

MATHEMATICS ACHIEVEMENT AND SOCIOECONOMIC STATUS

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

Although U.S. students were generally at an advantage in terms of socioeconomic status (SES) compared to their G-8 peers, low-SES 15-year-old students in the United States were outperformed by their peers in Germany, France, Japan, and Canada in mathematics literacy.

The 2003 Program for International Student Assessment (PISA 2003) measured socioeconomic status (SES) based on the occupational status of the 15-year-old student's mother or father (whichever parent had the higher occupational status), with parental occupation reported by the student. Parental occupations were translated into socioeconomic index scores. For example, whereas a low index score (i.e., between 16 and 34 points) corresponds with a parental occupation requiring a minimal level of education and skill (e.g., taxi driver, waiter/waitress), a high index score (i.e., between 71 and 90 points) corresponds with a parental occupation requiring a high level of education and skill (e.g., medical doctor, university professor).

In 2003, the United States had the highest mean socioeconomic index score of all the G-8 countries reporting data⁸ (54.6 in the United States compared to a range from 46.8 in Italy to 52.6 in Canada) (data not shown). Furthermore, when students were classified into national quarters on the index, U.S. 15-year-olds in the bottom national quarter had a higher mean index score than their peers in all but one G-8 country (32.6 in the United States compared to a range from 26.9 in Italy to 31.7 in Canada). Only in Japan did students in the bottom national quarter have a higher mean index score (33.4) than their U.S. counterparts. These results show that U.S. students were generally at an advantage in terms of SES compared to their G-8 peers (both overall as well as specifically at the low SES level).

On the other hand, when looking at the mathematics achievement of low-SES students, U.S. students did not demonstrate an advantage over their counterparts in most G-8 countries. Specifically, U.S. students in the bottom national quarter of the socioeconomic index were outperformed by their peers in Germany, France, Japan, and Canada on the PISA 2003 combined mathematics literacy scale (448 in the United States compared to a range from 463 in Germany to 506 in Canada) (figure 8a). U.S. students in the bottom national quarter of the index scored higher than their counterparts in only one G-8 country—Italy (with an average score of 430).

Nevertheless, in all G-8 countries, there was a relationship between SES and achievement scores. Specifically, students in the top national quarter of the socioeconomic index scored higher on the combined mathematics literacy scale than students in the bottom national quarter of the index. This difference ranged from 58 points in the Russian Federation to 102 points in Germany; in the United States, this difference was 82 points.

Another way to evaluate the relationship between socioeconomic status and mathematics achievement is to examine the specific change in score on the combined mathematics literacy scale in response to a one-standard-deviation increase (i.e., 16.4 units) in the socioeconomic index score. A greater increase in a country's average achievement score implies a stronger relationship between socioeconomic status and performance in that country. In the United States, an increase of one standard deviation on the index was associated with an average performance increase of 30 score points (figure 8b). Compared to the United States, three G-8 countries had a weaker relationship between the socioeconomic index and mathematics literacy performance—the Russian Federation, Japan, and Canada (with a range from 21 to 24 score points)—and one G-8 country had a stronger relationship—Germany (with 38 score points).

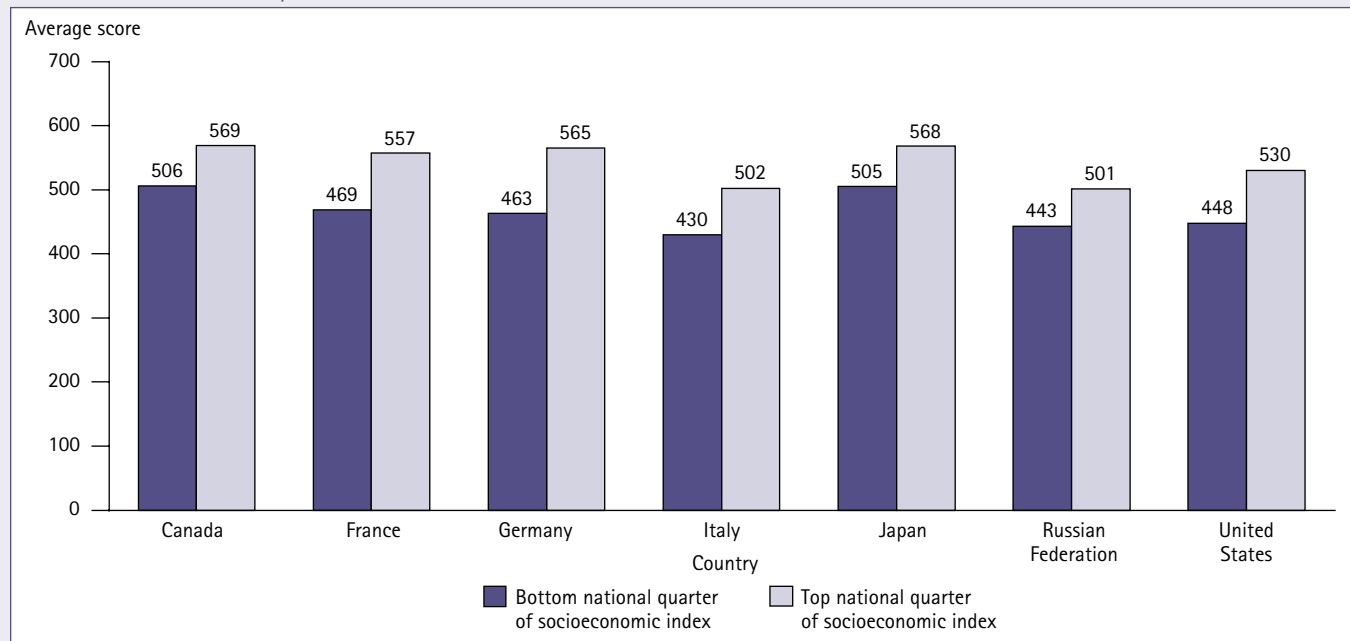
Definitions and Methodology

To facilitate the cross country comparison of achievement scores on the PISA 2003 combined mathematics literacy scale, an Organization for Economic Cooperation and Development (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. For more information about mathematics literacy in PISA 2003, see the Definitions and Methodology section of indicators 6 and 7.

