

# Chapter 3

## PERFORMANCE ON ITEMS WITHIN EACH SCIENCE CONTENT AREA

This chapter presents five to six example items within each of the science content areas, including the performance on these items for each of the TIMSS countries. The example items were selected to illustrate the different topics covered within each content area as well as the different performance expectations. The items also were chosen to show the range of item formats used within each area. To provide some sense of what types of items were answered correctly by higher-performing as compared to lower-performing students, the items show a range of difficulty within each content area. Finally, it should be noted that all these items and others have been released for use by the public.<sup>1</sup>

The presentation for each of the content areas begins with a brief description of the major topics and student performance expectations included in the content area. This description is followed by a series of tables, one for each of the example items, showing the percent correct for each of the TIMSS countries at both the third and fourth grades. If the item also was included in the TIMSS science test at the seventh and eighth grades, it is so designated, and the international averages are shown for those grades for purposes of comparison. Each table also presents the example item in its entirety. The correct answer is circled for multiple-choice items and shown in the answer space for short-answer items. For extended-response questions, the answer shown exemplifies the type of student responses that were given full credit. All of the responses shown have been reproduced from students' actual test booklets.

After the tables showing the country-by-country results, there is a figure relating achievement on each of the example items to performance on the TIMSS international science scale. This “difficulty map” provides a pictorial representation of achievement on the scale in relation to achievement on the items.

### WHAT HAVE STUDENTS LEARNED ABOUT EARTH SCIENCE?

Items in the earth science category measure students' knowledge of the scientific principles related to earth features, earth processes, and the earth in the solar system. Tables 3.1 through 3.5 show the percentage of correct responses across the TIMSS countries for each of five example items (Example Items 1-5) together with the corresponding example item.

The basic knowledge that the moon is illuminated by the sun was required for a correct response to Example Item 1 (Table 3.1). The majority of students in most countries responded correctly to this item, with international averages of 64% and 70% for the third and fourth grade, respectively. In about half of the countries, at

<sup>1</sup> The IEA retained about one-third of the TIMSS items as secure for possible future use in measuring international trends in mathematics and science achievement. All remaining items are available for general use.

least 70% of fourth-grade students responded correctly. In several of these countries (England, Hong Kong, Korea, Norway, Portugal, Singapore, and United States), at least 70% of the third-grade students also responded correctly. In contrast, in the Czech Republic and Hungary, where more than 75% percent of fourth-grade students responded correctly, the average percent correct was less than 60% at the third grade, indicating a substantial increase in performance from third to fourth grade.

Example Item 2 asked students to draw on their knowledge of the earth's resources and physical cycles to explain why a plain containing a river might be both a good place (Part 2A) and a bad place (Part 2B) for farming (Table 3.2). The majority of fourth graders and nearly half of the third graders internationally were able to answer the first part of this open-ended item (international averages of 48% and 62% for third- and fourth-grade students), with the percentage of correct responses ranging from 23% in Kuwait to 91% in Korea for the fourth grade and from 25% in Portugal to 81% in Korea for the third grade. Students were given credit for mentioning that the soil was fertile, good, or abundant; that the river would provide irrigation or water for animals; that there was plenty of space or flat areas for farmland; or for any other acceptable reason related to facilitating farming. Both fourth- and third-grade students found the second part of this item to be quite difficult, with less than a quarter of students internationally providing a correct reason for why the plain is not a good place for farming (16% and 23% for third and fourth grade). The percentage of correct responses ranged from a high of 45% in the fourth grade in the Netherlands to less than 20% at both the third and fourth grade in several countries. Reasons that were given credit in Part B included the possibility of flooding, wind or water erosion, and other problems related to farming. This example item was also included in the TIMSS assessment at the middle-school level, permitting the performance of seventh- and eighth-grade students to be compared with those of the primary-school students in the same set of countries. As seen in the shaded portion of Table 3.2, seventh- and eighth-grade students internationally demonstrated a higher performance on this item, with more than 80% providing a correct response to Part 2A, but still less than 50% responding correctly to Part 2B.

The majority of both third- and fourth-grade students had difficulty with Example Item 3 (Table 3.3), which required them to provide a short explanation for why snow remains at the top of a mountain. Students were given credit for responses related to temperature, amount of snow, or other acceptable explanations related to atmospheric or weather differences between the upper and lower parts of mountains. Nearly half of fourth-grade students (46%) and 31% of third-grade students internationally provided a correct response. The percent correct in the third grade was more than 15% lower than that in the fourth grade for many countries. In ten countries, at least 50% of fourth-grade students responded correctly (Canada, Czech Republic, England, Hungary, Iceland, Japan, Korea, the Netherlands, Norway, United States). The highest performances were observed in Japan and Korea, with more than 70% correct in the fourth grade, compared with about 20% in Kuwait and Thailand.

Students were also required to use their knowledge of temperature and weather in Example Item 4 (Table 3.4), which involved interpreting data in a table to determine in which town it would snow. Internationally, students found this multiple-choice item to be of comparable difficulty to Example Item 3, with less than half of the students responding correctly (32% at third grade and 44% at fourth grade). At the fourth grade, the percentage of correct responses ranged from about 25% in Kuwait, Portugal and Thailand to 60% or more in the Czech Republic, Hong Kong, Japan, and the Netherlands. In the majority of countries, the performance on Example Item 4 was comparable to or somewhat lower than that on Example Item 3. Notable exceptions were Hong Kong and Austria, where the percentage of correct responses on Example Item 4 were about 20% higher at both grade levels, with 63% for Hong Kong and 52% for Austria at the fourth grade level compared to 46% and 30% for Example Item 3, respectively.

Example Item 5 was one of the most difficult earth science items, requiring students to provide an explanation for the different size of the sun and moon based on their distances from the earth. The international average percents correct were 21% and 30% for third and fourth grade students, respectively. In the majority of countries, between 20% and 35% of third-grade students and between 30% and 45% of fourth-grade students responded correctly. The highest performances were in Australia, Austria, Japan, Korea, and Norway, with 40% to 46% correct at the fourth grade. In comparison, in Cyprus, Greece, Iran, and Portugal, 15% or less of students at both grades responded correctly. This item was of moderate difficulty for students in the seventh and eighth grades, with international average percentages in the 50% to 60% range.

The international item difficulty map shown in Figure 3.1 depicts the relationship between performance on the TIMSS international science scale and achievement on the five example items for earth science.<sup>2</sup> The international achievement on each example item is indicated both by the third- and fourth-grade international average percent correct and by the international science scale value, or item difficulty level, for each item. Since the scale was developed based on the performance of students at both grades in all countries, the international scale values apply to both grades and to all countries.

In Figure 3.1, the item results are placed on the scale at the point where students at the corresponding achievement level were more likely than not (65% probability) to answer the question correctly. Items at higher scale values are the more difficult items. For example, students scoring at or above 485 on the science scale were likely to answer correctly the question about why the moon shines at night (Example Item 1) but not the question about the advantages of farming by a river (Example Item 2A), while students scoring at or above 537 were also likely to answer this second item correctly.

<sup>2</sup> The three-digit item label shown in the lower right corner of the box locating each example item on the item difficulty map refers to the original item identification number used in the student test booklets.

The international average of 524 on the science scale at the fourth grade indicates that students from many countries at this grade would be likely to correctly answer the lower-difficulty items, such as Example Item 1, but not the more difficult items. With item difficulties for most of the earth science items ranging from about 450 to 700, students internationally found many of the earth science items to be rather difficult. These results, however, varied dramatically across countries. In Korea, with an average scale value of 597, fourth-grade students were likely to respond correctly to more of the earth science items than the students in other, lower-performing countries. This is reflected in Korea's average percent correct at the fourth grade for the earth science items, which was 72% compared to 57% internationally.

**Table 3.1 Earth Science****Percent Correct for Example Item 1  
Lower and Upper Grades (Third and Fourth Grades\*)**

Country	Percent Correct		Example 1 Moon shining at night.
	Third Grade	Fourth Grade	
Canada	63 (2.9)	68 (2.9)	<p>The Moon produces no light, and yet it shines at night. Why is this?</p> <p><input checked="" type="radio"/> A. The Moon reflects the light from the Sun.</p> <p>B. The Moon rotates at a very high speed.</p> <p>C. The Moon is covered with a thin layer of ice.</p> <p>D. The Moon has many craters.</p>
Cyprus	54 (2.7)	54 (2.4)	
Czech Republic	56 (2.7)	76 (2.1)	
<sup>12</sup> England	75 (2.5)	72 (2.6)	
Greece	65 (4.0)	67 (3.4)	
Hong Kong	85 (1.5)	87 (1.8)	
Iceland	63 (3.7)	64 (2.8)	
Iran, Islamic Rep.	43 (3.5)	56 (2.8)	
Ireland	68 (2.9)	69 (2.3)	
Japan	51 (2.2)	58 (2.3)	
Korea	77 (2.3)	76 (2.3)	
New Zealand	54 (3.1)	64 (3.1)	
Norway	70 (2.5)	85 (2.6)	
Portugal	71 (2.6)	77 (2.9)	
<sup>†</sup> Scotland	65 (2.4)	63 (2.6)	
Singapore	81 (1.5)	86 (1.2)	
United States	71 (1.6)	75 (1.8)	
<b>Countries Not Satisfying Guidelines for Sample Participation Rates (See Appendix A for Details):</b>			
Australia	61 (3.1)	70 (2.1)	
Austria	64 (2.9)	79 (2.5)	
<sup>1</sup> Latvia (LSS)	57 (3.4)	62 (3.5)	
Netherlands	66 (2.6)	81 (2.2)	
<b>Countries Not Meeting Age/Grade Specifications (High Percentage of Older Students; See Appendix A for Details):</b>			
Slovenia	65 (3.1)	72 (2.8)	
<b>Countries With Unapproved Sampling Procedures at Classroom Level (See Appendix A for Details):</b>			
Hungary	50 (2.7)	78 (2.3)	
<b>Unapproved Sampling Procedures at Classroom Level and Not Meeting Other Guidelines (See Appendix A for Details):</b>			
<sup>1</sup> Israel	- -	52 (3.0)	
Kuwait	- -	58 (2.9)	
Thailand	53 (3.5)	64 (2.5)	
<b>International Average Percent Correct</b>	64 (0.6)	70 (0.5)	

\*Third and fourth grades in most countries; See Table 2 for information about the grades tested in each country.

<sup>†</sup>Met guidelines for sample participation rates only after replacement schools were included (see Appendix A for details).

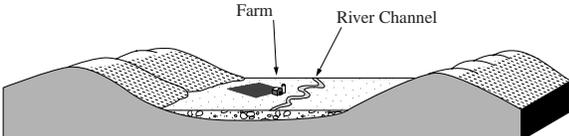
<sup>1</sup>National Desired Population does not cover all of International Desired Population (see Table A.2). Because coverage falls below 65%, Latvia is annotated LSS for Latvian Speaking Schools only.

<sup>2</sup>National Defined Population covers less than 90 percent of National Desired Population (see Table A.2).

( ) Standard errors appear in parentheses. Because results are rounded to the nearest whole number, some totals may appear inconsistent. A dash (-) indicates data are not available. Israel and Kuwait did not test at the lower grade.

SOURCE: IEA Third International Mathematics and Science Study (TIMSS), 1994-95.

**Table 3.2 Earth Science****Percent Correct for Example Item 2A  
Lower and Upper Grades (Third and Fourth Grades\*)**

Country	Percent Correct		Example 2A  River on the plain: good place for farming.
	Third Grade	Fourth Grade	
Canada	52 (2.2)	68 (3.2)	<p>The diagram shows a river flowing through a wide plain. The plain is covered with several layers of soil and sediment.</p>  <p>a. Write down one reason why this plain is a good place for farming.</p> <p>Because there is a river where the farmers could get fresh water.</p> <p>b. Write down one reason why this plain is NOT a good place for farming.</p> <p>The river could overflow during a rain storm.</p>
Cyprus	37 (2.2)	56 (2.0)	
Czech Republic	37 (2.0)	54 (2.3)	
<sup>12</sup> England	63 (2.0)	74 (1.7)	
Greece	40 (2.7)	62 (2.4)	
Hong Kong	45 (2.3)	65 (2.3)	
Iceland	26 (2.8)	38 (2.5)	
Iran, Islamic Rep.	28 (1.9)	40 (2.1)	
Ireland	55 (2.0)	70 (2.1)	
Japan	60 (1.6)	75 (1.5)	
Korea	81 (1.8)	91 (0.9)	
New Zealand	57 (2.7)	69 (2.6)	
Norway	30 (2.0)	56 (2.5)	
Portugal	25 (2.3)	49 (2.5)	
<sup>†</sup> Scotland	60 (1.9)	72 (1.9)	
Singapore	64 (1.6)	78 (1.4)	
United States	66 (2.4)	83 (1.1)	
<b>Countries Not Satisfying Guidelines for Sample Participation Rates (See Appendix A for Details):</b>			
Australia	64 (2.0)	77 (1.5)	
Austria	33 (2.3)	51 (2.6)	
<sup>1</sup> Latvia (LSS)	33 (2.5)	52 (2.3)	
Netherlands	52 (2.1)	62 (2.1)	
<b>Countries Not Meeting Age/Grade Specifications (High Percentage of Older Students; See Appendix A for Details):</b>			
Slovenia	43 (2.6)	59 (2.3)	
<b>Countries With Unapproved Sampling Procedures at Classroom Level (See Appendix A for Details):</b>			
Hungary	50 (1.9)	69 (1.9)	
<b>Unapproved Sampling Procedures at Classroom Level and Not Meeting Other Guidelines (See Appendix A for Details):</b>			
<sup>1</sup> Israel	- -	59 (2.6)	
Kuwait	- -	23 (1.4)	
Thailand	49 (3.1)	69 (2.3)	
<b>International Average Percent Correct</b>	48 (0.5)	62 (0.4)	<b>Note: Item also tested at seventh and eighth grades.</b>
	Seventh Grade	Eighth Grade	
	81 (0.4)	83 (0.4)	

\*Third and fourth grades in most countries; See Table 2 for information about the grades tested in each country.

<sup>1</sup>Met guidelines for sample participation rates only after replacement schools were included (see Appendix A for details).

<sup>1</sup>National Desired Population does not cover all of International Desired Population (see Table A.2). Because coverage falls below 65%, Latvia is annotated LSS for Latvian Speaking Schools only.

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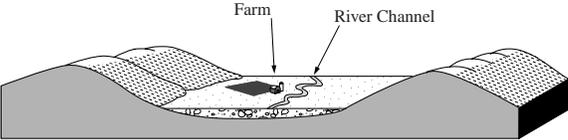
( ) Standard errors appear in parentheses. Because results are rounded to the nearest whole number, some totals may appear inconsistent.

A dash (-) indicates data are not available. Israel and Kuwait did not test at the lower grade.

SOURCE: IEA Third International Mathematics and Science Study (TIMSS), 1994-95.

