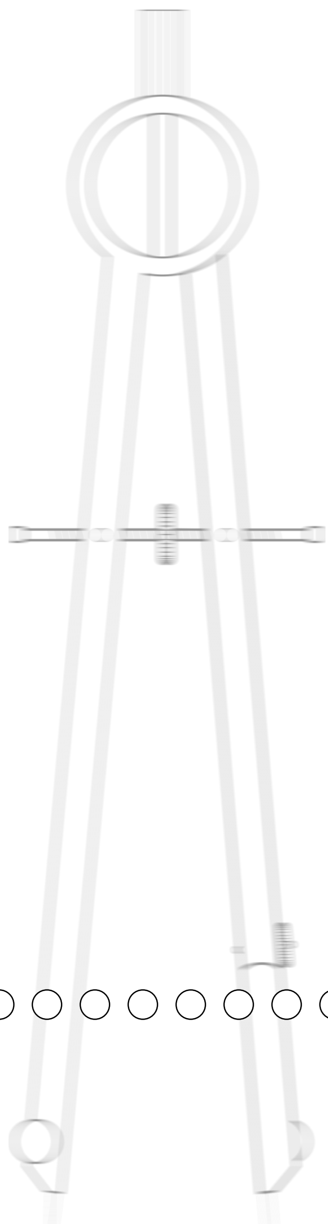
17

Reporting Questionnaire Data

Teresa A. Smith



17 Reporting Questionnaire Data

Teresa A. Smith

17.1 Overview

This chapter documents the analysis and reporting procedures used for the background questionnaire data in producing the TIMSS 1999 international reports. In particular, it provides an overview of the consensus process used to develop the report outlines and prototype exhibits; discusses the development and computation of indices based on student, teacher, and school background variables; presents the approach used in reporting trends in background data; describes special considerations in reporting the student, teacher, school, and country questionnaire data; and explains how TIMSS 1999 handled issues of non-response in reporting these data.

17.2 Background Questionnaires

As described in chapter 4, TIMSS 1999 used four types of background questionnaires to gather information at various levels of the educational system:

1. Curriculum questionnaires that addressed issues of curriculum design and curricular emphasis in mathematics and science were completed by National Research Coordinators
2. A school questionnaire that provided information about school staffing and facilities, as well as curricular and instructional arrangements, was completed by school principals
3. Teacher questionnaires completed by mathematics and science teachers, provided information about their backgrounds, attitudes, and teaching activities and approaches
4. Students completed a student questionnaire providing information about their home backgrounds and attitudes, and their experiences in mathematics and science classes; there were two versions: a general science version intended for systems where science is taught as a single integrated subject, and a version intended for systems where science is taught as separate subjects (biology, chemistry, earth science, and physics)

17.3 TIMSS 1999 Reporting Approach

As in TIMSS 1995, the TIMSS 1999 results were reported separately by subject area, with the mathematics and science results appearing in separate volumes (Mullis et al., 2000; Martin et al., 2000). The TIMSS 1999 reports contain four chapters devoted to the questionnaire data, dealing with students' backgrounds and attitudes, the nature and coverage of the curriculum, teachers and instruction, and school contexts for learning. The 1999 reports included a number of innovations. First, summary indices based on some of the student, teacher, and school background data were presented to focus the reports more closely on issues related to good educational practice. Second, since TIMSS 1999 was designed to measure trends in student achievement and in the related educational contexts for learning and instruction, trends were presented in cases where comparable background data were obtained in both assessments. Third, the report was designed to give prominence to the background indices, with displays of secondary importance relegated to a resource reference section at the end of the reports.

17.3.1 Summary Indices from Background Data

In an effort to summarize the information obtained from the background questionnaires concisely and focus attention on educationally relevant support and practice, TIMSS sometimes combined information to form an index that was more global and reliable than the component questions (e.g., students' home educational resources and attitudes towards mathematics or science; teachers' emphasis on reasoning and problem-solving, and confidence in their preparation to teach mathematics or science; availability of school resources for mathematics or science instruction). According to the responses of students, their teachers or their schools, students were placed in a "high," "medium," or "low" category for the index, with the high level being set so that it corresponds to conditions or activities generally associated with higher academic achievement. For example, a three-level index of home educational resources was constructed from students' responses to three questions: number of books in the home, educational aids in the home (computer, study desk/table for own use, dictionary), and parents' education. Students were assigned to the high level if they reported having more than 100 books, having all three educational aids, and that at least one parent finished university. Students at the low level reported having

25 or fewer books in the home, not all three educational aids, and some secondary or less to be the highest level of education for either parent. Students with all other response combinations were assigned to the middle category.

