RELATIONSHIP BETWEEN READING AND MATHEMATICS ACHIEVEMENT

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

In all G-8 countries, 15-year-old students who scored low in either mathematics or reading tended to score lower than average in the other subject as well.

This indicator examines the extent to which students who perform poorly in reading are also likely to perform poorly in mathematics, and vice versa. Student performance can be evaluated not only by examining mean scores, but also by looking at the percentages of students who can accomplish tasks at particular proficiency levels. In the 2003 Program for International Student Assessment (PISA 2003), 15-year-old students' proficiency in reading literacy was defined in terms of five levels and their proficiency in mathematics literacy in terms of six levels. In this way, literacy skills were assessed along a continuum, with level 1 and below indicative of the lowest performing students. This indicator focuses on the reading performance of the lowest mathematics performers and the mathematics performance of the lowest reading performers. The results show that in all of the G-8 countries reporting data,[10] 15-year-old students who scored low in either mathematics or reading tended to score lower than average in the other subject as well. The sections that follow describe the results separately for reading and mathematics, respectively.

In all of the G-8 countries, the average reading scores for students at level 1 or below in mathematics were lower than the respective country averages in reading (figure 10a). In fact, in the majority of the G-8 countries in 2003, the average reading scores of the lowest mathematics performers were at least 100 points lower (i.e., at least one standard deviation lower) than the respective country averages in reading. In the United States, the average reading score of the lowest mathematics performers was 116 points lower than the average U.S. reading score (380 vs. 495).[11]

Another way of evaluating the relationship between reading and mathematics achievement is to consider the percentage of students at level 1 or below in mathematics who are also at level 1 or below in reading, and vice versa. In all of the G-8 countries, at least one-half of the lowest mathematics performers were also among the lowest reading performers (with the United States at 62 percent) (figure 10b).

As noted, the mathematics performance of the lowest reading performers can also be examined. Similar to the results for reading, in all of the G-8 countries, the average mathematics scores for students at level 1 or below in reading were lower than the respective country averages in mathematics (figure 10a). Once again, in the majority of the G-8 countries, the lowest reading performers scored at least 100 points lower in mathematics compared to the respective country averages in mathematics. However, in Italy and the Russian Federation, which were the two lowest performing G-8 countries overall in mathematics, average mathematics scores were 93 points and 70 points lower, respectively, among the lowest reading performers. In Japan and Canada, the two highest performing G-8 countries overall in mathematics, average mathematics scores were about 130 points lower among the lowest reading performers.

The percentage of students at level 1 or below in reading who were also at level 1 or below in mathematics ranged from 61 percent in Japan to 82 percent in the United States, with the U.S. percentage higher than that of its G-8 peers (figure 10b).