**Table 3.2 Earth Science (Continued)**

**Percent Correct for Example Item 2B  
Lower and Upper Grades (Third and Fourth Grades\*)**

Country	Percent Correct		Example 2B  River on the plain: bad place for farming.
	Third Grade	Fourth Grade	
Canada	16 (1.8)	25 (1.7)	<p>The diagram shows a river flowing through a wide plain. The plain is covered with several layers of soil and sediment.</p>  <p>a. Write down one reason why this plain is a good place for farming.</p> <p>Because there is a river where the farmers could get fresh water.</p> <p>b. Write down one reason why this plain is NOT a good place for farming.</p> <p>The river could overflow during a rain storm.</p>
Cyprus	4 (0.9)	9 (1.1)	
Czech Republic	18 (1.8)	22 (1.5)	
<sup>†2</sup> England	32 (2.3)	40 (1.9)	
Greece	8 (1.3)	13 (1.6)	
Hong Kong	4 (0.6)	9 (0.9)	
Iceland	6 (1.2)	12 (1.7)	
Iran, Islamic Rep.	7 (1.4)	10 (1.5)	
Ireland	26 (2.4)	36 (2.1)	
Japan	8 (0.8)	12 (1.1)	
Korea	25 (2.1)	32 (2.3)	
New Zealand	23 (2.1)	32 (2.1)	
Norway	8 (1.3)	16 (1.8)	
Portugal	6 (1.2)	11 (1.2)	
<sup>†</sup> Scotland	17 (1.4)	27 (1.7)	
Singapore	10 (0.8)	19 (1.2)	
United States	21 (1.5)	28 (1.5)	
<b>Countries Not Satisfying Guidelines for Sample Participation Rates (See Appendix A for Details):</b>			
Australia	18 (2.4)	24 (1.4)	
Austria	17 (1.8)	20 (2.1)	
<sup>1</sup> Latvia (LSS)	14 (1.9)	20 (2.2)	
Netherlands	28 (2.1)	45 (2.4)	
<b>Countries Not Meeting Age/Grade Specifications (High Percentage of Older Students; See Appendix A for Details):</b>			
Slovenia	22 (1.9)	36 (2.0)	
<b>Countries With Unapproved Sampling Procedures at Classroom Level (See Appendix A for Details):</b>			
Hungary	23 (1.8)	35 (2.0)	
<b>Unapproved Sampling Procedures at Classroom Level and Not Meeting Other Guidelines (See Appendix A for Details):</b>			
<sup>1</sup> Israel	- -	26 (2.1)	
Kuwait	- -	7 (0.8)	
Thailand	21 (3.7)	25 (1.9)	
<b>International Average Percent Correct</b>	16 (0.4)	23 (0.3)	
	Seventh Grade	Eighth Grade	
	41 (0.4)	44 (0.4)	
<b>Note: Item also tested at seventh and eighth grades.</b>			

\*Third and fourth grades in most countries; See Table 2 for information about the grades tested in each country.

<sup>†</sup>Met guidelines for sample participation rates only after replacement schools were included (see Appendix A for details).

<sup>1</sup>National Desired Population does not cover all of International Desired Population (see Table A.2). Because coverage falls below 65%, Latvia is annotated LSS for Latvian Speaking Schools only.

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( ) Standard errors appear in parentheses. Because results are rounded to the nearest whole number, some totals may appear inconsistent. A dash (-) indicates data are not available. Israel and Kuwait did not test at the lower grade.

SOURCE: IEA Third International Mathematics and Science Study (TIMSS), 1994-95.

**Table 3.3 Earth Science****Percent Correct for Example Item 3  
Lower and Upper Grades (Third and Fourth Grades\*)**

Country	Percent Correct		Example 3 Snow on mountains.
	Third Grade	Fourth Grade	
Canada	37 (2.6)	54 (3.3)	<p>Sometimes mountains can still have snow on their tops when the snow on the lower parts of the mountains has melted. What makes this happen?</p> <p>Because the lower part is warmer.</p>
Cyprus	20 (2.2)	29 (2.1)	
Czech Republic	42 (2.4)	60 (2.5)	
<sup>12</sup> England	33 (2.9)	54 (2.3)	
Greece	18 (2.4)	28 (3.1)	
Hong Kong	27 (2.4)	46 (2.7)	
Iceland	28 (2.9)	50 (3.6)	
Iran, Islamic Rep.	20 (2.9)	42 (3.1)	
Ireland	32 (2.9)	41 (2.4)	
Japan	61 (2.5)	73 (1.9)	
Korea	54 (2.9)	70 (2.6)	
New Zealand	24 (2.4)	41 (3.3)	
Norway	44 (3.5)	64 (3.3)	
Portugal	22 (3.0)	33 (2.7)	
<sup>†</sup> Scotland	32 (2.4)	48 (3.2)	
Singapore	19 (1.8)	33 (2.3)	
United States	36 (2.5)	53 (2.4)	
<b>Countries Not Satisfying Guidelines for Sample Participation Rates (See Appendix A for Details):</b>			
Australia	28 (2.5)	37 (1.8)	
Austria	20 (3.5)	30 (3.1)	
<sup>1</sup> Latvia (LSS)	30 (3.4)	47 (3.0)	
Netherlands	32 (3.0)	52 (3.1)	
<b>Countries Not Meeting Age/Grade Specifications (High Percentage of Older Students; See Appendix A for Details):</b>			
Slovenia	28 (2.6)	47 (3.4)	
<b>Countries With Unapproved Sampling Procedures at Classroom Level (See Appendix A for Details):</b>			
Hungary	51 (2.7)	67 (2.5)	
<b>Unapproved Sampling Procedures at Classroom Level and Not Meeting Other Guidelines (See Appendix A for Details):</b>			
<sup>1</sup> Israel	- -	46 (3.7)	
Kuwait	- -	22 (1.8)	
Thailand	16 (3.8)	24 (3.1)	
<b>International Average Percent Correct</b>	31 (0.6)	46 (0.6)	

\*Third and fourth grades in most countries; See Table 2 for information about the grades tested in each country.

<sup>†</sup>Met guidelines for sample participation rates only after replacement schools were included (see Appendix A for details).

<sup>1</sup>National Desired Population does not cover all of International Desired Population (see Table A.2). Because coverage falls below 65%, Latvia is annotated LSS for Latvian Speaking Schools only.

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( ) Standard errors appear in parentheses. Because results are rounded to the nearest whole number, some totals may appear inconsistent. A dash (-) indicates data are not available. Israel and Kuwait did not test at the lower grade.

SOURCE: IEA Third International Mathematics and Science Study (TIMSS), 1994-95.

**Table 3.4 Earth Science****Percent Correct for Example Item 4  
Lower and Upper Grades (Third and Fourth Grades\*)**

Country	Percent Correct		Example 4 Temperature/precipitation table.																				
	Third Grade	Fourth Grade																					
Canada	30 (2.3)	47 (2.7)	<p>This table shows the temperature and precipitation (rain or snow) in four different towns on the same day.</p> <table border="1"> <thead> <tr> <th></th> <th>Town A</th> <th>Town B</th> <th>Town C</th> <th>Town D</th> </tr> </thead> <tbody> <tr> <td>Lowest Temperature</td> <td>13°C</td> <td>-9°C</td> <td>22°C</td> <td>-12°C</td> </tr> <tr> <td>Highest Temperature</td> <td>25°C</td> <td>-1°C</td> <td>30°C</td> <td>-4°C</td> </tr> <tr> <td>Precipitation (rain or snow)</td> <td>0 cm</td> <td>5 cm</td> <td>2.5 cm</td> <td>0 cm</td> </tr> </tbody> </table> <p>Where did it snow?</p> <p>A. Town A</p> <p><input checked="" type="radio"/> B. Town B</p> <p>C. Town C</p> <p>D. Town D</p>		Town A	Town B	Town C	Town D	Lowest Temperature	13°C	-9°C	22°C	-12°C	Highest Temperature	25°C	-1°C	30°C	-4°C	Precipitation (rain or snow)	0 cm	5 cm	2.5 cm	0 cm
	Town A	Town B		Town C	Town D																		
Lowest Temperature	13°C	-9°C		22°C	-12°C																		
Highest Temperature	25°C	-1°C		30°C	-4°C																		
Precipitation (rain or snow)	0 cm	5 cm		2.5 cm	0 cm																		
Cyprus	25 (2.5)	32 (2.7)																					
Czech Republic	44 (2.9)	60 (2.8)																					
<sup>12</sup> England	27 (2.2)	32 (2.6)																					
Greece	17 (2.0)	30 (2.8)																					
Hong Kong	49 (2.6)	63 (2.6)																					
Iceland	25 (3.2)	36 (3.7)																					
Iran, Islamic Rep.	21 (2.8)	31 (2.6)																					
Ireland	24 (2.2)	38 (2.5)																					
Japan	49 (2.8)	69 (2.0)																					
Korea	46 (2.7)	56 (2.3)																					
New Zealand	24 (2.3)	39 (3.2)																					
Norway	32 (3.1)	44 (3.3)																					
Portugal	21 (2.4)	26 (2.4)																					
<sup>†</sup> Scotland	24 (2.6)	31 (2.8)																					
Singapore	31 (1.8)	41 (2.0)																					
United States	37 (2.8)	54 (2.3)																					
<b>Countries Not Satisfying Guidelines for Sample Participation Rates (See Appendix A for Details):</b>																							
Australia	36 (1.8)	46 (2.3)																					
Austria	44 (2.9)	52 (3.6)																					
<sup>1</sup> Latvia (LSS)	32 (3.7)	48 (3.5)																					
Netherlands	32 (2.9)	60 (2.9)																					
<b>Countries Not Meeting Age/Grade Specifications (High Percentage of Older Students; See Appendix A for Details):</b>																							
Slovenia	35 (3.5)	55 (2.9)																					
<b>Countries With Unapproved Sampling Procedures at Classroom Level (See Appendix A for Details):</b>																							
Hungary	31 (2.4)	49 (2.7)																					
<b>Unapproved Sampling Procedures at Classroom Level and Not Meeting Other Guidelines (See Appendix A for Details):</b>																							
<sup>1</sup> Israel	- -	44 (2.8)																					
Kuwait	- -	27 (1.9)																					
Thailand	24 (3.8)	27 (3.0)																					
<b>International Average Percent Correct</b>	32 (0.6)	44 (0.5)																					

\*Third and fourth grades in most countries; See Table 2 for information about the grades tested in each country.

<sup>†</sup>Met guidelines for sample participation rates only after replacement schools were included (see Appendix A for details).

<sup>1</sup>National Desired Population does not cover all of International Desired Population (see Table A.2). Because coverage falls below 65%, Latvia is annotated LSS for Latvian Speaking Schools only.

<sup>2</sup>National Defined Population covers less than 90 percent of National Desired Population (see Table A.2).

( ) Standard errors appear in parentheses. Because results are rounded to the nearest whole number, some totals may appear inconsistent. A dash (-) indicates data are not available. Israel and Kuwait did not test at the lower grade.

SOURCE: IEA Third International Mathematics and Science Study (TIMSS), 1994-95.

**Table 3.5 Earth Science****Percent Correct for Example Item 5  
Lower and Upper Grades (Third and Fourth Grades\*)**

Country	Percent Correct		Example 5 Size of sun and moon.
	Third Grade	Fourth Grade	
Canada	29 (1.9)	36 (1.7)	<p>The Sun is bigger than the Moon, but they appear to be about the same size when you look at them from the Earth. Why is this?</p> <p><i>SUN</i></p> <p><i>Because the sun is farther away than the moon is.</i></p> <p><i>moon</i></p> <p><i>US</i></p>
Cyprus	6 (1.0)	9 (1.4)	
Czech Republic	20 (1.7)	38 (2.1)	
<sup>12</sup> England	26 (1.7)	35 (2.1)	
Greece	9 (1.5)	12 (1.5)	
Hong Kong	21 (1.7)	30 (2.0)	
Iceland	21 (2.3)	38 (2.4)	
Iran, Islamic Rep.	9 (2.1)	12 (1.5)	
Ireland	25 (2.1)	33 (1.9)	
Japan	30 (1.6)	43 (1.6)	
Korea	33 (1.8)	46 (2.0)	
New Zealand	25 (2.3)	34 (2.1)	
Norway	24 (2.5)	43 (2.3)	
Portugal	10 (1.4)	15 (1.7)	
<sup>†</sup> Scotland	21 (1.7)	36 (2.2)	
Singapore	20 (1.6)	27 (1.7)	
United States	21 (1.9)	33 (1.5)	
<b>Countries Not Satisfying Guidelines for Sample Participation Rates (See Appendix A for Details):</b>			
Australia	30 (1.7)	44 (1.7)	
Austria	29 (3.1)	40 (2.3)	
<sup>1</sup> Latvia (LSS)	22 (2.1)	30 (2.4)	
Netherlands	24 (2.0)	38 (2.1)	
<b>Countries Not Meeting Age/Grade Specifications (High Percentage of Older Students; See Appendix A for Details):</b>			
Slovenia	22 (2.3)	29 (2.2)	
<b>Countries With Unapproved Sampling Procedures at Classroom Level (See Appendix A for Details):</b>			
Hungary	16 (1.5)	33 (1.9)	
<b>Unapproved Sampling Procedures at Classroom Level and Not Meeting Other Guidelines (See Appendix A for Details):</b>			
<sup>1</sup> Israel	- -	25 (2.2)	
Kuwait	- -	16 (1.4)	
Thailand	13 (2.2)	18 (2.1)	
<b>International Average Percent Correct</b>	21 (0.4)	30 (0.4)	<b>Note: Item also tested at seventh and eighth grades.</b>
	Seventh Grade	Eighth Grade	
	53 (0.6)	59 (0.6)	

\*Third and fourth grades in most countries; See Table 2 for information about the grades tested in each country.

<sup>1</sup>Met guidelines for sample participation rates only after replacement schools were included (see Appendix A for details).

<sup>1</sup>National Desired Population does not cover all of International Desired Population (see Table A.2). Because coverage falls below 65%, Latvia is annotated LSS for Latvian Speaking Schools only.

<sup>2</sup>National Defined Population covers less than 90 percent of National Desired Population (see Table A.2).