The 17 indices computed for the TIMSS 1999 report are listed in Exhibit 17.1, which identifies the name of the index; the label used to identify it in the international report and database; the mathematics or science exhibit where the index data were reported; and the method used to compute the index.

Exhibit 17.1 Summary Indices from Background Data in the TIMSS-1999 International Report

Name of Index	Label	Exhibit[a]	Analysis Method
Index of Home Educational Resources	HER	4.1 (M) 4.1 (S)	Index based on students' responses to three questions about home educational resources: number of books in the home; educational aids in the home (computer, study desk/table for own use, dictionary); parents' education. High level indicates more than 100 books in the home; all three educational aids; and either parent's highest level of education is finished university. Low level indicates 25 or fewer books in the home; not all three educational aids; and both parents' highest level of education is some secondary or less or is not known. Medium level includes all other possible combinations of responses. Response categories were defined by each country to conform to their own educational system and may not be strictly comparable across countries.
Index of Out-of-School Study Time	OST	4.5 (M) 4.5 (S)	Index based on students' responses to three questions about out-of-school study time: time spent after school studying mathematics or doing mathematics homework; time spent after school studying science or doing science homework; time spent after school studying or doing homework in school subjects other than mathematics and science. Number of hours based on: no time = 0, less than 1 hour = 0.5, 1-2 hours = 1.5, 3-5 hours = 4, more than 5 hours = 7. High level indicates more than three hours studying all subjects combined. Medium level indicates more than one hour to three hours studying all subjects combined. Low level indicates one hour or less studying all subjects combined.
Index of Students' Self-Concept in Mathematics	SCM	4.8 (M)	Index based on students' responses to five statements about their mathematics ability: 1) I would like mathematics much more if it were not so difficult; 2) although I do my best, mathematics is more difficult for me than for many of my classmates; 3) nobody can be good in every subject, and I am just not talented in mathematics; 4) sometimes, when I do not understand a new topic in mathematics initially, I know that I will never really understand it; 5) mathematics is not one of my strengths. High level indicates student disagrees or strongly disagrees with all five statements. Low level indicates student agrees or strongly agrees with all five statements. Medium level includes all other possible combinations of responses.
Index of Students' Self-Concept in the Sciences*	SCS-G SCS-E SCS-B SCS-P SCS-C	4.8 (S)	Index based on students' responses to four statements about their science ability: 1) I would like science much more if it were not so difficult; 2) although I do my best, science is more difficult for me than for many of my classmates; 3) nobody can be good in every subject, and I am just not talented in science; 4) science is not one of my strengths. In countries where science is taught as separate subjects, students were asked about each subject area separately. High level indicates student disagrees or strongly disagrees with all four statements. Low level indicates student agrees or strongly agrees with all four statements. Medium level includes all other possible combinations of responses.

