds of the students across all the participating OECD countries scored between 400 and 600.

⁷Due to low response rates, data for the United Kingdom are not shown in this indicator.

Figure 7. Average mathematics literacy subscale scores of 15-year-old students, by country: 2003



NOTE: The space and shape subscale is related to spatial and geometric phenomena and relationships. The change and relationships subscale pertains to mathematical manifestations of change, functional relationships, and dependency among variables. The quantity subscale is related to numeric phenomena and quantitative relationships and patterns. The uncertainty subscale focuses on probabilistic and statistical phenomena and relationships. Due to low response rates, data for the United Kingdom are not shown.

SOURCE: Organization for Economic Cooperation and Development (OECD). (2004). *Learning for Tomorrow's World: First Results From PISA 2003*, tables 2.1c, 2.2c, 2.3c, 2.4c, and 2.5c. Paris: Author.