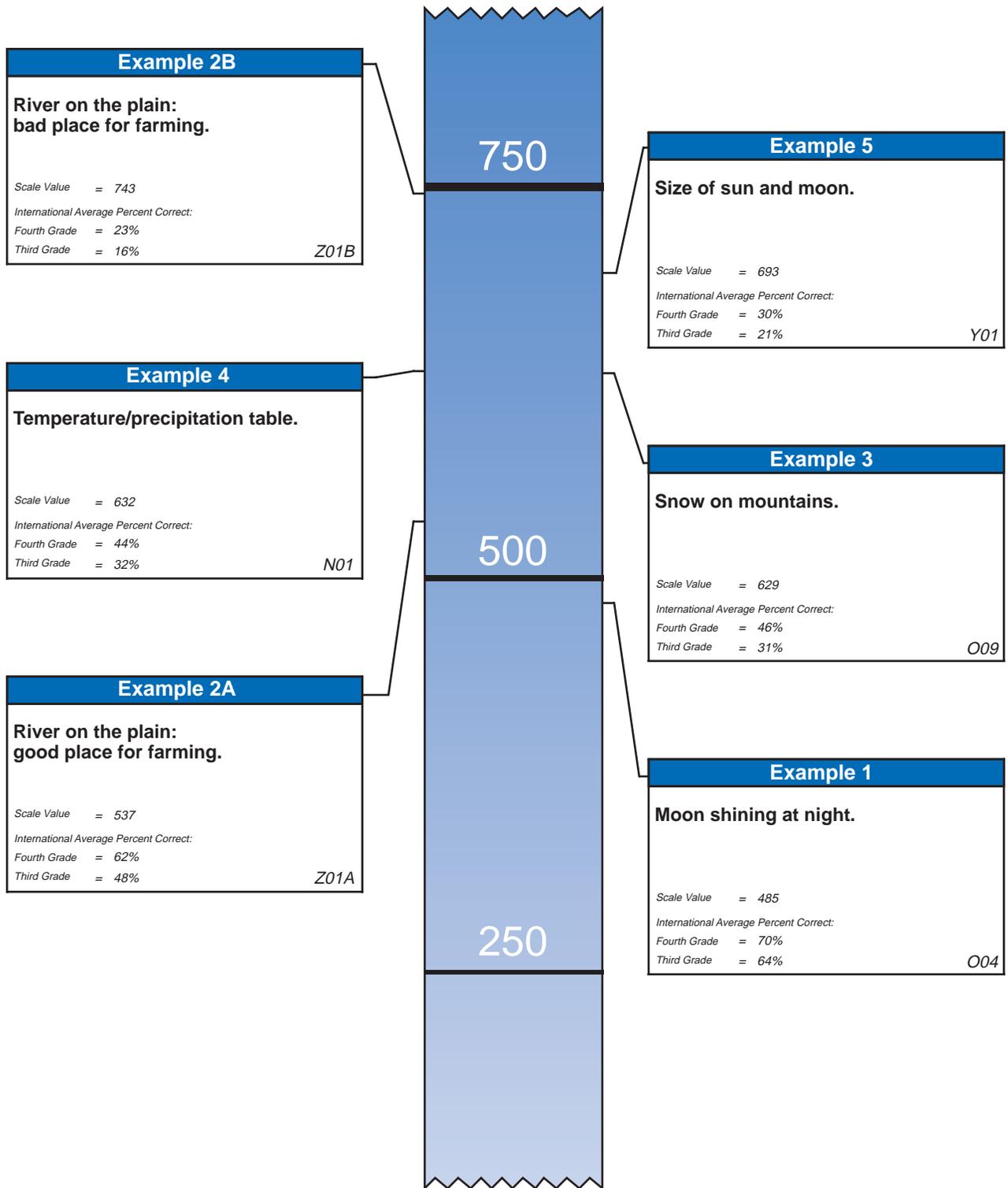
( ) Standard errors appear in parentheses. Because results are rounded to the nearest whole number, some totals may appear inconsistent.

A dash (-) indicates data are not available. Israel and Kuwait did not test at the lower grade.

SOURCE: IEA Third International Mathematics and Science Study (TIMSS), 1994-95.

**Figure 3.1**

**International Difficulty Map for Earth Science Example Items  
Lower and Upper Grades (Third and Fourth Grades\*)**



\*Third and fourth grades in most countries; see Table 2 for information about the grades tested in each country.

NOTE: Each item was placed onto the TIMSS international science scale based on students' performance in both grades. Items are shown at the point on the scale where students with that level of proficiency had a 65 percent probability of providing a correct response.

## WHAT HAVE STUDENTS LEARNED ABOUT LIFE SCIENCE?

The life science content area contains the largest portion of items on the science test. Items in this category cover a broad range of content areas including human biology and topics related to the structure, diversity, classification, processes, cycles, and interactions of plant and animal life. To answer these items, students were required to demonstrate and apply their knowledge of both simple and complex information. The percentages of correct responses for six example items (Example Items 6-11) illustrating the life science content area are shown in Tables 3.6 through 3.11.

The vast majority of students in both third and fourth grades demonstrated knowledge of the life cycle of insects by correctly identifying the butterfly as the adult stage of the caterpillar in Example Item 6, with international average percents correct of 82% and 85% for the third and fourth grades, respectively (Table 3.6). In the majority of countries, nearly 90% or more of students at both grade levels responded correctly. In only seven countries did less than three-quarters respond correctly (Cyprus, Greece, Iceland, Iran, Kuwait, Latvia, and Portugal), with percents correct ranging from 45% in Kuwait to 71% in Iceland at the fourth grade.

As seen in Table 3.7, knowledge of the importance of skin protection against the harmful rays of the sun (Example Item 7) also was demonstrated by the majority of students internationally (65% and 76%). A much broader range of performance across countries was found for this item, with the percentage of correct responses ranging from 28% in Iran to 93% in Australia at the fourth grade. Students in most countries, particularly at the third grade, found this item to be more difficult than Example Item 6, with most countries having percentages of correct responses in the range of 80% to 90% at the fourth grade and 65% to 80% at the third grade. Only Ireland and Australia had 90% correct responses or more at the fourth grade. In contrast to the majority of countries, Cyprus, Greece, and Portugal performed somewhat higher on this item than on Example Item 6.

Somewhat fewer students internationally demonstrated knowledge of basic nutrition as measured by Example Item 8 (Table 3.8), with 58% and 65% of students responding correctly at the third and fourth grades. Across countries, the percentages of correct responses at the fourth grade ranged from less than 50% in Cyprus (44%), Greece (46%), Iran (39%), Kuwait (45%), and Thailand (45%) to 80% or more in Austria (92%), the Czech Republic (83%), Hungary (82%), the Netherlands (93%), and Slovenia (80%). In most countries, there was not a large difference in performance between third- and fourth-grade students. The largest across-grade difference was found in Hungary, where the percentage of correct responses increased from 66% in third grade to 82% in fourth grade. Internationally, this item was answered correctly by about three-quarters of seventh- and eighth-grade students.

In Example Item 9 (Table 3.9), students were asked to apply their knowledge of animal behavior and describe two ways in which animals protect themselves. Correct responses included references to defensive or offensive actions, the use of specific animal features such as poison, scent, or appearance, and the like. The majority of fourth-grade students and nearly half of third-grade students internationally were able

to provide one correct reason (46% and 60% correct at the third and fourth grades). Providing a second way proved to be much more difficult for both third- and fourth-grade students, with less than half of the students giving two correct ways (29% and 42%). In the majority of countries, about 60% to 80% of fourth-grade students provided at least one correct reason – with more than 80% in the Netherlands (83%) and Japan (92%). At least 50% of fourth-grade students in Canada, Ireland, Israel, New Zealand, Norway, and Singapore and more than 60% in Australia, the Netherlands, and the United States provided a second correct answer. In general, there was a considerable across-grade difference for this item. In particular, in Greece, Hong Kong, Norway, and Latvia the percentage providing at least one correct reason increased from 40% or less in third grade to at least 60% in fourth grade.

Students in both grades found Example Item 10 (Table 3.10), requiring knowledge of the parts of a plant, to be more difficult. Less than half of the students in the third and fourth grades internationally answered correctly (39% and 46%), with about half of the countries having less than 40% correct at the fourth grade. In many countries, including Australia, Canada, England, Iceland, Iran, Ireland, Kuwait, New Zealand, Norway, Portugal, Scotland, and the United States, nearly half or more of fourth-grade students incorrectly answered that seeds develop from the root of the plant (answer C). In most countries, fourth-grade students did not perform substantially higher than third-grade students, although in Hong Kong, Hungary, and Singapore, the percentage of correct responses increased from less than half in the third grade to more than 60% in the fourth grade. The between-grade increase was most dramatic for Singapore, with 64% correct at the fourth grade compared to 26% at the third grade. In contrast, relatively high performances were found at both grade levels for the Czech Republic, with 65% and 79% at the third and fourth grades, respectively.

One of the more difficult life science items was Example Item 11 (Table 3.11), an open-ended item that required students to demonstrate their understanding of the function of the heart. Internationally, 28% of third-grade students and 40% of fourth-grade students provided a correct response that mentioned the pumping or supplying of blood to other parts of the body. The across-country performance at the fourth grade ranged from less than 20% in Cyprus (18%), Hong Kong (14%), Kuwait (12%), and Thailand (13%) to more than 60% in Australia (69%), England (61%), and the United States (64%), with slightly less than half the countries at or above the 50% correct level. In only two countries were more than half of the third-grade students also able to provide a correct response – Australia (54%) and the United States (55%).

Figure 3.2 presents the international difficulty map for the life science example items. In comparison with the earth science items, the item difficulties for the majority of life science items ranged from about 330 to 640, indicating that, internationally, students were likely to answer a larger portion of the life science items correctly.



**Table 3.6** Life Science**Percent Correct for Example Item 6  
Lower and Upper Grades (Third and Fourth Grades\*)**

Country	Percent Correct		Example 6 Adult stage of caterpillar.
	Third Grade	Fourth Grade	
Canada	96 (1.0)	98 (0.5)	<p>When this caterpillar  becomes an adult, what will it look like?</p> <p>A  B </p> <p>C  D </p> <p>E </p>
Cyprus	54 (2.9)	64 (2.9)	
Czech Republic	90 (1.5)	96 (1.0)	
<sup>12</sup> England	92 (1.3)	96 (1.0)	
Greece	52 (3.4)	67 (2.9)	
Hong Kong	92 (1.4)	97 (0.7)	
Iceland	65 (3.9)	71 (3.1)	
Iran, Islamic Rep.	60 (3.6)	69 (2.7)	
Ireland	89 (1.7)	94 (1.3)	
Japan	93 (1.2)	95 (0.9)	
Korea	93 (1.3)	90 (1.8)	
New Zealand	89 (2.1)	95 (1.8)	
Norway	91 (1.6)	97 (0.9)	
Portugal	54 (2.8)	59 (3.0)	
<sup>†</sup> Scotland	93 (1.4)	94 (1.3)	
Singapore	92 (1.2)	94 (0.9)	
United States	96 (1.0)	97 (0.6)	
<b>Countries Not Satisfying Guidelines for Sample Participation Rates (See Appendix A for Details):</b>			
Australia	94 (1.5)	96 (0.7)	
Austria	91 (1.9)	94 (1.6)	
<sup>1</sup> Latvia (LSS)	59 (3.5)	63 (3.3)	
Netherlands	95 (1.3)	97 (1.1)	
<b>Countries Not Meeting Age/Grade Specifications (High Percentage of Older Students; See Appendix A for Details):</b>			
Slovenia	83 (2.5)	87 (1.9)	
<b>Countries With Unapproved Sampling Procedures at Classroom Level (See Appendix A for Details):</b>			
Hungary	79 (2.6)	85 (2.2)	
<b>Unapproved Sampling Procedures at Classroom Level and Not Meeting Other Guidelines (See Appendix A for Details):</b>			
<sup>1</sup> Israel	- -	81 (2.6)	
Kuwait	- -	45 (2.5)	
Thailand	68 (3.0)	76 (3.0)	
<b>International Average Percent Correct</b>	82 (0.5)	85 (0.4)	

\*Third and fourth grades in most countries; See Table 2 for information about the grades tested in each country.

<sup>†</sup>Met guidelines for sample participation rates only after replacement schools were included (see Appendix A for details).

<sup>1</sup>National Desired Population does not cover all of International Desired Population (see Table A.2). Because coverage falls below 65%, Latvia is annotated LSS for Latvian Speaking Schools only.

<sup>2</sup>National Defined Population covers less than 90 percent of National Desired Population (see Table A.2).

( ) Standard errors appear in parentheses. Because results are rounded to the nearest whole number, some totals may appear inconsistent. A dash (-) indicates data are not available. Israel and Kuwait did not test at the lower grade.

SOURCE: IEA Third International Mathematics and Science Study (TIMSS), 1994-95.

**Table 3.7** Life Science**Percent Correct for Example Item 7  
Lower and Upper Grades (Third and Fourth Grades\*)**

Country	Percent Correct		Example 7 Why use sunscreen.
	Third Grade	Fourth Grade	
Canada	73 (1.8)	85 (2.2)	<p>What is the MOST important reason for people to use a sunscreen when they are outside in sunlight?</p> <p><input checked="" type="radio"/> A. It protects the skin against dangerous rays from the sun.</p> <p><input type="radio"/> B. It makes the skin more tanned.</p> <p><input type="radio"/> C. It makes the skin smooth.</p> <p><input type="radio"/> D. It makes the skin feel cooler.</p>
Cyprus	65 (3.0)	76 (2.2)	
Czech Republic	79 (1.9)	89 (1.6)	
<sup>12</sup> England	75 (2.4)	87 (2.0)	
Greece	63 (2.8)	68 (2.9)	
Hong Kong	76 (2.2)	85 (1.8)	
Iceland	55 (3.3)	74 (2.6)	
Iran, Islamic Rep.	25 (2.6)	28 (2.4)	
Ireland	72 (2.4)	90 (1.7)	
Japan	56 (2.5)	61 (2.3)	
Korea	81 (2.1)	83 (1.8)	
New Zealand	69 (3.1)	81 (2.7)	
Norway	62 (3.3)	85 (2.3)	
Portugal	53 (3.1)	77 (2.7)	
<sup>†</sup> Scotland	64 (2.8)	80 (2.6)	
Singapore	58 (2.2)	74 (1.8)	
United States	75 (2.3)	83 (1.8)	
<b>Countries Not Satisfying Guidelines for Sample Participation Rates (See Appendix A for Details):</b>			
Australia	83 (2.0)	93 (1.0)	
Austria	74 (2.7)	83 (2.9)	
<sup>1</sup> Latvia (LSS)	44 (3.5)	51 (3.6)	
Netherlands	77 (2.5)	83 (2.6)	
<b>Countries Not Meeting Age/Grade Specifications (High Percentage of Older Students; See Appendix A for Details):</b>			
Slovenia	72 (2.9)	85 (2.6)	
<b>Countries With Unapproved Sampling Procedures at Classroom Level (See Appendix A for Details):</b>			
Hungary	60 (2.8)	69 (2.8)	
<b>Unapproved Sampling Procedures at Classroom Level and Not Meeting Other Guidelines (See Appendix A for Details):</b>			
<sup>1</sup> Israel	- -	83 (2.6)	
Kuwait	- -	53 (2.6)	
Thailand	55 (3.9)	63 (3.1)	
<b>International Average Percent Correct</b>	65 (0.6)	76 (0.5)	

\*Third and fourth grades in most countries; See Table 2 for information about the grades tested in each country.