Name of Index	Label	Exhibit[a]	Analysis Method
Index of Positive Attitudes Towards Mathematics	PATM	4.10 (M)	Index based on students' responses to five statements about mathematics: 1) I like mathematics; 2) I enjoy learning mathematics; 3) mathematics is boring (reversed scale); 4) mathematics is important to everyone's life; 5) I would like a job that involved using mathematics. Average is computed across the five items based on a 4-point scale: 1 = strongly negative; 2 = negative; 3 = positive; 4 = strongly positive. High level indicates average is greater than 3. Medium level indicates average is greater than 2 and less than or equal to 3. Low level indicates average is less than or equal to 2.
Index of Positive Attitudes Towards the Sciences*	PATS-G PATS-E PATS-B PATS-P PATS-C	4.10 (S)	Index based on students' responses to five statements about science: 1) I like science; 2) I enjoy learning science; 3) science is boring (reversed scale); 4) science is important to everyone's life; 5) I would like a job that involved using science. Average is computed across the five items based on a 4-point scale: 1 = strongly negative; 2 = negative; 3 = positive; 4 = strongly positive. In countries where science is taught as separate subjects, students were asked about each subject area separately. High level indicates average is greater than 3. Medium level indicates average is greater than 2 and less than or equal to 3. Low level indicates average is less than or equal to 2.
Index of Confidence in Preparation to Teach Mathematics	CPTM	6.3 (M)	Index based on teachers' responses to 12 questions about how prepared they feel to teach different mathematics topics based on a 3-point scale: 1 = not well prepared; 2 = somewhat prepared; 3 = very well prepared. Average is computed across the 12 items for topics for which the teacher did not respond "do not teach". High level indicates average is greater than or equal to 2.75. Medium level indicates average is greater than or equal to 2.25 and less than 2.75. Low level indicates average is less than 2.25.
Index of Confidence in Preparation to Teach Science	CPTS	6.3 (S)	Index based on teachers' responses to 10 questions about how prepared they feel to teach different science topics (see reference exhibit R3.2) based on a 3-point scale: 1 = not well prepared; 2 = somewhat prepared; 3 = very well prepared. Average is computed across the 10 items for items for which the teacher did not respond "do not teach". High level indicates average is greater than or equal to 2.75. Medium level indicates average is greater than or equal to 2.25 and less than 2.75. Low level indicates average is less than 2.25.
Index of Teachers' Emphasis on Scientific Reasoning and Problem-Solving	ESRPS	6.12 (S)	Index based on teachers' responses to five questions about how often they ask students to: 1) explain the reasoning behind an idea; 2) represent and analyze relationships using tables, charts, graphs; 3) work on problems for which there is no immediately obvious method of solution; 4) write explanations about what was observed and why it happened; 5) put events or objects in order and give a reason for the organization. Average is computed across the five items based on a 4-point scale: 1 = never or almost never; 2 = some lessons; 3 = most lessons; 4 = every lesson. High level indicates average is greater than or equal to 3. Medium level indicates average is greater than or equal to 2.25 and less than 3. Low level indicates average is less than 2.25.
Index of Teachers' Emphasis on Mathematics Reasoning and Problem-Solving	EMRPS	6.13 (M)	Index based on teachers' responses to four questions about how often they ask students to: 1) explain the reasoning behind an idea; 2) represent and analyze relationships using tables, charts, or graphs; 3) work on problems for which there is no immediately obvious method of solution; 4) write equations to represent relationships. Average is computed across the four items based on a 4-point scale: 1 = never or almost never; 2 = some lessons; 3 = most lessons; 4 = every lesson. High level indicates average is greater than or equal to 3. Medium level indicates average is greater than or equal to 2.25 and less than 3. Low level indicates average is less than 2.25.

