Chapter 4

Country by Country Profiles of Achievement in the Mathematics Cognitive Domains

To highlight relative strengths and weaknesses within each country, this chapter describes in which mathematics cognitive areas each country is relatively strong or weak. Regardless of international standing, the profiles of achievement within country reveal that many countries performed relatively better or worse in one or more cognitive domains than they did overall.

Differences in relative performance may be related to one or more of a number of factors, such as emphases in intended curriculum or widely used textbooks, differences in instruction and curriculum implementation, and differences in the match between instruction and the types of items contained in TIMSS 2003.

Profiles of Achievement

For each country, Exhibit 4.1 displays the difference between average performance in each content area and the country's average performance overall. The first three pages of Exhibit 4.1 show the results for eighth grade and the next two pages show the results for the

fourth grade. For each country, the average of the cognitive domain scores has been set to zero, so that above average or below average performance can be highlighted for each of the three domains. Relatively better achievement in a cognitive domain is shown when the circle and the lines indicating its confidence interval are completely above and not touching zero on the scale, and relatively worse achievement by a circle and its confidence interval lines completely below "0."

The profiles of relative performance reveal interesting differences among countries. Most countries show the profile of performing relatively better or worse in only one of the domains, or perhaps having a relative strength in one domain together with a relative weakness in another of the domains. However, a few countries were very balanced in their performance across the cognitive domains, for example, Belgium (Flemish) at the eighth grade and Chinese Taipei at the fourth grade. At the other end of the continuum, a few countries had a relative strength or weakness in each of the three domains. For example, at the eighth grade, it can be seen that Bahrain performed relatively better in the reasoning domain and relatively worse in the knowing and applying domains compared to its average achievement overall. At the fourth grade, the only country with this pattern was Norway, with relatively worse performance in the knowing and applying domains, combined with better performance in the reasoning domain.
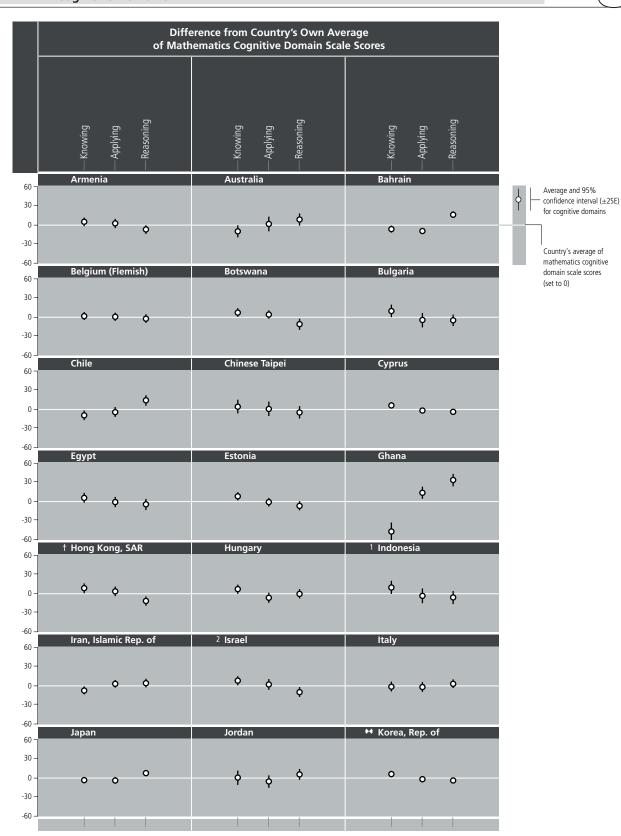
Relative Strengths and Weaknesses in the Knowing Domain

At the eighth grade, countries with relative strength in the knowing domain included Botswana, Bulgaria, Cyprus, Estonia, Hong Kong SAR, Israel, the Republic of Korea, Latvia, Lebanon, Lithuania, the Philippines, Romania, the Russian Federation, Serbia, and the Slovak Republic. The countries that performed significantly less well in the knowing domain than in mathematics overall included Australia, Bahrain, Chile, Ghana, Iran, the Netherlands, New Zealand, Norway, Saudi Arabia, Scotland, Sweden, England, and the Canadian province of Ontario. At the

Exhibit 4.1: **Profiles of Within-Country Relative Performance in Mathematics Cognitive Domains**

MATHEMATICS
Grade 8

SOURCE: IEA's Trends in International Mathematics and Science Study (TIMSS) 2003

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MATHEMATICS Grade 8

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† Met guidelines for sample participation rates only after replacement schools were included (see Exhibit C.2).