Definitions and Methodology

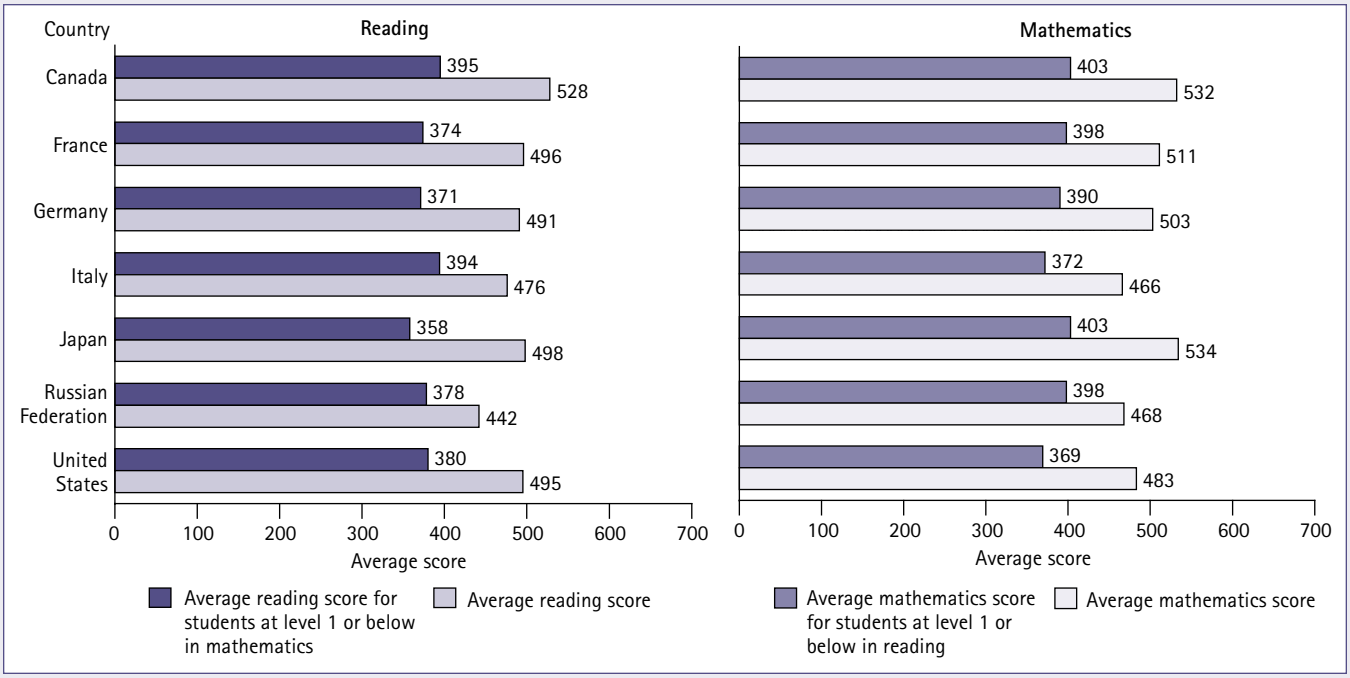
To facilitate the cross country comparison of achievement scores on the PISA combined reading literacy scale and the combined mathematics literacy scale, an Organization for Economic Cooperation and Development (OECD) average was calculated whereby all the participating OECD countries contributed equally. The data were then standardized to set the OECD average on the reading scale and the mathematics scale 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.

Proficiency in reading literacy and mathematics literacy was defined in terms of levels based on student performance scores on the combined scales for each subject area. Exact cut point scores in reading literacy are as follows: below level 1 (a score less than or equal to 334.75); level 1 (a score greater than 334.75 and less than or equal to 407.47); level 2 (a score greater than 407.47 and less than or equal to 480.18); level 3 (a score greater than 480.18 and less than or equal to 552.89); level 4 (a score greater than 552.89 and less than or equal to 625.61); and level 5 (a score greater than 625.61). See the Definitions and Methodology section of indicator 6 for cut point scores in mathematics literacy. In order to reach a particular proficiency level, a student must have been able to answer correctly a majority of items at that level. In reading literacy, tasks at level 1 require students to locate single pieces of information with little or no competing information or draw simple inferences. On the other hand, tasks at level 5 require students to examine very complex texts, locate and organize multiple pieces of information, interpret language or apply unfamiliar categorization schemes, or evaluate and hypothesize about the information in the text. See the Definitions and Methodology section of indicator 6 for a description of the proficiency levels in mathematics literacy.

Score-point differences presented in the text are computed from unrounded numbers; therefore, they may differ from computations made using the rounded whole numbers that appear in figure 10a.