Name of Index	Label	Exhibit[a]	Analysis Method
Index of Emphasis on Conducting Experiments in Science Classes[*]	ECES-G ECES-E ECES-B ECES-P ECES-C	6.14 (S)	Index based on teachers' reports on the percentage of time they spend demonstrating experiments; teachers' reports on the percentage of time students spend conducting experiments; students' reports on how often the teacher gives a demonstration of an experiment in science lessons; students' reports on how often they conduct an experiment or practical investigation in class. In countries where science is taught as separate subjects, students were asked about each subject area separately, and only teachers who teach a particular subject are included in the index shown for that subject. High level indicates teacher reported that at least 25% of class time is spent on the teacher demonstrating experiments or students conducting experiments, and the student reported that the teacher gives a demonstration of an experiment or the student conducts an experiment or practical investigation in class almost always or pretty often. Low level indicates the teacher reported that less than 10% of class time is spent on the teacher demonstrating experiments or students conducting experiments, and student reported that the teacher gives a demonstration of an Experiment and the student conducts an experiment or practical investigation in class once in a while or never. Medium level includes all other possible combinations of responses.
Index of Emphasis on Calculators in Mathematics Class	ECMC	6.16 (M)	Index based on students' reports of the frequency of using calculators in mathematics lessons and teachers' reports of students' use of calculators in mathematics class for five activities: checking answers; tests and exams; routine computation; solving complex problems; and exploring number concepts. High level indicates the student reported using calculators in mathematics lessons almost always or pretty often, and the teacher reported students use calculators at least once or twice a week for any of the tasks. Low level indicates the student reported using calculators once in a while or never, and the teacher reported students use calculators never or hardly ever for all of the tasks. Medium level includes all other possible combinations of responses.
Index of Teachers' Emphasis on Science Homework	ESH	6.18 (S)	Index based on teachers' responses to two questions about how often they usually assign science homework and how many minutes of science homework they usually assign students. High level indicates the assignment of more than 30 minutes of homework at least once or twice a week. Low level indicates the assignment of less than 30 minutes of homework less than once a week or never assigning homework. Medium level includes all other possible combinations of responses.
Index of Teachers' Emphasis on Mathematics Homework	EMH	6.21 (M)	Index based on teachers' responses to two questions about how often they usually assign mathematics homework and how many minutes of mathematics homework they usually assign students. High level indicates the assignment of more than 30 minutes of homework at least once or twice a week. Low level indicates the assignment of less than 30 minutes of homework less than once a week or never assigning homework. Medium level includes all other possible combinations of responses.
Index of Availability of School Resources for Mathematics Instruction	ASRMI	7.1 (M)	Index based on schools' average response to five questions about shortages that affect general capacity to provide instruction (instructional materials; budget for supplies; school buildings and grounds; heating/cooling and lighting systems; instructional space), and the average response to five questions about shortages that affect mathematics instruction (computers; computer software; calculators; library materials; audio-visual resources). High level indicates that both shortages, on average, affect instructional capacity none or a little. Medium level indicates that one shortage affects instructional capacity none or a little and the other shortage affects instructional capacity some or a lot. Low level indicates that both shortages affect instructional capacity some or a lot.
Index of Availability of School Resources for Science Instruction	ASRSI	7.1 (S)	Index based on schools' average response to five questions about shortages that affect general capacity to provide instruction (instructional materials; budget for supplies; school buildings and grounds; heating/cooling and lighting systems; instructional space), and the average response to six questions about shortages that affect science instruction (laboratory equipment and materials; computers; computer software; calculators; library materials; audio-visual resources). High level indicates that both shortages, on average, affect instructional capacity none or a little. Medium level indicates that one shortage affects instructional capacity none or a little and the other shortage affects instructional capacity some or a lot. Low level indicates that both shortages affect instructional capacity some or a lot.

Name of Index	Label	Exhibit[a]	Analysis Method
Index of Good School and Class Attendance	SCA	7.5 (M) 7.5 (S)	Index based on schools' responses to three questions about the seriousness of attendance problems in school: arriving late at school; absenteeism; skipping class. High level indicates that all three behaviors are reported to be not a problem. Low level indicates that two or more behaviors are reported to be a serious problem, or two behaviors are reported to be minor problems and the third a serious problem. Medium level includes all other possible combinations of responses.

a Exhibit number in the international report where data based on the index were presented. An (M) indicates mathematics report; (S) indicates science report.

* Separate indices were computed for general/integrated science (G), earth science (E), biology (B), physics (P), and chemistry (C)

The exhibit that displays each index shows the percentages of students at each level of the index, together with their mathematics or science achievement. In addition, the percentage at the high level was displayed graphically, with the countries ranked in order. For some of the sciences indices, the results were presented in separate panels for each science subject. The data for the component questions that made up the indices were usually presented in a section of the resource reference.

17.3.2 Reporting Trends in Background Data

Wherever possible and relevant, trend data were presented for the background indices as well as for other key variables from the background questionnaires. The exhibits containing trend data include all countries that participated in both the 1995 and 1999 assessments and that had internationally comparable data for the questions asked in both years.[1] In reporting trends for indices, the percentages of students in 1995 and 1999 at the high, medium, and low level of the index were presented, as were differences in the percentages from 1995 to 1999. Trend exhibits for some other key background variables presented percentages or average values for a number of reporting categories. In these exhibits, only the percentage of students in 1999 (or the average across students in 1999) and the corresponding difference between 1995 and 1999 were presented. This format was used most often in the science report, where the results for five science subject categories (general/integrated science, earth science, biology, physics, and chemistry) were presented in a single display.

○○○

1. Although they were included in the trend exhibits based only on achievement data, Bulgaria and South Africa were excluded from trend exhibits due to problems with their 1995 background data.