<sup>†</sup>Met guidelines for sample participation rates only after replacement schools were included (see Appendix A for details).

<sup>1</sup>National Desired Population does not cover all of International Desired Population (see Table A.2). Because coverage falls below 65%, Latvia is annotated LSS for Latvian Speaking Schools only.

<sup>2</sup>National Defined Population covers less than 90 percent of National Desired Population (see Table A.2).

( ) Standard errors appear in parentheses. Because results are rounded to the nearest whole number, some totals may appear inconsistent.

A dash (-) indicates data are not available. Israel and Kuwait did not test at the lower grade.

SOURCE: IEA Third International Mathematics and Science Study (TIMSS), 1994-95.

**Table 3.8** Life Science**Percent Correct for Example Item 8  
Lower and Upper Grades (Third and Fourth Grades\*)**

Country	Percent Correct		Example 8 Why eat fruits and vegetables.
	Third Grade	Fourth Grade	
Canada	49 (2.3)	58 (3.4)	<p>What is the BEST reason for including fruits and leafy vegetables in a healthy diet?</p> <p>A. They have a high water content.</p> <p>B. They are the best source of protein.</p> <p><input checked="" type="radio"/> C. They are rich in minerals and vitamins.</p> <p>D. They are the best source of carbohydrates.</p>
Cyprus	36 (3.0)	44 (2.6)	
Czech Republic	75 (2.1)	83 (2.1)	
<sup>12</sup> England	59 (2.7)	58 (2.7)	
Greece	41 (2.7)	46 (3.0)	
Hong Kong	75 (2.1)	74 (2.6)	
Iceland	56 (4.2)	65 (3.5)	
Iran, Islamic Rep.	40 (2.8)	39 (2.4)	
Ireland	55 (2.7)	62 (2.5)	
Japan	53 (2.1)	64 (1.7)	
Korea	68 (2.9)	79 (2.1)	
New Zealand	48 (3.2)	55 (3.2)	
Norway	59 (3.3)	77 (2.7)	
Portugal	51 (2.5)	57 (2.9)	
<sup>†</sup> Scotland	61 (2.6)	59 (2.4)	
Singapore	62 (2.0)	72 (1.9)	
United States	50 (3.3)	62 (1.9)	
<b>Countries Not Satisfying Guidelines for Sample Participation Rates (See Appendix A for Details):</b>			
Australia	47 (3.1)	57 (2.6)	
Austria	79 (2.7)	92 (1.3)	
<sup>1</sup> Latvia (LSS)	63 (3.0)	73 (3.2)	
Netherlands	91 (1.7)	93 (1.7)	
<b>Countries Not Meeting Age/Grade Specifications (High Percentage of Older Students; See Appendix A for Details):</b>			
Slovenia	72 (3.2)	80 (2.5)	
<b>Countries With Unapproved Sampling Procedures at Classroom Level (See Appendix A for Details):</b>			
Hungary	66 (2.9)	82 (2.3)	
<b>Unapproved Sampling Procedures at Classroom Level and Not Meeting Other Guidelines (See Appendix A for Details):</b>			
<sup>1</sup> Israel	- -	72 (3.5)	
Kuwait	- -	45 (1.9)	
Thailand	40 (3.0)	45 (3.7)	
International Average Percent Correct	58 (0.6)	65 (0.5)	<b>Note: Item also tested at seventh and eighth grades.</b>
	Seventh Grade	Eighth Grade	
	72 (0.5)	75 (0.5)	

\*Third and fourth grades in most countries; See Table 2 for information about the grades tested in each country.

<sup>1</sup>Met guidelines for sample participation rates only after replacement schools were included (see Appendix A for details).

<sup>1</sup>National Desired Population does not cover all of International Desired Population (see Table A.2). Because coverage falls below 65%, Latvia is annotated LSS for Latvian Speaking Schools only.

<sup>2</sup>National Defined Population covers less than 90 percent of National Desired Population (see Table A.2).

( ) Standard errors appear in parentheses. Because results are rounded to the nearest whole number, some totals may appear inconsistent. A dash (-) indicates data are not available. Israel and Kuwait did not test at the lower grade.

SOURCE: IEA Third International Mathematics and Science Study (TIMSS), 1994-95.

**Table 3.9** Life Science**Percent Correct for Example Item 9 - One Way  
Lower and Upper Grades (Third and Fourth Grades\*)**

Country	Percent Correct		Example 9 Ways animals protect themselves.
	Third Grade	Fourth Grade	
Canada	60 (1.6)	72 (2.1)	<p>One way for animals to protect themselves is by escaping (running, flying, or swimming away). What are two other ways they protect themselves?</p> <p><i>Two other ways are: fighting back, or staying as still as can be.</i></p>
Cyprus	22 (2.0)	38 (2.4)	
Czech Republic	46 (1.9)	62 (2.2)	
<sup>12</sup> England	53 (1.9)	67 (1.9)	
Greece	38 (2.7)	61 (2.4)	
Hong Kong	35 (1.9)	61 (2.2)	
Iceland	33 (2.3)	48 (2.7)	
Iran, Islamic Rep.	22 (2.3)	35 (2.3)	
Ireland	54 (2.2)	67 (1.7)	
Japan	87 (1.0)	92 (1.0)	
Korea	67 (2.0)	80 (1.7)	
New Zealand	52 (2.4)	64 (2.3)	
Norway	38 (2.3)	65 (2.3)	
Portugal	30 (2.3)	47 (2.4)	
<sup>†</sup> Scotland	51 (2.0)	64 (2.2)	
Singapore	50 (1.7)	69 (1.6)	
United States	61 (2.3)	77 (1.3)	
<b>Countries Not Satisfying Guidelines for Sample Participation Rates (See Appendix A for Details):</b>			
Australia	60 (2.4)	75 (1.5)	
Austria	52 (2.4)	61 (2.4)	
<sup>1</sup> Latvia (LSS)	40 (2.3)	60 (2.6)	
Netherlands	63 (2.0)	83 (1.6)	
<b>Countries Not Meeting Age/Grade Specifications (High Percentage of Older Students; See Appendix A for Details):</b>			
Slovenia	47 (2.2)	67 (2.0)	
<b>Countries With Unapproved Sampling Procedures at Classroom Level (See Appendix A for Details):</b>			
Hungary	39 (2.2)	43 (1.8)	
<b>Unapproved Sampling Procedures at Classroom Level and Not Meeting Other Guidelines (See Appendix A for Details):</b>			
<sup>1</sup> Israel	- -	66 (2.7)	
Kuwait	- -	28 (1.7)	
Thailand	11 (1.9)	20 (1.7)	
<b>International Average Percent Correct</b>	46 (0.4)	60 (0.4)	

\*Third and fourth grades in most countries; See Table 2 for information about the grades tested in each country.

<sup>1</sup>Met guidelines for sample participation rates only after replacement schools were included (see Appendix A for details).

<sup>1</sup>National Desired Population does not cover all of International Desired Population (see Table A.2). Because coverage falls below 65%, Latvia is annotated LSS for Latvian Speaking Schools only.

<sup>2</sup>National Defined Population covers less than 90 percent of National Desired Population (see Table A.2).

( ) Standard errors appear in parentheses. Because results are rounded to the nearest whole number, some totals may appear inconsistent. A dash (-) indicates data are not available. Israel and Kuwait did not test at the lower grade.

SOURCE: IEA Third International Mathematics and Science Study (TIMSS), 1994-95.

**Table 3.9** Life Science (Continued)**Percent Correct for Example Item 9 - Two Ways Lower and Upper Grades (Third and Fourth Grades\*)**

Country	Percent Correct		Example 9 Ways animals protect themselves.
	Third Grade	Fourth Grade	
Canada	44 (2.3)	56 (1.7)	<p>One way for animals to protect themselves is by escaping (running, flying, or swimming away). What are two other ways they protect themselves?</p> <p><i>Two other ways are: fighting back, or staying as still as can be.</i></p>
Cyprus	11 (1.6)	23 (1.9)	
Czech Republic	29 (1.8)	44 (2.0)	
<sup>†2</sup> England	38 (2.1)	46 (2.1)	
Greece	21 (1.8)	35 (2.8)	
Hong Kong	26 (1.8)	47 (2.3)	
Iceland	17 (1.9)	36 (2.6)	
Iran, Islamic Rep.	17 (1.9)	25 (2.2)	
Ireland	36 (2.2)	53 (2.0)	
Japan	23 (1.3)	31 (1.4)	
Korea	41 (2.4)	49 (2.3)	
New Zealand	34 (2.4)	51 (2.5)	
Norway	27 (2.1)	50 (2.6)	
Portugal	6 (0.9)	14 (1.6)	
<sup>†</sup> Scotland	33 (1.7)	47 (2.1)	
Singapore	35 (1.6)	52 (2.0)	
United States	48 (2.6)	64 (1.6)	
<b>Countries Not Satisfying Guidelines for Sample Participation Rates (See Appendix A for Details):</b>			
Australia	47 (2.3)	63 (1.7)	
Austria	30 (2.5)	41 (2.4)	
<sup>1</sup> Latvia (LSS)	25 (1.9)	35 (2.5)	
Netherlands	48 (2.1)	61 (2.0)	
<b>Countries Not Meeting Age/Grade Specifications (High Percentage of Older Students; See Appendix A for Details):</b>			
Slovenia	27 (2.4)	41 (2.4)	
<b>Countries With Unapproved Sampling Procedures at Classroom Level (See Appendix A for Details):</b>			
Hungary	34 (2.2)	37 (1.9)	
<b>Unapproved Sampling Procedures at Classroom Level and Not Meeting Other Guidelines (See Appendix A for Details):</b>			
<sup>1</sup> Israel	- -	52 (3.0)	
Kuwait	- -	15 (1.2)	
Thailand	7 (1.8)	11 (1.5)	
<b>International Average Percent Correct</b>	29 (0.4)	42 (0.4)	

\*Third and fourth grades in most countries; See Table 2 for information about the grades tested in each country.

<sup>†</sup>Met guidelines for sample participation rates only after replacement schools were included (see Appendix A for details).

<sup>1</sup>National Desired Population does not cover all of International Desired Population (see Table A.2). Because coverage falls below 65%, Latvia is annotated LSS for Latvian Speaking Schools only.

<sup>2</sup>National Defined Population covers less than 90 percent of National Desired Population (see Table A.2).

( ) Standard errors appear in parentheses. Because results are rounded to the nearest whole number, some totals may appear inconsistent.

A dash (-) indicates data are not available. Israel and Kuwait did not test at the lower grade.

SOURCE: IEA Third International Mathematics and Science Study (TIMSS), 1994-95.

**Table 3.10** Life Science**Percent Correct for Example Item 10  
Lower and Upper Grades (Third and Fourth Grades\*)**

Country	Percent Correct		Example 10 Seeds in plants.
	Third Grade	Fourth Grade	
Canada	24 (2.0)	33 (2.7)	Seeds develop from which part of a plant?  <input checked="" type="radio"/> A. Flower <input type="radio"/> B. Leaf <input type="radio"/> C. Root <input type="radio"/> D. Stem
Cyprus	42 (3.4)	44 (2.5)	
Czech Republic	65 (2.5)	79 (2.0)	
<sup>†2</sup> England	29 (2.6)	35 (2.7)	
Greece	28 (3.0)	37 (3.1)	
Hong Kong	47 (2.4)	62 (2.7)	
Iceland	28 (4.7)	29 (3.9)	
Iran, Islamic Rep.	28 (2.6)	23 (2.7)	
Ireland	18 (2.4)	22 (2.2)	
Japan	60 (2.3)	68 (2.1)	
Korea	51 (3.0)	55 (2.7)	
New Zealand	31 (3.2)	33 (3.0)	
Norway	28 (3.2)	33 (3.2)	
Portugal	20 (3.0)	20 (2.3)	
<sup>†</sup> Scotland	24 (2.3)	26 (2.5)	
Singapore	26 (1.9)	64 (1.7)	
United States	30 (2.0)	37 (1.9)	
<b>Countries Not Satisfying Guidelines for Sample Participation Rates (See Appendix A for Details):</b>			
Australia	33 (2.8)	38 (2.4)	
Austria	59 (3.5)	71 (2.6)	
<sup>1</sup> Latvia (LSS)	67 (2.8)	66 (2.8)	
Netherlands	40 (2.5)	46 (3.6)	
<b>Countries Not Meeting Age/Grade Specifications (High Percentage of Older Students; See Appendix A for Details):</b>			
Slovenia	55 (3.0)	68 (2.7)	
<b>Countries With Unapproved Sampling Procedures at Classroom Level (See Appendix A for Details):</b>			
Hungary	45 (2.6)	65 (2.5)	
<b>Unapproved Sampling Procedures at Classroom Level and Not Meeting Other Guidelines (See Appendix A for Details):</b>			
<sup>1</sup> Israel	- -	45 (3.6)	
Kuwait	- -	22 (1.8)	
Thailand	52 (3.7)	69 (3.3)	
<b>International Average Percent Correct</b>	39 (0.6)	46 (0.5)	

\*Third and fourth grades in most countries; See Table 2 for information about the grades tested in each country.

<sup>†</sup>Met guidelines for sample participation rates only after replacement schools were included (see Appendix A for details).

<sup>1</sup>National Desired Population does not cover all of International Desired Population (see Table A.2). Because coverage falls below 65%, Latvia is annotated LSS for Latvian Speaking Schools only.

<sup>2</sup>National Defined Population covers less than 90 percent of National Desired Population (see Table A.2).

( ) Standard errors appear in parentheses. Because results are rounded to the nearest whole number, some totals may appear inconsistent. A dash (-) indicates data are not available. Israel and Kuwait did not test at the lower grade.

SOURCE: IEA Third International Mathematics and Science Study (TIMSS), 1994-95.