Socioeconomic status is measured by the Highest International Socioeconomic Index of Occupational Status (HISEI), which corresponds to the highest occupational index score of the student's father or mother. Parental occupation, as reported by the student, was coded based on the current version of the International Standard Classification of Occupations (ISCO-88) (International Labor Organization 1988). Occupational codes were, in turn, mapped onto an internationally comparable index of occupational status, the International Socioeconomic Index of Occupational Status (ISEI), developed by Ganzeboom, De Graaf, and Treiman (1992). The ISEI captures the attributes of occupations that convert parents' education into income. It is derived by optimally scaling occupation groups to maximize the indirect effect of education on income through occupation and to minimize the direct effect of education on income, net of occupation (both effects being net of age).

⁸Due to low response rates, data for the United Kingdom are not shown in this indicator.

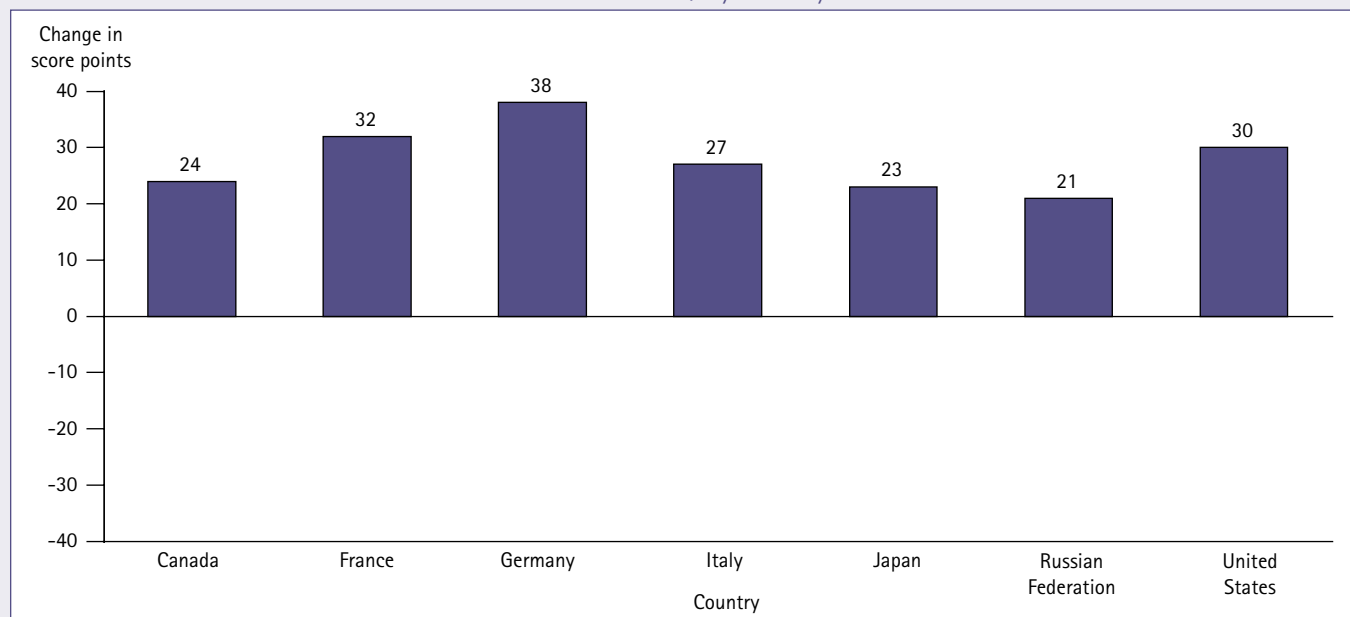
Figure 8a. Combined mathematics literacy scores of 15-year-old students in PISA 2003, by socioeconomic status and country: 2003



NOTE: In the 2003 Program for International Student Assessment (PISA 2003), socioeconomic status is measured by the Highest International Socioeconomic Index of Occupational Status (HISEI), which corresponds to the highest occupational index score of the student's father or mother. This information, derived from students' responses to questionnaire items pertaining to parental occupation, is transformed into an index developed by Ganzeboom, De Graaf, and Treiman (1992). The index is keyed to the International Standard Classification of Occupations (ISCO) and allows direct comparisons between nations. 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*, table 4.2a. Paris: Author.

Figure 8b. Change in the combined mathematics literacy scores of 15-year-old students in PISA 2003 per one-standard-deviation increase in the socioeconomic index, by country: 2003



NOTE: In the 2003 Program for International Student Assessment (PISA 2003), socioeconomic status is measured by the Highest International Socioeconomic Index of Occupational Status (HISEI), which corresponds to the highest occupational index score of the student's father or mother. This information, derived from students' responses to questionnaire items pertaining to parental occupation, is transformed into an index developed by Ganzeboom, De Graaf, and Treiman (1992). The index is keyed to the International Standard Classification of Occupations (ISCO) and allows direct comparisons between nations. Shown in this figure is the average score-point difference that is associated with an increase of one standard deviation (i.e., 16.4 units) on the socioeconomic index. 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*, table 4.2a. Paris: Author.