All trend exhibits indicate the statistical significance of the difference between 1995 and 1999 in percentage of students or average across students. The significance tests reported in these exhibits are adjusted for multiple comparisons based on a Bonferroni procedure that holds to five percent the overall probability of erroneously declaring as significant any of the pair-wise differences across or within countries. Therefore, the requirement for statistical significance of each pair-wise difference is more stringent than that required for a simple comparison of two percentages without adjusting for multiple comparisons, and fewer statistically significant differences are identified.[2] In all exhibits based on background data, standard errors were provided for major statistics, and these may be used to construct unadjusted confidence intervals, if required.

17.3.3 Resource Reference

In the TIMSS 1999 reports, the most important background data displays are provided in the body of the text, with supporting exhibits included in a resource reference section for each chapter. The resource reference provides support for the main report chapters, containing detailed information about the component variables that went into computing the indices and on other variables of secondary interest, particularly some that were included in the 1995 report. In addition, trend data for component variables of an index were sometimes presented in the resource reference. For example, the index of home educational resources was supported by five exhibits presenting the component variables used to compute the index: number of books in the home; educational aids in the home; highest level of education of either parent; trends in educational aids in the home; and trends in number of books in the home. In addition, an exhibit in the resource reference section described country modifications in the definitions of educational levels for the parents' education.

17.4 Development of the International Reports

Like TIMSS in 1995, TIMSS 1999 was designed to investigate student learning of mathematics and science and the way in which aspects of the education systems, the schools, the teachers, and the students themselves relate to the learning opportunities and experiences of individual students. In trying to assess the influences on student learning put forth by the model as key determi-

○○○

2. See Chapter 16 for a description of the Bonferroni correction.

nants of achievement – the system, schools, teachers, and students – the TIMSS International Study Center included in the initial report outlines as much information as possible about the following major areas:

- The curricular context of students' learning
- System-level characteristics
- School contexts
- Teacher qualifications and characteristics
- Instructional organization and activities
- Students' backgrounds and attitudes towards mathematics and science

Within each category aspects identified as key features of the educational process were included in the outlines as proposed subsections.

The goal of the international reports was to present as much descriptive information about the contexts for learning mathematics and science as possible without overburdening the reader. Indices based on variables from the TIMSS 1999 background questionnaires were proposed to summarize information. The TIMSS 1995 reports were reviewed to identify other key variables that should be included in 1999. Trend analyses were proposed for all indices and other key variables where comparable data were obtained in 1995 and 1999.

Analyses required to present indices and other descriptive data were planned and prototype exhibits prepared. This required a careful review of the questionnaires, detailed documentation of the variables and response categories, the development of general analysis plans (including the cutoffs for high, medium, and low levels of indices), and the specification of any country-specific modified analyses required to account for national adaptations. These plans were documented in analysis notes for each proposed exhibit.

The analysis plans, report outlines, and prototype exhibits were drafted by the International Study Center and underwent a lengthy review involving the National Research Coordinators and project staff. Consensus was then built among the constituents as to the reporting priorities for the first international reports including which indices and variables should be reported, how much information should be included, and which trend tables to present. The analysis plans, outlines, and prototype exhibits were again reviewed at the fifth meeting of the TIMSS 1999 National Research Coordinators in Kuala Lumpur, Malaysia, in October 1999, and then at the sixth meeting in Antalya, Turkey, in February 2000. Following each meeting, the material was revised and updated to reflect the ideas and suggestions of the coordinators. Some exhibits were deleted or added, and some of the analyses or presentational modes were modified.

After the data for all countries became available for analysis in the spring of 2000, the International Study Center, with support from the IEA Data Processing Center, conducted the analyses documented in the analysis notes. NRCs were given the opportunity to review the first draft tables in light of their national data in a mailout review in May, 2000, and to comment on the quality and consistency of their background data. Feedback from NRCs was incorporated into the draft exhibits prepared for international review at the final meeting of National Research Coordinators held in August, 2000, in Helsinki, Finland. As a result of this review, some tables and figures were modified and some deleted. For example, the cutoffs for high, medium, and low levels of some indices were changed, and for some categorical variables, categories were modified to reflect the distribution of student responses. Further refinements were made following that meeting and final drafts were sent to NRCs in September, 2000. Final revisions were made in October and November, and the two reports were published in December 2000 (Mullis et al., 2000; Martin et al., 2000).