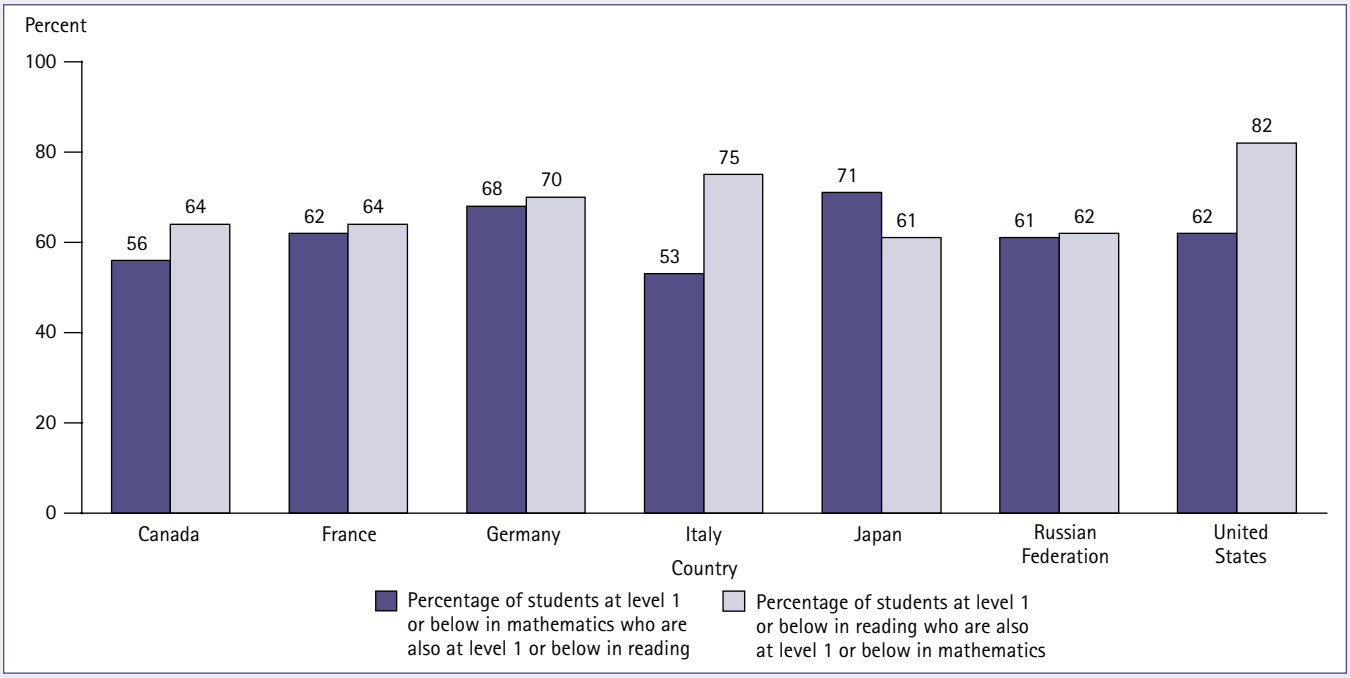
[10]Due to low response rates, data for the United Kingdom are not shown in this indicator.
[11]Score-point difference was computed from unrounded numbers.

Figure 10a. Average scores of 15-year-old students in reading and mathematics, and average scores in reading and mathematics for students at PISA proficiency level 1 or below in the other subject area, by country: 2003



NOTE: In the Program for International Student Assessment (PISA), proficiency in reading literacy and mathematics literacy was defined in terms of levels based on student performance scores on the combined scales for each subject area. There were five levels for reading and six levels for mathematics. Students were classified into levels according to their scores. In this way, literacy skills were assessed along a continuum, with level 1 or below indicative of the lowest performing students. 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 2.5c and 6.2. Paris: Author; OECD. (2006). *Education at a Glance: OECD Indicators 2006*, tables A6.2 and A6.3. Paris: Author; and OECD, PISA 2003, previously unpublished tabulations (June 2006).

Figure 10b. Percentage of 15-year-old students at PISA proficiency level 1 or below in mathematics who are also at level 1 or below in reading, and percentage of students at PISA proficiency level 1 or below in reading who are also at level 1 or below in mathematics, by country: 2003



NOTE: In the Program for International Student Assessment (PISA), proficiency in reading literacy and mathematics literacy was defined in terms of levels based on student performance scores on the combined scales for each subject area. There were five levels for reading and six levels for mathematics. Students were classified into levels according to their scores. In this way, literacy skills were assessed along a continuum, with level 1 or below indicative of the lowest performing students. Due to low response rates, data for the United Kingdom are not shown.
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