**Table 3.11** Life Science**Percent Correct for Example Item 11  
Lower and Upper Grades (Third and Fourth Grades\*)**

Country	Percent Correct		Example 11 Function of the heart.
	Third Grade	Fourth Grade	
Canada	36 (1.7)	49 (1.8)	<p>Write down one thing your heart does that helps the other parts of your body.</p> <p><i>Your heart pumps blood to all parts of your body.</i></p>
Cyprus	8 (1.1)	18 (1.7)	
Czech Republic	31 (2.0)	35 (2.2)	
<sup>12</sup> England	45 (2.1)	61 (1.8)	
Greece	16 (1.6)	34 (2.4)	
Hong Kong	6 (0.9)	14 (1.4)	
Iceland	21 (2.9)	33 (2.8)	
Iran, Islamic Rep.	6 (1.2)	23 (2.0)	
Ireland	34 (2.0)	49 (2.2)	
Japan	21 (1.5)	39 (1.8)	
Korea	28 (1.9)	34 (2.1)	
New Zealand	41 (2.6)	53 (3.1)	
Norway	30 (2.2)	51 (2.6)	
Portugal	19 (2.0)	27 (1.7)	
<sup>†</sup> Scotland	37 (2.0)	53 (2.3)	
Singapore	22 (2.0)	59 (2.2)	
United States	55 (2.0)	64 (1.6)	
<b>Countries Not Satisfying Guidelines for Sample Participation Rates (See Appendix A for Details):</b>			
Australia	54 (2.3)	69 (2.1)	
Austria	26 (2.7)	57 (2.8)	
<sup>1</sup> Latvia (LSS)	24 (2.3)	33 (2.9)	
Netherlands	28 (1.8)	36 (2.1)	
<b>Countries Not Meeting Age/Grade Specifications (High Percentage of Older Students; See Appendix A for Details):</b>			
Slovenia	46 (2.1)	49 (2.3)	
<b>Countries With Unapproved Sampling Procedures at Classroom Level (See Appendix A for Details):</b>			
Hungary	20 (2.0)	30 (2.0)	
<b>Unapproved Sampling Procedures at Classroom Level and Not Meeting Other Guidelines (See Appendix A for Details):</b>			
<sup>1</sup> Israel	- -	37 (2.6)	
Kuwait	- -	12 (1.1)	
Thailand	8 (1.8)	13 (1.6)	
<b>International Average Percent Correct</b>	28 (0.4)	40 (0.4)	

\*Third and fourth grades in most countries; See Table 2 for information about the grades tested in each country.

<sup>†</sup>Met guidelines for sample participation rates only after replacement schools were included (see Appendix A for details).

<sup>1</sup>National Desired Population does not cover all of International Desired Population (see Table A.2). Because coverage falls below 65%, Latvia is annotated LSS for Latvian Speaking Schools only.

<sup>2</sup>National Defined Population covers less than 90 percent of National Desired Population (see Table A.2).

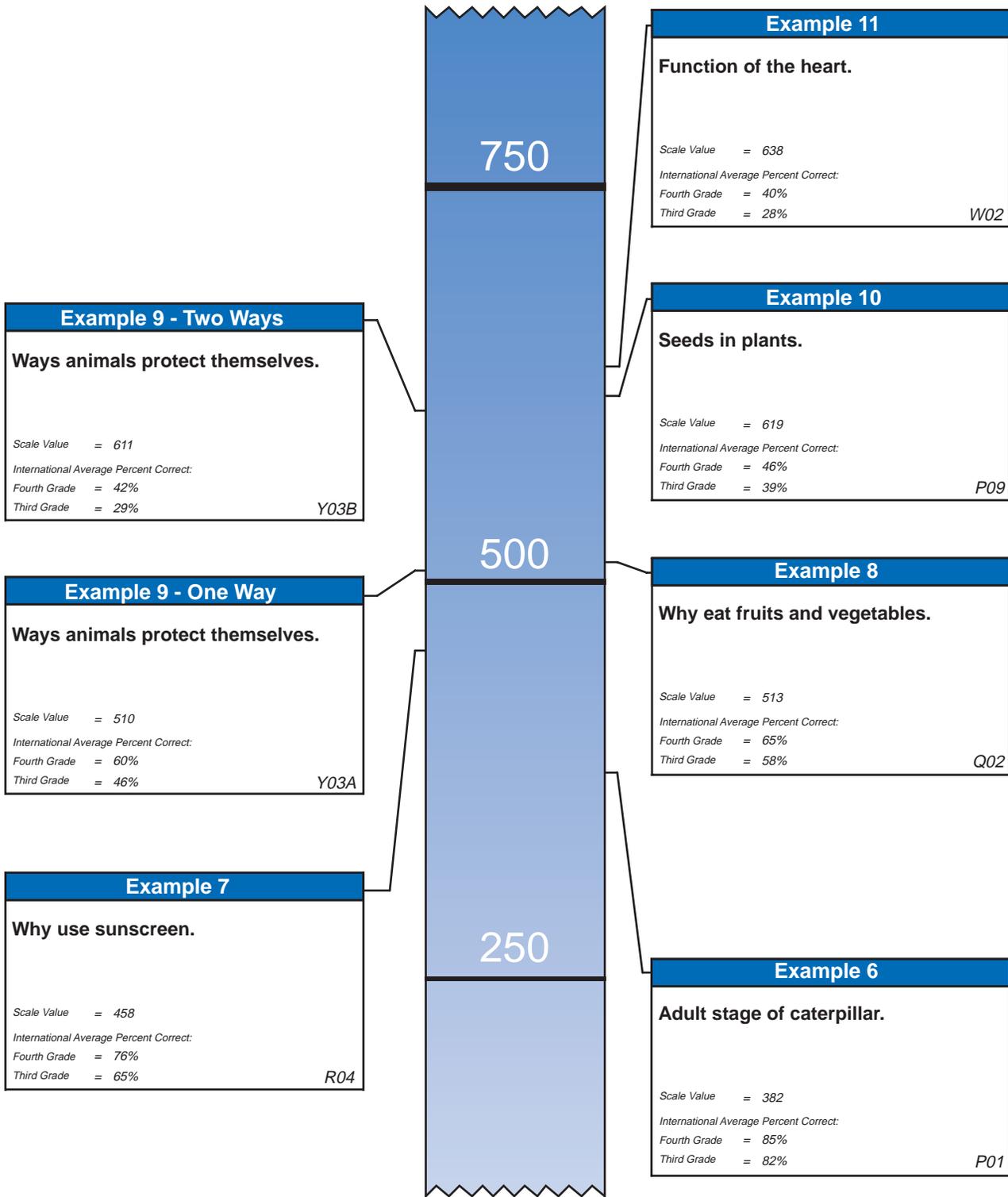
( ) Standard errors appear in parentheses. Because results are rounded to the nearest whole number, some totals may appear inconsistent.

A dash (-) indicates data are not available. Israel and Kuwait did not test at the lower grade.

SOURCE: IEA Third International Mathematics and Science Study (TIMSS), 1994-95.

**Figure 3.2**

**International Difficulty Map for Life Science Example Items  
Lower and Upper Grades (Third and Fourth Grades\*)**



\*Third and fourth grades in most countries; see Table 2 for information about the grades tested in each country.

NOTE: Each item was placed onto the TIMSS international science scale based on students' performance in both grades. Items are shown at the point on the scale where students with that level of proficiency had a 65 percent probability of providing a correct response.

## WHAT HAVE STUDENTS LEARNED ABOUT PHYSICAL SCIENCE?

Major topics covered by the physical science items include properties of matter; energy and physical processes; forces and motion; and physical or chemical changes. Students were asked to solve problems and demonstrate their knowledge of these physical science principles. Six example items (Example Items 12-17) are included to illustrate the range of item types and content areas as well as student performance in physical science. The percentages of correct responses results for these items are shown in Tables 3.12 through 3.17.

Example Item 12 (Table 3.12) required students to supply explanations that demonstrated knowledge of the need for oxygen in order for a flame to burn. Internationally, 64% of fourth-grade and 49% of third-grade students were able to provide a correct response that explained the loss of oxygen or air (using either scientific or non-scientific language) resulting from isolating the flame. Moderate to substantial between-grade increases were found in many countries, which is consistent with a higher level of content coverage at the fourth grade. The most pronounced of these was Singapore, where 78% of fourth-grade students provided a correct response, compared with only 39% of third-grade students. There were also substantial between-grade increases in Cyprus and Greece, where the percentages of correct responses increased from 20 - 25% at the third grade to at least 50% at the fourth grade. A notable exception to the lower performance of third-grade students was Korea, where about three-quarter of students in both grades (73% and 74%) responded correctly. The highest performances on this item at both grades were in the Czech Republic (80% and 85%) and Slovenia (78% and 94%). These higher performance levels are comparable to what was found for seventh- and eighth-grade students internationally when this item was tested at those levels.

In Example Item 13 (Table 3.13), students demonstrated their knowledge of the conversion of the energy in food to the physical energy required to push a bicycle. About half of the students internationally answered correctly (45% at third grade and 52% at fourth). In the majority of countries, performances ranged from 50% to 65% correct at the fourth grade, with the highest performances of 70% correct found in Iceland and the Netherlands. This item was particularly difficult for students in Cyprus and Thailand, where less than 30% of both third and fourth graders responded correctly. In comparison with Example Item 12, there was little increase in performance between the lower- and upper-grade students across countries, with the most noticeable increases found in Norway (40% compared to 61%).

Understanding of the relative speed of light was required in Example Item 14 (Table 3.14), which was rather difficult for students internationally. Less than half of the students in either grade were able to identify the correct response (31% and 41%). While there was some increase in performance between the third and fourth grades in most countries, in only six countries was the percentage of correct responses at the fourth-grade level at least 50% – Australia (59%), England (50%), Japan (58%),

Korea (64%), New Zealand (56%), and Slovenia (50%). Internationally, both an airplane and sound were selected by about one-quarter of students as traveling faster than light.

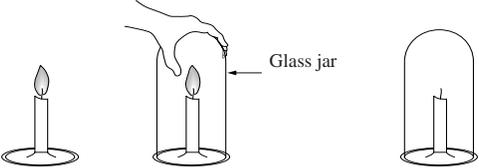
Students internationally also had considerable difficulty with Example Item 15 (Table 3.15), with 27% of third-grade and 37% of fourth-grade students receiving full credit. Full credit on this item required an explanation for why loose sugar crystals dissolve more quickly than cubes. Although about 70% or more of fourth-grade students in most countries identified loose sugar as the form that would dissolve more quickly, far fewer students were able to support their answer with an explanation based on the size of the crystals, the compactness of the cubes or other acceptable reasons. Performance across countries varied widely, ranging from less than 10% to more than 70% at the fourth grade. The highest performances on this item were in Japan, Korea, and the Netherlands, all of which had about 60% of third-grade and 70% or more of fourth-grade students receiving full credit.

Example Item 16 (Table 3.16) was similar in international difficulty to Example Item 15. This item, which required an understanding of the concept of increased buoyancy in salt water compared with fresh water, was answered correctly by 30% of third-grade and 34% of fourth-grade students. A common misconception was that the block would sink when placed in salt water (answer A). There was little variation in performance across countries on this item. The percentage of correct responses ranged from about 30% to 45% at the fourth grade in most countries, and only in Korea did more than half of the fourth-grade students answer correctly. There was also little increase in performance across grades in most countries, indicating that coverage of this topic was not included by the fourth-grade level.

Example 17 (Table 3.17), related to fluid behavior, was an extremely difficult item for the third- and fourth-grade students, with international percents correct of 15% and 21% respectively. Less than 30% of students in all countries indicated that, although the water can was tipped, the surface of the water would remain horizontal and at about the same vertical level. In about 40% of the student responses internationally the surface level of the water was incorrectly drawn at an angle corresponding to the tipping angle of the water can. This item was moderately difficult for seventh- and eighth-grade students internationally, about half of whom provided a correct response.

The international difficulty map showing the physical science example items appears in Figure 3.3. With item difficulties for most of the physical science items ranging from about 425 to 675, this content area was of comparable difficulty to earth science, and the majority of students internationally had considerable difficulty on the more complex physical science items.

**Table 3.12 Physical Science****Percent Correct for Example Item 12  
Lower and Upper Grades (Third and Fourth Grades\*)**

Country	Percent Correct		Example 12 Glass over candle.
	Third Grade	Fourth Grade	
Canada	52 (2.2)	61 (4.3)	<p>When a glass jar is placed over a lighted candle, the flame goes out.</p>  <p>Why does this happen?</p> <p>Because there is no air in so it goes right out.</p>
Cyprus	25 (2.7)	56 (3.3)	
Czech Republic	80 (1.7)	85 (1.9)	
<sup>†2</sup> England	52 (2.6)	66 (2.7)	
Greece	20 (2.2)	50 (3.1)	
Hong Kong	46 (2.4)	68 (2.9)	
Iceland	38 (3.3)	62 (3.8)	
Iran, Islamic Rep.	23 (2.5)	33 (3.3)	
Ireland	42 (3.0)	62 (3.1)	
Japan	38 (2.3)	48 (2.4)	
Korea	73 (2.9)	74 (2.5)	
New Zealand	55 (3.1)	66 (3.3)	
Norway	51 (3.9)	75 (3.1)	
Portugal	37 (3.3)	63 (3.2)	
<sup>†</sup> Scotland	45 (2.8)	66 (2.5)	
Singapore	39 (2.4)	78 (1.5)	
United States	52 (2.9)	62 (2.7)	
<b>Countries Not Satisfying Guidelines for Sample Participation Rates (See Appendix A for Details):</b>			
Australia	59 (3.4)	69 (2.5)	
Austria	58 (3.3)	83 (2.9)	
<sup>†</sup> Latvia (LSS)	51 (3.6)	62 (3.1)	
Netherlands	60 (3.3)	74 (2.6)	
<b>Countries Not Meeting Age/Grade Specifications (High Percentage of Older Students; See Appendix A for Details):</b>			
Slovenia	78 (2.6)	94 (1.5)	
<b>Countries With Unapproved Sampling Procedures at Classroom Level (See Appendix A for Details):</b>			
Hungary	64 (2.7)	77 (2.3)	
<b>Unapproved Sampling Procedures at Classroom Level and Not Meeting Other Guidelines (See Appendix A for Details):</b>			
<sup>†</sup> Israel	- -	60 (3.2)	
Kuwait	- -	39 (2.4)	
Thailand	25 (4.4)	37 (4.5)	
<b>International Average Percent Correct</b>	49 (0.6)	64 (0.6)	<b>Note: Item also tested at seventh and eighth grades.</b>
	Seventh Grade	Eighth Grade	
	88 (0.4)	91 (0.3)	

\*Third and fourth grades in most countries; See Table 2 for information about the grades tested in each country.

<sup>†</sup>Met guidelines for sample participation rates only after replacement schools were included (see Appendix A for details).

<sup>†</sup>National Desired Population does not cover all of International Desired Population (see Table A.2). Because coverage falls below 65%, Latvia is annotated LSS for Latvian Speaking Schools only.

<sup>2</sup>National Defined Population covers less than 90 percent of National Desired Population (see Table A.2).

( ) Standard errors appear in parentheses. Because results are rounded to the nearest whole number, some totals may appear inconsistent.

A dash (-) indicates data are not available. Israel and Kuwait did not test at the lower grade.

SOURCE: IEA Third International Mathematics and Science Study (TIMSS), 1994-95.