17.5 Reporting Student Background Data

Reporting the data from the student questionnaire was fairly straightforward. Most of the tables in the international reports present weighted percentages of students in each country for each response category, together with the mean achievement (mathematics or science) of those students. International averages are also displayed for each category. In general, jackknife standard errors accompany the statistics reported.[3] In addition to the exhibits showing percentages of students overall, the international reports include some information separately by gender. For gender-based exhibits, the percentages of boys and girls in each category were displayed, and the statistical significance of the difference between genders was indicated.

○○○

3. See Chapter 12 for a description of the jackknife methodology.

Reporting student attitudes, self-perceptions, and activities related to science was complicated by the fact that in some countries, science is taught as a general, integrated subject, while in others the fields of science - earth science, physics, chemistry, and biology - are taught as separate subjects. Countries could choose the appropriate version of the student questionnaire: the general science version or the version for countries with separate science subjects. The exhibits showing results for questions that differed in the two versions have separate sections that display the data for countries that administered each one.

In the exhibits based on questions asked about the separate sciences, data were presented in five panels corresponding to the types of science subjects included in the international version of the student questionnaires: general/integrated science and the four separate science subjects (earth science, life science, physics, and chemistry). Countries appear in the appropriate panels. In some countries, earth science or chemistry was not applicable for the eighth grade, and these countries were excluded from these panels. Also, in some countries combined courses such as physical science (physics/chemistry) or natural science (biology/earth science) were taught. In these cases, separate questions were still asked about separate science subjects (earth science, biology, physics, and chemistry), and the student data were reported in all panels. An exception was the Netherlands, where students were asked about earth science, biology, and physics/chemistry. The data for the physics/chemistry questions for this country were presented in the physics panel, and no data were presented in the chemistry panel.

In TIMSS 1999, 23 countries administered the general version of the student questionnaire, and 15 countries the separate science subject version. Table 17.2 lists the countries administering the general and separate science versions and indicates which science subjects were taught in each of the latter. In two countries, Chinese Taipei and Indonesia, the sciences were taught as separate subjects but students receive a single science course grade, and so the general version of the student questionnaire was administered. In both countries, student data were displayed in the general/integrated science panel.

Table 17.2 Countries that Administered the General Science and Separate Science Subject Versions of the Student Questionnaire

Country	General Version	Separate Science Version			
	General / Integrated Science	Earth Science	Biology	Physics	Chemistry
Australia	●				
Belgium (Flemish)		●	●	●	
Bulgaria		●	●	●	●
Canada	●				
Chile	●				
[a] Chinese Taipei	●				
Cyprus	●				
Czech Republic		●	●	●	●
England	●				
Finland		●	●	●	●
Hong Kong, SAR	●				
Hungary		●	●	●	●
[b] Indonesia	●				
Iran, Islamic Republic	●				
Israel	●				
Italy	●				
Japan	●				
Jordan	●				
Korea, Republic of	●				
Latvia			●	●	●
Lithuania			●	●	●
Macedonia, Republic of		●	●	●	●
Malaysia	●				
Moldova		●	●	●	●
Morocco		●	●	●	●
[c] Netherlands		●	●	●	●
New Zealand	●				
Philippines	●				
Romania		●	●	●	●
Russian Federation		●	●	●	●
Singapore	●				
Slovak Republic		●	●	●	●
Slovenia			●	●	●
South Africa	●				
Thailand	●				
Tunisia	●				
Turkey	●				
United States	●				

a Chinese Taipei: separate sciences are taught starting in grade 7, with biology in grade 7 and physics/chemistry in grade 8. Since the students in the target grade take only one science course (physics/chemistry), the general version of the questionnaire was administered and students were asked about 'natural science', which would pertain to the physics/chemistry course in grade 8"

b Indonesia: students are taught 'IPA science' by separate biology and physics teachers, but students receive a single composite grade. The general version of the questionnaire was used, and students were asked about 'IPA science'.

c Netherlands: students were asked questions about integrated physics/chemistry; data for questions pertaining to physics/chemistry were reported in the physics panel.