‡ Nearly satisfied guidelines for sample participation rates only after replacement schools were included (see Exhibit C.2).

1 National Desired Population does not cover all of International Desired Population (see Exhibit C.1).

2 National Defined Population covers less than 90% of National Desired Population (see Exhibit C.1).

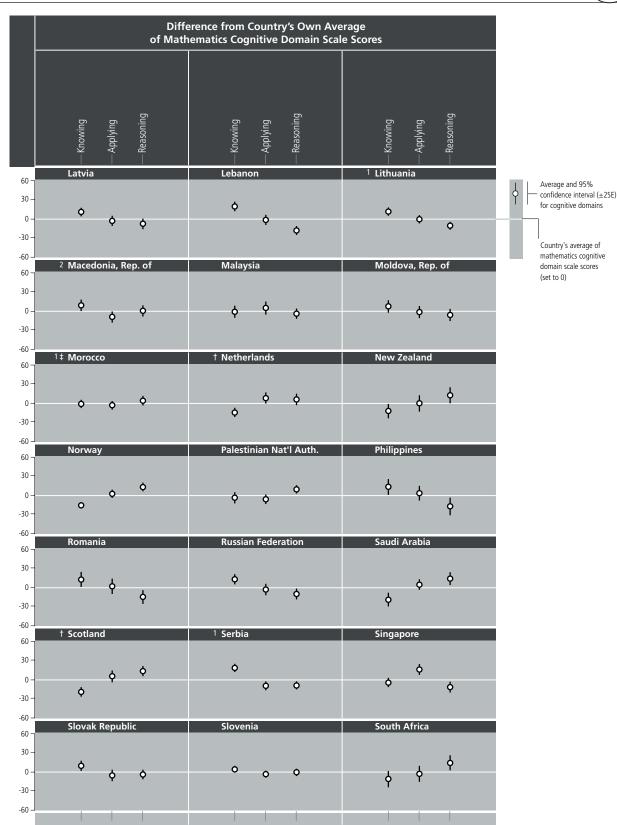**Exhibit 4.1:** Profiles of Within-Country Relative Performance in Mathematics Cognitive Domains

MATHEMATICS
Grade 8

‡   Nearly satisfied guidelines for sample participation rates only after replacement schools were
     included (see Exhibit C.2).

‡   Did not satisfy guidelines for sample participation rates (see Exhibit C.2).

Exhibit 4.1: **Profiles of Within-Country Relative Performance in Mathematics Cognitive Domains**