**Table 3.13 Physical Science****Percent Correct for Example Item 13  
Lower and Upper Grades (Third and Fourth Grades\*)**

Country	Percent Correct		Example 13 Girl's source of energy.
	Third Grade	Fourth Grade	
Canada	53 (2.7)	63 (2.5)	<p>Keisha is pushing her bicycle up a hill. Where does Keisha get the energy to push her bicycle?</p>  <p>A line drawing of a girl in a long-sleeved shirt and pants pushing a bicycle up a hill. The bicycle is tilted forward, and the girl is leaning back, pushing the frame. The hill is represented by a diagonal line sloping upwards from left to right.</p> <p> <input checked="" type="radio"/> A. From the food she has eaten  <input type="radio"/> B. From the exercise she did earlier  <input type="radio"/> C. From the ground she is walking on  <input type="radio"/> D. From the bicycle she is pushing </p>
Cyprus	29 (2.7)	29 (2.6)	
Czech Republic	52 (3.0)	54 (2.7)	
<sup>†2</sup> England	53 (3.0)	61 (2.5)	
Greece	31 (3.2)	31 (2.8)	
Hong Kong	52 (3.3)	54 (2.8)	
Iceland	60 (3.2)	70 (2.6)	
Iran, Islamic Rep.	27 (2.9)	47 (3.0)	
Ireland	45 (2.9)	52 (2.7)	
Japan	56 (2.6)	63 (2.4)	
Korea	62 (2.6)	65 (2.3)	
New Zealand	42 (3.1)	50 (3.1)	
Norway	40 (3.6)	61 (3.2)	
Portugal	46 (3.2)	44 (3.0)	
<sup>†</sup> Scotland	45 (3.1)	51 (2.8)	
Singapore	48 (2.1)	64 (2.1)	
United States	54 (2.5)	60 (2.0)	
<b>Countries Not Satisfying Guidelines for Sample Participation Rates (See Appendix A for Details):</b>			
Australia	55 (3.7)	59 (2.2)	
Austria	42 (3.5)	66 (3.1)	
<sup>1</sup> Latvia (LSS)	41 (3.5)	44 (3.5)	
Netherlands	53 (2.9)	70 (3.2)	
<b>Countries Not Meeting Age/Grade Specifications (High Percentage of Older Students; See Appendix A for Details):</b>			
Slovenia	45 (3.1)	46 (2.8)	
<b>Countries With Unapproved Sampling Procedures at Classroom Level (See Appendix A for Details):</b>			
Hungary	28 (2.2)	42 (2.4)	
<b>Unapproved Sampling Procedures at Classroom Level and Not Meeting Other Guidelines (See Appendix A for Details):</b>			
<sup>1</sup> Israel	- -	52 (3.7)	
Kuwait	- -	32 (2.3)	
Thailand	20 (3.1)	25 (2.4)	
<b>International Average Percent Correct</b>	45 (0.6)	52 (0.5)	

\*Third and fourth grades in most countries; See Table 2 for information about the grades tested in each country.

<sup>†</sup>Met guidelines for sample participation rates only after replacement schools were included (see Appendix A for details).

<sup>1</sup>National Desired Population does not cover all of International Desired Population (see Table A.2). Because coverage falls below 65%, Latvia is annotated LSS for Latvian Speaking Schools only.

<sup>2</sup>National Defined Population covers less than 90 percent of National Desired Population (see Table A.2).

( ) Standard errors appear in parentheses. Because results are rounded to the nearest whole number, some totals may appear inconsistent.

A dash (-) indicates data are not available. Israel and Kuwait did not test at the lower grade.

SOURCE: IEA Third International Mathematics and Science Study (TIMSS), 1994-95.

**Table 3.14 Physical Science****Percent Correct for Example Item 14  
Lower and Upper Grades (Third and Fourth Grades\*)**

Country	Percent Correct		Example 14 What travels fastest.
	Third Grade	Fourth Grade	
Canada	34 (3.3)	44 (2.8)	<p>Which travels fastest?</p> <p>A. A train</p> <p>B. An airplane</p> <p>C. Sound</p> <p><b>D. Light</b></p>
Cyprus	23 (2.5)	23 (2.1)	
Czech Republic	38 (2.5)	53 (2.4)	
<sup>†2</sup> England	33 (2.7)	50 (2.4)	
Greece	21 (2.6)	29 (2.8)	
Hong Kong	28 (2.0)	44 (3.1)	
Iceland	26 (3.8)	37 (3.8)	
Iran, Islamic Rep.	43 (3.4)	34 (2.9)	
Ireland	32 (2.9)	39 (2.7)	
Japan	52 (2.6)	58 (2.4)	
Korea	37 (2.7)	64 (3.0)	
New Zealand	38 (2.9)	56 (3.4)	
Norway	30 (2.9)	48 (3.4)	
Portugal	22 (2.3)	33 (2.5)	
<sup>†</sup> Scotland	25 (2.6)	34 (2.7)	
Singapore	32 (2.0)	38 (2.2)	
United States	33 (2.9)	43 (1.9)	
<b>Countries Not Satisfying Guidelines for Sample Participation Rates (See Appendix A for Details):</b>			
Australia	46 (2.6)	59 (1.9)	
Austria	34 (3.0)	43 (2.9)	
<sup>1</sup> Latvia (LSS)	27 (2.5)	41 (3.2)	
Netherlands	17 (2.5)	27 (3.2)	
<b>Countries Not Meeting Age/Grade Specifications (High Percentage of Older Students; See Appendix A for Details):</b>			
Slovenia	29 (2.8)	50 (3.3)	
<b>Countries With Unapproved Sampling Procedures at Classroom Level (See Appendix A for Details):</b>			
Hungary	34 (2.6)	49 (2.6)	
<b>Unapproved Sampling Procedures at Classroom Level and Not Meeting Other Guidelines (See Appendix A for Details):</b>			
<sup>1</sup> Israel	- -	43 (2.6)	
Kuwait	- -	16 (1.6)	
Thailand	16 (2.5)	22 (3.2)	
<b>International Average Percent Correct</b>	31 (0.6)	41 (0.5)	

\*Third and fourth grades in most countries; See Table 2 for information about the grades tested in each country.

<sup>†</sup>Met guidelines for sample participation rates only after replacement schools were included (see Appendix A for details).

<sup>1</sup>National Desired Population does not cover all of International Desired Population (see Table A.2). Because coverage falls below 65%, Latvia is annotated LSS for Latvian Speaking Schools only.

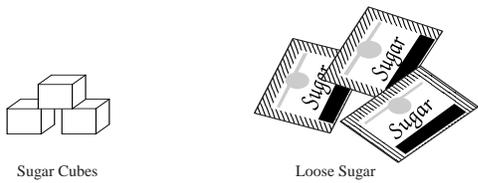
<sup>2</sup>National Defined Population covers less than 90 percent of National Desired Population (see Table A.2).

( ) Standard errors appear in parentheses. Because results are rounded to the nearest whole number, some totals may appear inconsistent.

A dash (-) indicates data are not available. Israel and Kuwait did not test at the lower grade.

SOURCE: IEA Third International Mathematics and Science Study (TIMSS), 1994-95.

**Table 3.15 Physical Science****Percent Correct for Example Item 15  
Lower and Upper Grades (Third and Fourth Grades\*)**

Country	Percent Correct		Example 15 Dissolving sugar.
	Third Grade	Fourth Grade	
Canada	28 (1.5)	46 (2.1)	<p>The picture shows two forms of sugar — solid cubes and packets of loose crystals. One cube has the same mass of sugar as one packet.</p>  <p>Sugar Cubes                      Loose Sugar</p> <p>Which of the two forms of sugar will dissolve faster in water? <i>loose sugar</i> Give a reason for your answer. <i>The loose sugar is smaller so it will dissolve faster.</i></p>
Cyprus	13 (1.3)	27 (1.7)	
Czech Republic	36 (2.3)	44 (1.9)	
<sup>†2</sup> England	30 (1.9)	42 (2.0)	
Greece	14 (1.7)	20 (1.7)	
Hong Kong	28 (2.2)	40 (2.2)	
Iceland	5 (1.2)	8 (1.4)	
Iran, Islamic Rep.	2 (0.6)	5 (0.9)	
Ireland	29 (2.2)	43 (2.1)	
Japan	64 (1.5)	72 (1.4)	
Korea	61 (1.8)	75 (2.1)	
New Zealand	24 (1.8)	37 (2.5)	
Norway	8 (1.3)	18 (1.7)	
Portugal	13 (1.4)	22 (1.9)	
<sup>†</sup> Scotland	28 (2.1)	40 (2.0)	
Singapore	28 (1.4)	45 (1.7)	
United States	28 (1.7)	43 (1.6)	
<b>Countries Not Satisfying Guidelines for Sample Participation Rates (See Appendix A for Details):</b>			
Australia	29 (2.0)	42 (1.6)	
Austria	27 (2.3)	47 (2.3)	
<sup>1</sup> Latvia (LSS)	24 (2.1)	33 (2.4)	
Netherlands	58 (2.0)	70 (2.2)	
<b>Countries Not Meeting Age/Grade Specifications (High Percentage of Older Students; See Appendix A for Details):</b>			
Slovenia	15 (1.7)	32 (2.4)	
<b>Countries With Unapproved Sampling Procedures at Classroom Level (See Appendix A for Details):</b>			
Hungary	20 (1.6)	29 (1.9)	
<b>Unapproved Sampling Procedures at Classroom Level and Not Meeting Other Guidelines (See Appendix A for Details):</b>			
<sup>1</sup> Israel	- -	32 (2.3)	
Kuwait	- -	16 (1.1)	
Thailand	23 (3.4)	30 (2.6)	
<b>International Average Percent Correct</b>	27 (0.4)	37 (0.4)	

\*Third and fourth grades in most countries; See Table 2 for information about the grades tested in each country.

<sup>1</sup>Met guidelines for sample participation rates only after replacement schools were included (see Appendix A for details).

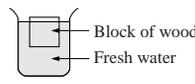
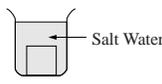
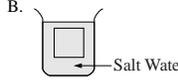
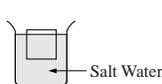
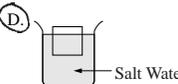
<sup>1</sup>National Desired Population does not cover all of International Desired Population (see Table A.2). Because coverage falls below 65%, Latvia is annotated LSS for Latvian Speaking Schools only.

<sup>2</sup>National Defined Population covers less than 90 percent of National Desired Population (see Table A.2).

( ) Standard errors appear in parentheses. Because results are rounded to the nearest whole number, some totals may appear inconsistent. A dash (-) indicates data are not available. Israel and Kuwait did not test at the lower grade.

SOURCE: IEA Third International Mathematics and Science Study (TIMSS), 1994-95.

**Table 3.16 Physical Science****Percent Correct for Example Item 16  
Lower and Upper Grades (Third and Fourth Grades\*)**

Country	Percent Correct		Example 16 Block floating in water.
	Third Grade	Fourth Grade	
Canada	29 (2.6)	36 (2.6)	<p>The picture shows a block of wood floating in fresh water.</p>  <p>If this block were placed in salt water from the ocean, which picture shows what would happen?</p> <p>A.  B. </p> <p>C.  D. </p>
Cyprus	27 (3.2)	37 (2.6)	
Czech Republic	33 (2.5)	35 (2.3)	
<sup>12</sup> England	28 (2.5)	29 (2.5)	
Greece	28 (2.9)	32 (2.6)	
Hong Kong	33 (2.4)	44 (3.1)	
Iceland	30 (4.1)	29 (3.2)	
Iran, Islamic Rep.	18 (2.6)	20 (2.6)	
Ireland	29 (2.6)	34 (3.2)	
Japan	27 (2.0)	37 (2.0)	
Korea	46 (2.5)	54 (2.6)	
New Zealand	28 (2.7)	34 (3.4)	
Norway	36 (3.1)	41 (3.5)	
Portugal	15 (1.7)	20 (2.2)	
<sup>†</sup> Scotland	29 (2.5)	31 (2.2)	
Singapore	32 (1.6)	40 (1.9)	
United States	25 (2.7)	31 (1.8)	
<b>Countries Not Satisfying Guidelines for Sample Participation Rates (See Appendix A for Details):</b>			
Australia	31 (3.2)	32 (1.9)	
Austria	41 (3.0)	43 (3.2)	
<sup>1</sup> Latvia (LSS)	26 (2.8)	26 (2.9)	
Netherlands	24 (2.3)	31 (3.0)	
<b>Countries Not Meeting Age/Grade Specifications (High Percentage of Older Students; See Appendix A for Details):</b>			
Slovenia	33 (2.5)	46 (3.2)	
<b>Countries With Unapproved Sampling Procedures at Classroom Level (See Appendix A for Details):</b>			
Hungary	31 (2.6)	24 (2.4)	
<b>Unapproved Sampling Procedures at Classroom Level and Not Meeting Other Guidelines (See Appendix A for Details):</b>			
<sup>1</sup> Israel	- -	38 (2.7)	
Kuwait	- -	33 (2.2)	
Thailand	32 (2.7)	24 (2.9)	
<b>International Average Percent Correct</b>	30 (0.6)	34 (0.5)	

\*Third and fourth grades in most countries; See Table 2 for information about the grades tested in each country.

<sup>†</sup>Met guidelines for sample participation rates only after replacement schools were included (see Appendix A for details).

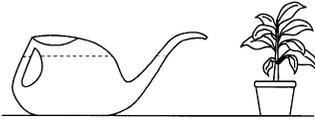
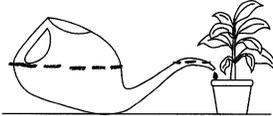
<sup>1</sup>National Desired Population does not cover all of International Desired Population (see Table A.2). Because coverage falls below 65%, Latvia is annotated LSS for Latvian Speaking Schools only.

<sup>2</sup>National Defined Population covers less than 90 percent of National Desired Population (see Table A.2).

( ) Standard errors appear in parentheses. Because results are rounded to the nearest whole number, some totals may appear inconsistent. A dash (-) indicates data are not available. Israel and Kuwait did not test at the lower grade.

SOURCE: IEA Third International Mathematics and Science Study (TIMSS), 1994-95.