17.6 Reporting Teacher Background Data

In the eighth grade, different teachers generally teach mathematics and science. Accordingly, there was a questionnaire for mathematics teachers and another for science teachers, the two having some general questions in common but different subject-matter-related questions.The procedure was to sample a mathematics class from each participating school, administer the test to those students, and ask all their mathematics and science teachers to complete a teacher questionnaire. In countries with different teachers for each of the science subjects, this included all science teachers of the students in the sampled classes.[4] The teacher questionnaire was divided into two sections: Section A asked about teachers' general background and Section B asked class-specific questions about instructional practices. Where teachers taught more than one mathematics or science class to the sampled students, they were to complete only one Section A but a separate Section B for each class taught. Thus, the information about instruction was tied directly to the students tested and the specific mathematics and science classes in which they were taught.

Because the sampling for the teacher questionnaires was based on participating students, these responses do not necessarily represent all of the teachers of the target grade in each of the TIMSS countries. Rather, they represent teachers of the representative samples of students assessed. It is important to note that in the international reports, the student is always the unit of analysis, even when information from the teacher questionnaires is being reported. That is, the data presented are the percentages of *students* whose teachers reported various characteristics or instructional strategies. Using the student as the unit of analysis makes it possible to describe the instruction received by representative samples of students. Although this approach may provide a different perspective from that obtained by simply collecting information from teachers, it is consistent with the TIMSS goals of illuminating students' educational contexts and performance.

Data collected from mathematics teachers were presented in the international mathematics report, and those collected from science teachers in the science report. As in reporting the student background data, most exhibits based on teacher responses dis-

4. In Slovenia and the Slovak Republic, background questionnaires were administered to only one of the separate science subject area teachers for the sampled mathematics classes. As a result, science teacher background data are not available for more than half of the relevant science teachers, and Slovenia and the Slovak Republic are not included in the exhibits based on science teacher data.

played percentages of students in different categories for each country and on average internationally. Where possible and relevant, the average achievement of students was reported for each category in an exhibit to show the relationship with achievement. Trends in the percentages of students were also displayed where appropriate. For indices computed from teacher data, percentages of students and average achievement are displayed at the high, medium, and low level for the index.

The data obtained from the science teachers were displayed in two ways. Some of the general information data were presented together for all science teachers in each country. The data for information specific to the science subject, such as preparation to teach the sciences, instructional time in the sciences, and emphasis on experiments, were presented both for the general/integrated science and for the separate science subject area teachers. The tracking information provided by schools that identified teachers by the type of course taught to the sampled students - mathematics, physics, biology, chemistry, earth science, or integrated science - was used to organize the panels for exhibits showing data for the separate sciences.

In general, the countries displayed in the separate science panels correspond to those in Exhibit 17.2. Exceptions include Chinese Taipei and Indonesia, which were shown in the separate science panels in the exhibits based on science teacher data but in the general/integrated panels in the exhibits based on student data. Although the students were asked the general science questions, the teachers in Chinese Taipei were identified as physics/chemistry teachers and were reported in the physics panel; the teachers in Indonesia were identified as biology or physics teachers, and were reported in the corresponding panels. Furthermore, in a few other countries, some combined science subjects were taught by the same teachers. In Finland, Morocco, and the Netherlands, some teachers were identified as physics/chemistry teachers; in Finland and Morocco, some were identified as biology/earth science teachers. The data for teachers who teach more than one subject were reported in only one panel to avoid duplicating the information; biology/earth science was reported in the biology panel and physics/chemistry in the physics panel.

Another consequence of the TIMSS design was that since students were usually taught mathematics and science by different teachers and often were taught one subject by more than one teacher, they had to be linked to more than one teacher for reporting purposes. When a student was taught a subject by more than one teacher, the student's sampling weight used in reporting results for the subject was distributed among those teachers. The student's contribution to student population estimates thus remained constant regardless of the number of teachers.This was consistent with the policy of reporting attributes of teachers and their classrooms in terms of the percentages of students taught by teachers with these attributes. Exceptions were where student-level variables were based on composite responses of all of the students' teachers in a given subject. Analyses of this type involved computing the sum or determining the highest value reported across all of a student's teachers. The composite values obtained were then used to produce the reported student-weighted statistics (e.g., total instructional time in the subjects and the degree of content coverage in mathematics or science).

17.7 Reporting School Background Data

The principals of the selected schools in TIMSS completed questionnaires on the school contexts in which the learning and teaching of mathematics and science occur. Although schools constituted the first stage of sampling, the TIMSS school sample was designed to optimize the student sample, not to provide an optimal sample of schools.[5] Therefore, like the teacher data, the school-level data were reported using the student as the unit of analysis to describe the school contexts for the representative samples of students. In general, the exhibits based on the school data present percentages of students in schools with different characteristics for each country and for the international average. In a few instances, average numerical values for open-ended questions were computed across students (e.g., instructional time, and hours the principal spends on different activities).