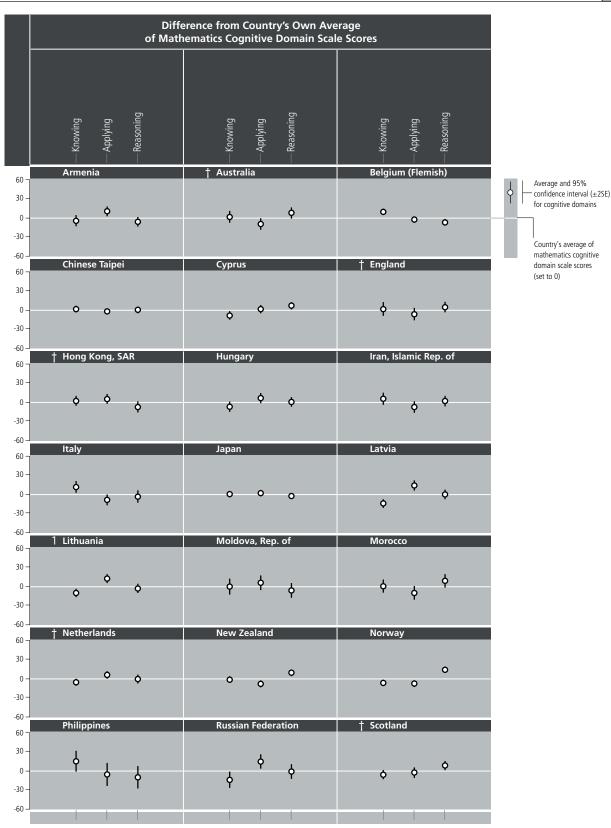MATHEMATICS
Grade 4

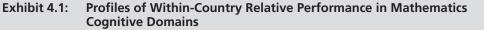SOURCE: IEA's Trends in International Mathematics and Science Study (TIMSS) 2003
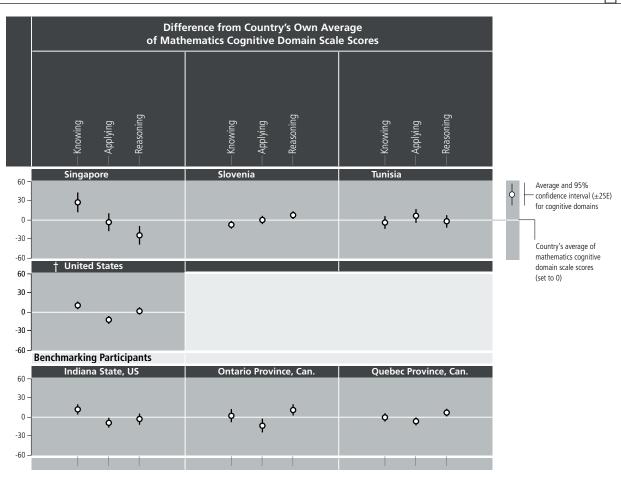
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MATHEMATICS
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fourth grade, countries with a relative strength in the knowing domain were Belgium (Flemish), Italy, Singapore, the United States, and the US state of Indiana. Comparatively more countries at the fourth grade had a relative weakness in the knowing domain, including Cyprus, Latvia, Lithuania, the Netherlands, Norway, the Russian Federation, and Slovenia.

Relative Strengths and Weaknesses in the Applying Domain

At the eighth grade, there were fewer countries with differences between overall mathematics achievement and achievement in the applying domain than there were with such differences in the knowing domain. Countries with a relative strength in the applying domain at the eighth grade included Ghana, Singapore, and Tunisia. Those with a relative weakness in the applying domain included Bahrain, Macedonia, and Serbia.

At the fourth grade, Armenia, Latvia, Lithuania, and the Russian Federation had applying as a particular strength. Compared to performance in overall mathematics, applying was a relative weakness in Australia, New Zealand, Norway, the United States, the US state of Indiana, and the two Canadian provinces (a group including three English-speaking countries).

Relative Strengths and Weaknesses in the Reasoning Domain

Countries with the reasoning domain as a particular strength at the eighth grade included Bahrain, Chile, Ghana, Japan, Norway, the Palestinian National Authority, Saudi Arabia, Scotland, South Africa, and Sweden. Countries that performed less well in the reasoning domain than they did in overall mathematics included Armenia, Botswana, Cyprus, Hong Kong, Israel, Lebanon, Lithuania, the Philippines, Romania, the Russian Federation, Serbia, and Singapore.

At the fourth grade, the participants with a relative strength in reasoning were Cyprus, New Zealand, Norway, Scotland, Slovenia, and

the two Canadian provinces. Only two countries, Belgium (Flemish) and Singapore, did relatively less well in reasoning as compared to their overall mathematics performance.

International Achievement Across the Cognitive Domains

At the eighth grade across the TIMSS 2003 participants, the knowing domain had the most differences, with many countries showing either a relative strength or weakness in this area. Fifteen countries performed better in the knowing domain than they did in mathematics overall, and 12 countries and the Canadian province of Ontario performed worse. The applying domain was the cognitive area least likely to feature either relatively strong or relatively weak performance. Only three countries performed better in the applying domain than they did in mathematics overall (Ghana, Singapore, and Tunisia) and only three countries performed worse (Bahrain, Macedonia, and Serbia).

In the reasoning domain at the eighth grade, 10 countries performed relatively better than they did in mathematics overall and 12 countries did less well. The countries making up each of the two groups included those from very different parts of the world geographically and with disparate cultures and mathematics traditions. For example, the countries with a relative strength in the reasoning domain were Bahrain, Chile, Ghana, Japan, Norway, the Palestinian National Authority, Saudi Arabia, Scotland, South Africa, and Sweden.

At the fourth grade, looking across the participating countries, about the same number of differences (strengths or weaknesses) occurred in each of the cognitive domains. However, several more countries showed a relative weakness in the knowing cognitive domain (seven) than had this domain as a relative strength (five). Similarly, more countries had a relative weakness in the applying domain (seven) than had this domain as a relative strength (four). In comparison, more countries showed a relative strength in the reasoning domain (seven) than showed this domain as a relative weakness (two).