**Table 3.17 Physical Science****Percent Correct for Example Item 17  
Lower and Upper Grades (Third and Fourth Grades\*)**

Country	Percent Correct		Example 17 Tipped watering can.
	Third Grade	Fourth Grade	
Canada	13 (1.8)	22 (1.8)	<p>A watering can is almost filled with water as shown.</p>  <p>The watering can is tipped so that the water just begins to drip through the spout.</p> <p>Draw a line to show where the surface of the water in the can is now.</p> 
Cyprus	11 (1.9)	13 (2.0)	
Czech Republic	22 (2.5)	28 (2.6)	
<sup>12</sup> England	21 (2.0)	29 (2.3)	
Greece	16 (2.4)	17 (2.1)	
Hong Kong	19 (1.9)	28 (2.6)	
Iceland	10 (1.7)	17 (2.2)	
Iran, Islamic Rep.	5 (1.5)	10 (1.6)	
Ireland	12 (1.8)	19 (2.3)	
Japan	18 (2.0)	27 (2.1)	
Korea	22 (2.6)	26 (2.7)	
New Zealand	13 (2.3)	17 (2.5)	
Norway	17 (2.1)	21 (3.0)	
Portugal	14 (2.2)	20 (2.3)	
<sup>†</sup> Scotland	17 (2.2)	15 (1.7)	
Singapore	15 (1.2)	32 (1.7)	
United States	12 (1.6)	21 (1.8)	
<b>Countries Not Satisfying Guidelines for Sample Participation Rates (See Appendix A for Details):</b>			
Australia	15 (1.8)	20 (1.6)	
Austria	14 (2.3)	25 (3.5)	
<sup>1</sup> Latvia (LSS)	26 (2.8)	30 (3.2)	
Netherlands	15 (2.4)	28 (2.4)	
<b>Countries Not Meeting Age/Grade Specifications (High Percentage of Older Students; See Appendix A for Details):</b>			
Slovenia	18 (2.5)	25 (2.6)	
<b>Countries With Unapproved Sampling Procedures at Classroom Level (See Appendix A for Details):</b>			
Hungary	16 (1.8)	26 (2.7)	
<b>Unapproved Sampling Procedures at Classroom Level and Not Meeting Other Guidelines (See Appendix A for Details):</b>			
<sup>1</sup> Israel	- -	13 (2.2)	
Kuwait	- -	8 (1.0)	
Thailand	8 (1.6)	15 (2.5)	
International Average Percent Correct	15 (0.4)	21 (0.5)	<b>Note: Item also tested at seventh and eighth grades.</b>
	Seventh Grade	Eighth Grade	
	47 (0.6)	53 (0.6)	

\*Third and fourth grades in most countries; See Table 2 for information about the grades tested in each country.

<sup>1</sup> Met guidelines for sample participation rates only after replacement schools were included (see Appendix A for details).

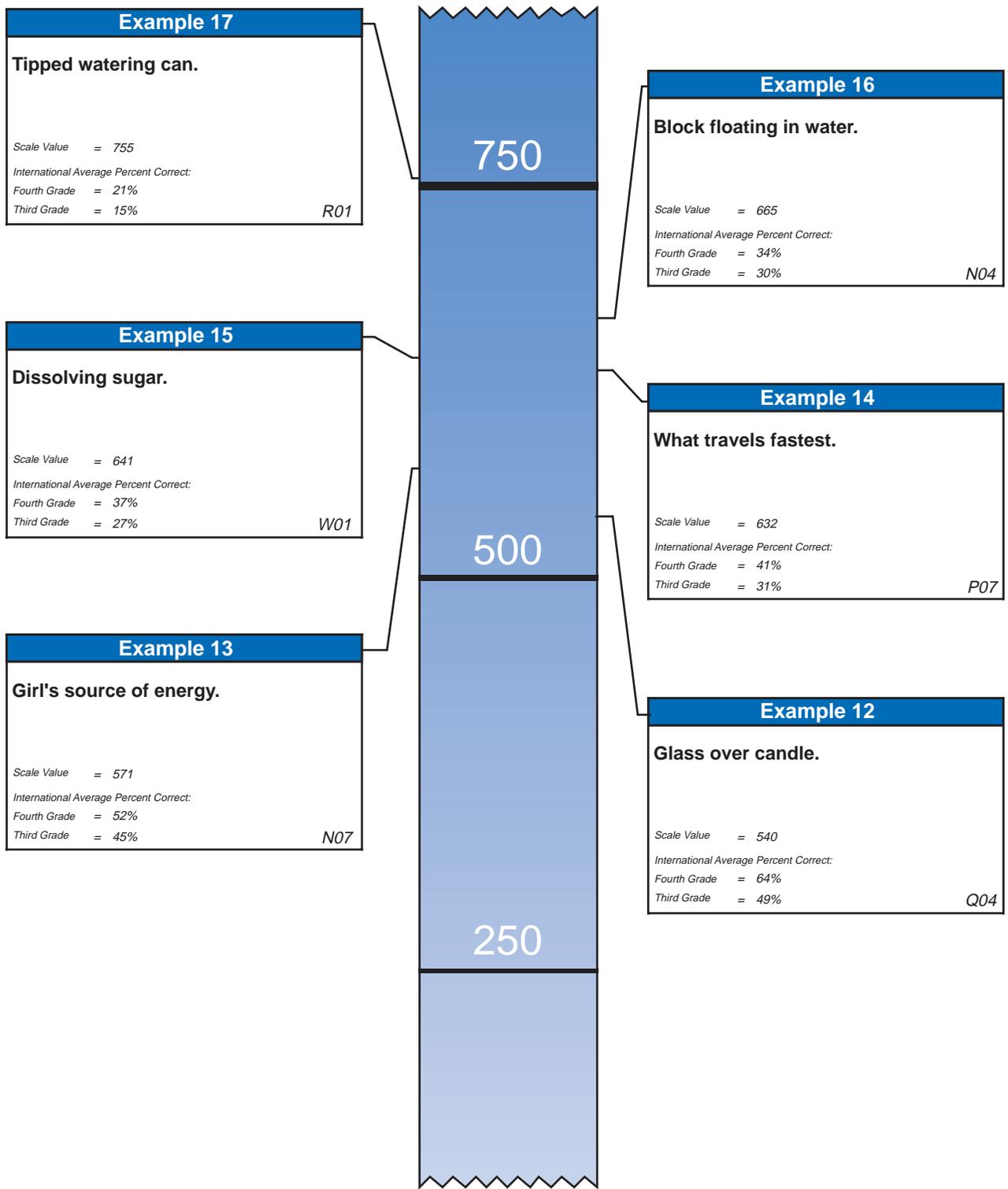
<sup>1</sup> National Desired Population does not cover all of International Desired Population (see Table A.2). Because coverage falls below 65%, Latvia is annotated LSS for Latvian Speaking Schools only.

<sup>2</sup> National Defined Population covers less than 90 percent of National Desired Population (see Table A.2).

( ) Standard errors appear in parentheses. Because results are rounded to the nearest whole number, some totals may appear inconsistent. A dash (-) indicates data are not available. Israel and Kuwait did not test at the lower grade.

**Figure 3.3**

### International Difficulty Map for Physical Science Example Items Lower and Upper Grades (Third and Fourth Grades\*)



\*Third and fourth grades in most countries; see Table 2 for information about the grades tested in each country.

NOTE: Each item was placed onto the TIMSS international science scale based on students' performance in both grades. Items are shown at the point on the scale where students with that level of proficiency had a 65 percent probability of providing a correct response.

## WHAT HAVE STUDENTS LEARNED ABOUT ENVIRONMENTAL ISSUES AND THE NATURE OF SCIENCE?

The fourth science category includes four items about environmental and resource issues, three items covering the nature of scientific knowledge, and one item involving the influence of science and technology on society. Four of these items (Example Items 18-21) are presented in Tables 3.18 through 3.21 with their percents correct, illustrating the types of items and student performance expectations covered in these science areas.

Example Item 18 (Table 3.18), one of the items related to environmental issues, required students to write about two ways people could help reduce air pollution. Nearly half of fourth graders (48%) and 31% of third graders internationally were able to provide at least one correct way. Fewer students provided a second correct way (21% and 34%). Credit was given for any acceptable responses mentioning specific ways to reduce air pollution. Internationally, the most common ways given were related to reducing pollution by motor vehicles; reducing industrial pollution and stopping smoking were also common responses across countries. In the majority of countries, half or more of fourth-grade students provided at least one correct way, with more than 60% correct in Australia (67%), Austria (62%), Korea (67%), the Netherlands (66%), and Slovenia (69%). The percentages of correct responses for the third-grade students in these higher-performing countries were in the range of 40% to 50%. Only in Australia and the Netherlands were more than half of fourth-grade students able to provide a second correct way.

Both Example Items 19 and 20 are related to the nature of scientific knowledge. Example Item 19 (Table 3.19) required students to demonstrate an understanding of what is meant by a physical observation. Less than half of both third- and fourth-grade students internationally answered this item correctly (34% and 43%), although between 50% and 60% of fourth-grade students responded correctly in 11 countries (Australia, Canada, England, Ireland, Japan, Korea, the Netherlands, New Zealand, Norway, Scotland, and the United States). Example Item 20 (Table 3.20), requiring students to identify the correct way to design an investigation of growing seeds, was more difficult. Internationally, only 29% of third graders and 36% of fourth graders identified the correct response, with percents correct at the fourth grade ranging from 25% to less than 50% in nearly all countries. In three countries – Korea, Singapore, and the United States – students performed substantially higher, with more than 60% correct at the fourth grade.

Example Item 21 (Table 3.21) was the most difficult item related to environmental issues. In this item, students were required to demonstrate their understanding of pollution and its environmental effects by writing an explanation for how oil spills are harmful to the environment. Full credit was given for extended responses that referred to water, air, or beach pollution as well as their harmful effect on living things or the earth. Internationally, about a quarter of fourth-grade students (27%) and only 16% of third-grade students provided responses that were given full credit. Across

countries, percents correct at the fourth grade ranged from less than 10% in Hong Kong and Iran to more than 50% in Japan (53%) and Korea (64%). In general, this item was extremely difficult for third-grade students, with less than 20% correct in all countries except Australia, Canada, Japan, Korea, New Zealand, and the United States. Only in Korea did half or more of both the third- and fourth-grade students provide a fully correct response, but about half of students in both grades internationally received at least partial credit.

The international difficulty map for the example items in the content area of environmental issues and the nature of science in Figure 3.4 shows that these items, ranging in item difficulty from 580 to 686, were relatively challenging for third- and fourth-grade students internationally.

**Table 3.18** Environmental Issues and the Nature of Science**Percent Correct for Example Item 18 - One Way  
Lower and Upper Grades (Third and Fourth Grades\*)**

Country	Percent Correct		Example 18 Reducing air pollution.
	Third Grade	Fourth Grade	
Canada	31 (1.4)	46 (2.2)	<p>Write down two different things that people can do to help reduce air pollution.</p> <p>Don't drive but walk Put air filters on factories</p>
Cyprus	17 (1.7)	36 (2.0)	
Czech Republic	33 (1.8)	55 (1.9)	
<sup>12</sup> England	36 (2.2)	52 (2.1)	
Greece	17 (1.8)	33 (2.0)	
Hong Kong	24 (1.4)	39 (1.8)	
Iceland	23 (2.3)	50 (2.7)	
Iran, Islamic Rep.	10 (1.8)	18 (1.6)	
Ireland	29 (2.2)	46 (2.0)	
Japan	41 (1.9)	57 (1.7)	
Korea	52 (2.0)	67 (2.2)	
New Zealand	28 (2.2)	41 (2.2)	
Norway	25 (2.2)	50 (2.5)	
Portugal	12 (1.5)	24 (1.8)	
<sup>†</sup> Scotland	29 (2.3)	49 (2.3)	
Singapore	28 (2.3)	44 (1.9)	
United States	45 (2.2)	59 (1.5)	
<b>Countries Not Satisfying Guidelines for Sample Participation Rates (See Appendix A for Details):</b>			
Australia	50 (2.4)	67 (1.7)	
Austria	46 (3.2)	62 (3.0)	
<sup>1</sup> Latvia (LSS)	34 (2.7)	54 (2.4)	
Netherlands	43 (2.1)	66 (2.0)	
<b>Countries Not Meeting Age/Grade Specifications (High Percentage of Older Students; See Appendix A for Details):</b>			
Slovenia	44 (2.3)	69 (2.5)	
<b>Countries With Unapproved Sampling Procedures at Classroom Level (See Appendix A for Details):</b>			
Hungary	25 (1.9)	52 (2.1)	
<b>Unapproved Sampling Procedures at Classroom Level and Not Meeting Other Guidelines (See Appendix A for Details):</b>			
<sup>1</sup> Israel	- -	38 (3.0)	
Kuwait	- -	18 (1.3)	
Thailand	30 (4.2)	49 (3.0)	
<b>International Average Percent Correct</b>	31 (0.5)	48 (0.4)	

\*Third and fourth grades in most countries; See Table 2 for information about the grades tested in each country.

<sup>†</sup>Met guidelines for sample participation rates only after replacement schools were included (see Appendix A for details).

<sup>1</sup>National Desired Population does not cover all of International Desired Population (see Table A.2). Because coverage falls below 65%, Latvia is annotated LSS for Latvian Speaking Schools only.

<sup>2</sup>National Defined Population covers less than 90 percent of National Desired Population (see Table A.2).

( ) Standard errors appear in parentheses. Because results are rounded to the nearest whole number, some totals may appear inconsistent.

A dash (-) indicates data are not available. Israel and Kuwait did not test at the lower grade.

SOURCE: IEA Third International Mathematics and Science Study (TIMSS), 1994-95.

**Table 3.18 Environmental Issues and the Nature of Science**  
(Continued)

**Percent Correct for Example Item 18 - Two Ways  
Lower and Upper Grades (Third and Fourth Grades\*)**

Country	Percent Correct		Example 18 Reducing air pollution.
	Third Grade	Fourth Grade	
Canada	22 (1.5)	33 (2.0)	<p>Write down two different things that people can do to help reduce air pollution.</p> <p>Don't drive but walk Put air filters on factories</p>
Cyprus	10 (1.4)	25 (2.1)	
Czech Republic	19 (1.5)	38 (2.0)	
<sup>†2</sup> England	21 (2.0)	35 (2.2)	
Greece	14 (1.6)	24 (1.6)	
Hong Kong	17 (1.2)	35 (2.3)	
Iceland	12 (1.7)	32 (2.7)	
Iran, Islamic Rep.	3 (0.8)	8 (1.2)	
Ireland	18 (1.3)	33 (1.8)	
Japan	30 (1.5)	44 (1.6)	
Korea	39 (2.4)	49 (2.2)	
New Zealand	17 (1.6)	31 (2.6)	
Norway	15 (1.7)	41 (2.3)	
Portugal	5 (1.0)	10 (1.3)	
<sup>†</sup> Scotland	18 (1.8)	35 (2.1)	
Singapore	21 (1.9)	37 (2.0)	
United States	37 (1.6)	48 (1.5)	
<b>Countries Not Satisfying Guidelines for Sample Participation Rates (See Appendix A for Details):</b>			
Australia	35 (2.6)	51 (1.6)	
Austria	29 (2.6)	46 (2.8)	
<sup>†</sup> Latvia (LSS)	16 (2.1)	29 (2.3)	
Netherlands	33 (2.0)	56 (2.2)	
<b>Countries Not Meeting Age/Grade Specifications (High Percentage of Older Students; See Appendix A for Details):</b>			
Slovenia	24 (1.8)	47 (2.6)	
<b>Countries With Unapproved Sampling Procedures at Classroom Level (See Appendix A for Details):</b>			
Hungary	15 (1.5)	23 (1.6)	
<b>Unapproved Sampling Procedures at Classroom Level and Not Meeting Other Guidelines (See Appendix A for Details):</b>			
<sup>†</sup> Israel	- -	28 (2.3)	
Kuwait	- -	11 (1.1)	
Thailand	24 (3.5)	36 (2.8)	
<b>International Average Percent Correct</b>	21 (0.4)	34 (0.4)	

\*Third and fourth grades in most countries; See Table 2 for information about the grades tested in each country.

<sup>†</sup>Met guidelines for sample participation rates only after replacement schools were included (see Appendix A for details).

<sup>1</sup>National Desired Population does not cover all of International Desired Population (see Table A.2). Because coverage falls below 65%, Latvia is annotated LSS for Latvian Speaking Schools only.

<sup>2</sup>National Defined Population covers less than 90 percent of National Desired Population (see Table A.2).

( ) Standard errors appear in parentheses. Because results are rounded to the nearest whole number, some totals may appear inconsistent.

A dash (-) indicates data are not available. Israel and Kuwait did not test at the lower grade.

SOURCE: IEA Third International Mathematics and Science Study (TIMSS), 1994-95.

**Table 3.19** Environmental Issues and the Nature of Science**Percent Correct for Example Item 19  
Lower and Upper Grades (Third and Fourth Grades\*)**

Country	Percent Correct		Example 19 Observations of objects in bag.
	Third Grade	Fourth Grade	
Canada	37 (2.3)	54 (3.5)	<p>Four children can feel and smell an object inside a bag, but they cannot see it. Which of the following is NOT an observation about the object?</p> <p>A. "It is flat at one end and round at the other."</p> <p>B. "It smells like peppermint."</p> <p>C. "It has a bump on it."</p> <p><input checked="" type="radio"/> D. "I hope it is candy."</p>
Cyprus	22 (2.3)	29 (2.3)	
Czech Republic	38 (2.7)	47 (2.8)	
<sup>†2</sup> England	41 (2.9)	53 (3.0)	
Greece	27 (3.0)	28 (2.5)	
Hong Kong	35 (2.6)	47 (2.7)	
Iceland	19 (2.5)	27 (4.2)	
Iran, Islamic Rep.	19 (2.5)	21 (2.3)	
Ireland	36 (2.7)	51 (2.8)	
Japan	43 (2.1)	56 (2.2)	
Korea	49 (2.7)	59 (3.0)	
New Zealand	38 (3.4)	50 (3.5)	
Norway	34 (2.7)	54 (3.0)	
Portugal	25 (2.7)	32 (3.0)	
<sup>†</sup> Scotland	38 (2.4)	50 (3.3)	
Singapore	37 (1.8)	44 (2.0)	
United States	43 (2.6)	58 (2.1)	
<b>Countries Not Satisfying Guidelines for Sample Participation Rates (See Appendix A for Details):</b>			
Australia	40 (3.0)	57 (2.2)	
Austria	31 (2.9)	42 (3.6)	
<sup>1</sup> Latvia (LSS)	31 (3.6)	33 (3.2)	
Netherlands	38 (2.9)	53 (3.2)	
<b>Countries Not Meeting Age/Grade Specifications (High Percentage of Older Students; See Appendix A for Details):</b>			
Slovenia	32 (2.9)	38 (3.1)	
<b>Countries With Unapproved Sampling Procedures at Classroom Level (See Appendix A for Details):</b>			
Hungary	34 (2.7)	44 (3.1)	
<b>Unapproved Sampling Procedures at Classroom Level and Not Meeting Other Guidelines (See Appendix A for Details):</b>			
<sup>1</sup> Israel	- -	40 (3.6)	
Kuwait	- -	18 (1.8)	
Thailand	36 (3.5)	37 (3.4)	
<b>International Average Percent Correct</b>	34 (0.6)	43 (0.6)	

\*Third and fourth grades in most countries; See Table 2 for information about the grades tested in each country.

<sup>†</sup>Met guidelines for sample participation rates only after replacement schools were included (see Appendix A for details).

<sup>1</sup>National Desired Population does not cover all of International Desired Population (see Table A.2). Because coverage falls below 65%, Latvia is annotated LSS for Latvian Speaking Schools only.

<sup>2</sup>National Defined Population covers less than 90 percent of National Desired Population (see Table A.2).

( ) Standard errors appear in parentheses. Because results are rounded to the nearest whole number, some totals may appear inconsistent. A dash (-) indicates data are not available. Israel and Kuwait did not test at the lower grade.

SOURCE: IEA Third International Mathematics and Science Study (TIMSS), 1994-95.

**Table 3.20** Environmental Issues and the Nature of Science**Percent Correct for Example Item 20  
Lower and Upper Grades (Third and Fourth Grades\*)**

Country	Percent Correct		Example 20 Growing seeds in light or dark.
	Third Grade	Fourth Grade	
Canada	30 (2.2)	43 (3.1)	<p>To find out whether seeds grow better in the light or dark, you could put some seeds on pieces of damp paper and</p> <p>A. keep them in a warm, dark place</p> <p><input checked="" type="radio"/> B. keep one group in a light place and another in a dark place</p> <p>C. keep them in a warm, light place</p> <p>D. put them in a light or dark place that is cool</p>
Cyprus	24 (2.9)	27 (2.5)	
Czech Republic	26 (2.9)	40 (2.9)	
<sup>12</sup> England	33 (2.4)	43 (2.5)	
Greece	21 (2.2)	30 (2.8)	
Hong Kong	25 (1.8)	36 (2.5)	
Iceland	30 (2.7)	40 (3.9)	
Iran, Islamic Rep.	18 (2.6)	14 (2.1)	
Ireland	24 (2.3)	29 (2.4)	
Japan	- -	- -	
Korea	56 (2.9)	66 (2.7)	
New Zealand	33 (2.8)	39 (3.2)	
Norway	23 (2.7)	30 (2.5)	
Portugal	19 (2.4)	25 (2.4)	
<sup>†</sup> Scotland	32 (2.9)	36 (2.6)	
Singapore	43 (2.0)	62 (2.1)	
United States	43 (3.2)	61 (2.0)	
<b>Countries Not Satisfying Guidelines for Sample Participation Rates (See Appendix A for Details):</b>			
Australia	34 (2.3)	49 (3.1)	
Austria	19 (2.5)	35 (2.9)	
<sup>1</sup> Latvia (LSS)	24 (2.9)	23 (3.0)	
Netherlands	27 (3.1)	36 (3.2)	
<b>Countries Not Meeting Age/Grade Specifications (High Percentage of Older Students; See Appendix A for Details):</b>			
Slovenia	28 (2.7)	36 (2.5)	
<b>Countries With Unapproved Sampling Procedures at Classroom Level (See Appendix A for Details):</b>			
Hungary	21 (2.0)	19 (2.2)	
<b>Unapproved Sampling Procedures at Classroom Level and Not Meeting Other Guidelines (See Appendix A for Details):</b>			
<sup>1</sup> Israel	- -	26 (2.4)	
Kuwait	- -	25 (1.5)	
Thailand	30 (2.8)	40 (3.0)	
<b>International Average Percent Correct</b>	29 (0.5)	36 (0.5)	

\*Third and fourth grades in most countries; See Table 2 for information about the grades tested in each country.

<sup>†</sup>Met guidelines for sample participation rates only after replacement schools were included (see Appendix A for details).

<sup>1</sup>National Desired Population does not cover all of International Desired Population (see Table A.2). Because coverage falls below 65%, Latvia is annotated LSS for Latvian Speaking Schools only.

<sup>2</sup>National Defined Population covers less than 90 percent of National Desired Population (see Table A.2).

( ) Standard errors appear in parentheses. Because results are rounded to the nearest whole number, some totals may appear inconsistent.

A dash (-) indicates data are not available. Israel and Kuwait did not test at the lower grade. Internationally comparable data are unavailable for Japan on Example 20.

SOURCE: IEA Third International Mathematics and Science Study (TIMSS), 1994-95.

**Table 3.21 Environmental Issues and the Nature of Science****Percent Correct for Example Item 21  
Lower and Upper Grades (Third and Fourth Grades\*)**

Country	Percent Correct		Example 21 Oil spills.
	Third Grade	Fourth Grade	
Canada	20 (1.3)	30 (2.2)	<p>Write as completely as possible why large oil spills in rivers and seas are harmful to the environment.</p> <p>They kill the fish and make the water polluted.</p>
Cyprus	9 (1.3)	18 (1.6)	
Czech Republic	12 (1.4)	22 (2.0)	
<sup>12</sup> England	19 (1.8)	28 (2.0)	
Greece	14 (1.7)	25 (2.6)	
Hong Kong	3 (0.5)	9 (1.5)	
Iceland	6 (1.2)	20 (2.2)	
Iran, Islamic Rep.	3 (0.8)	7 (1.0)	
Ireland	17 (1.3)	30 (1.8)	
Japan	42 (1.8)	53 (1.7)	
Korea	51 (2.2)	64 (2.3)	
New Zealand	24 (2.1)	38 (2.2)	
Norway	10 (1.4)	21 (1.9)	
Portugal	17 (1.8)	29 (2.1)	
<sup>†</sup> Scotland	14 (1.5)	23 (1.8)	
Singapore	10 (1.4)	21 (1.7)	
United States	27 (1.8)	46 (1.3)	
<b>Countries Not Satisfying Guidelines for Sample Participation Rates (See Appendix A for Details):</b>			
Australia	23 (1.7)	37 (2.4)	
Austria	11 (1.5)	29 (2.7)	
<sup>1</sup> Latvia (LSS)	16 (2.2)	24 (2.3)	
Netherlands	10 (1.3)	20 (2.0)	
<b>Countries Not Meeting Age/Grade Specifications (High Percentage of Older Students; See Appendix A for Details):</b>			
Slovenia	12 (1.8)	21 (1.8)	
<b>Countries With Unapproved Sampling Procedures at Classroom Level (See Appendix A for Details):</b>			
Hungary	15 (1.8)	26 (1.8)	
<b>Unapproved Sampling Procedures at Classroom Level and Not Meeting Other Guidelines (See Appendix A for Details):</b>			
<sup>1</sup> Israel	- -	36 (2.3)	
Kuwait	- -	11 (1.0)	
Thailand	9 (1.5)	14 (1.7)	
<b>International Average Percent Correct</b>	16 (0.3)	27 (0.4)	

\*Third and fourth grades in most countries; See Table 2 for information about the grades tested in each country.

<sup>1</sup>Met guidelines for sample participation rates only after replacement schools were included (see Appendix A for details).

<sup>1</sup>National Desired Population does not cover all of International Desired Population (see Table A.2). Because coverage falls below 65%, Latvia is annotated LSS for Latvian Speaking Schools only.

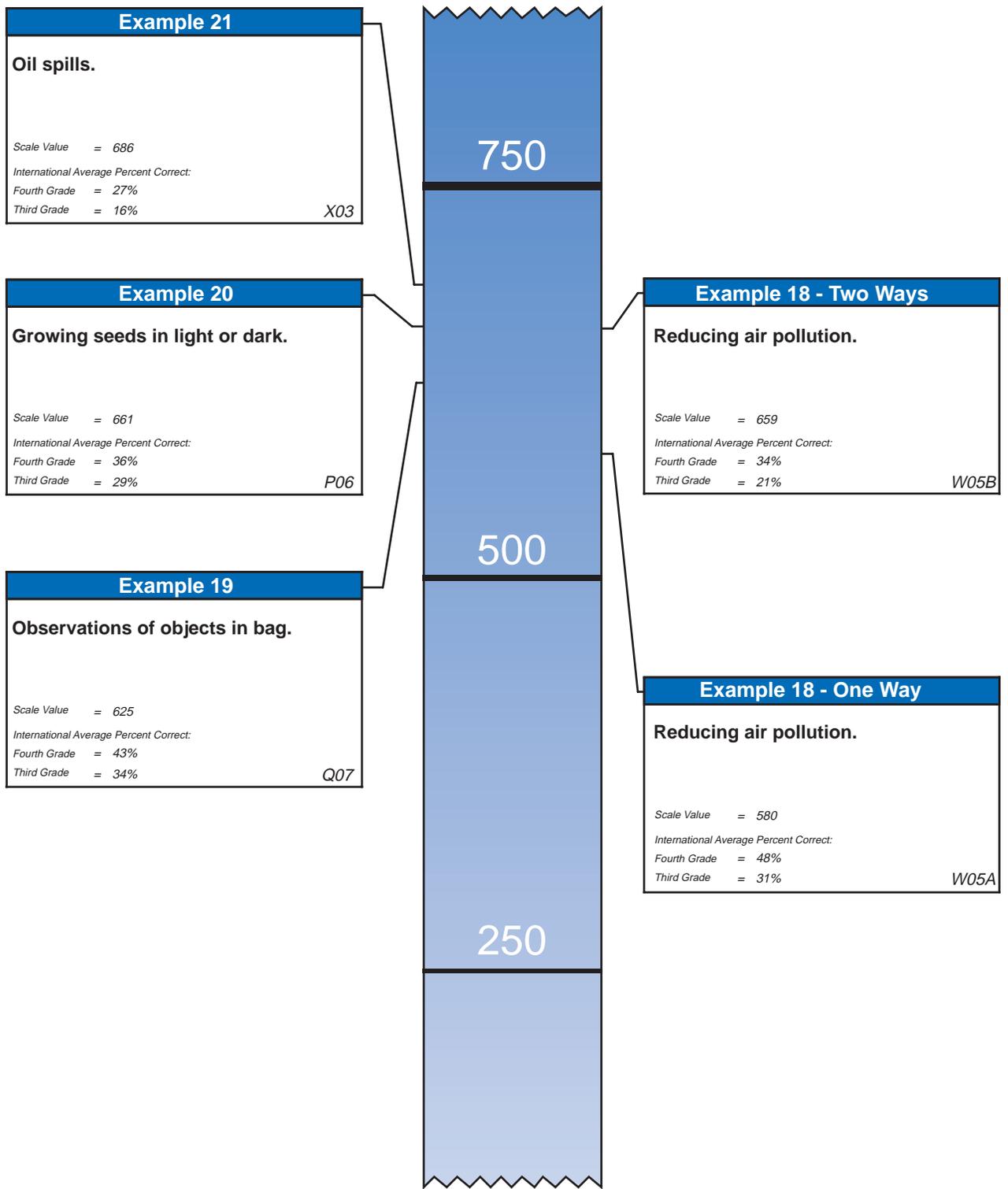
<sup>2</sup>National Defined Population covers less than 90 percent of National Desired Population (see Table A.2).

( ) Standard errors appear in parentheses. Because results are rounded to the nearest whole number, some totals may appear inconsistent. A dash (-) indicates data are not available. Israel and Kuwait did not test at the lower grade.

SOURCE: IEA Third International Mathematics and Science Study (TIMSS), 1994-95.

**Figure 3.4**

### International Difficulty Map for Environmental Issues and the Nature of Science Example Items – Lower and Upper Grades (Third and Fourth Grades\*)



\*Third and fourth grades in most countries; see Table 2 for information about the grades tested in each country.

NOTE: Each item was placed onto the TIMSS international science scale based on students' performance in both grades. Items are shown at the point on the scale where students with that level of proficiency had a 65 percent probability of providing a correct response.