17.8 Reporting Curriculum Questionnaire Data

One chapter in each of the 1999 international mathematics and science reports was devoted to data from the curriculum questionnaire. This chapter included summary information about the structure and organization of the mathematics and science curriculum: the level of centralization (i.e., national, regional, local); when the curriculum was introduced and its current status; meth-

5. See Chapter 2 for a description of the TIMSS sample design.

ods used to support and monitor curriculum implementation; use of public examinations and system wide assessments; percentage of instructional time specified for mathematics and science; differentiation of instruction for students with different abilities or interests; emphasis placed on different approaches and processes; and subjects offered at the eighth grade (science only). For TIMSS countries without a national curriculum (i.e., Australia, Canada, and the United States), composite information that reflected the curriculum across the states or provinces was provided in answer to most questions.

A major function of the curriculum questionnaires was to collect information about which topics in mathematics and science were intended to have been taught by the end of the eighth grade. Responses were summarized to give the percentage of the topics in each content area that were intended to be taught to all or almost all of the eighth-grade students in each country. Detailed information on the percentage of students intended to be taught each individual mathematics or science topic was reported in the accompanying reference section. Most of these topics were addressed by items on the TIMSS achievement tests. (In the teacher questionnaires, these topics were also presented to the mathematics and science teachers, who were asked to what extent they had been covered in class during the year or in previous years.) The curriculum chapters in the international reports present both teachers' reports of the topics actually taught (i.e., the implemented curriculum) and National Research Coordinators' reports of topics intended to be taught (i.e., the intended curriculum), providing complementary perspectives on the coverage of the mathematics and science curriculum in each country.

17.9 Reporting Response Rates for Background Questionnaire Data

While it is desirable that all questions included in a data collection instrument be answered by all intended respondents, a certain percentage of non-response is inevitable. Not only do some questions remain unanswered; sometimes entire questionnaires are not completed or not returned. In TIMSS 1999, since teachers, students, or principals sometimes did not complete the questionnaire assigned to them or some questions within it, certain variables had less than a 100% response rate.

The handling of non-responses varied depending on how the data were to be reported. For background variables that were reported directly, the non-response rates indicate the percentage of students for whom no response was available for a given question. In general, derived variables based on more than one background question were coded as missing if data for any of the required background variables were missing. An exception were indices. Cases were coded as missing for an index variable only if there was no response for more the one-third of the questions used to compute the index; index values would be computed if there were valid data for at least two-thirds of the required variables.

The tables in the TIMSS international reports contain special notations on response rates for the background variables. Although in general the response rates for the student and school background variables were high, some variables and some countries exhibited less than acceptable rates. The non-response rates were somewhat higher for the teacher background data, particularly in cases where teachers were required to complete more than one questionnaire. Since the student is the unit of analysis, the non-response rates given in the international reports always reflect the percentage of students for whom the required responses from students, teachers, or schools were not available. The following special notations were used to convey information about response rates in tables in the international reports.[6]

- For a country where student, teacher or school responses were available for 70% to 84% of the students, an "r" appears next to the data for that country.
- When student, teacher or school responses were available for 50% to 69% of the students, an "s" appears next to the data for that country.

6. Since the information from the country questionnaires was obtained at the national level, no non-response flags were necessary in exhibits based on these data.

- When student, teacher or school responses were available for fewer than 50% of the students, an “x” replaces the data.
- When the percentage of students in a particular category fell below 2%, achievement data were not reported in that category. The data were replaced by a tilde (~).
- When data were unavailable for all respondents in a country, dashes (–) were used in place of data in all of the affected columns.[7]

For the trend exhibits, which displayed data for both 1995 and 1999, the non-response notation was determined by the lower of the two response rates. Since response rates for some variables were lower in 1995, this sometimes led to the data for a country being replaced with xx’s or dashes in the trend exhibit, even though response rates for their 1999 data were acceptable.

17.10 Summary

This chapter presented how TIMSS reported and analyzed the background data from students, teachers, schools and NRCs. It documented how summary indices were created, trend data was reported, and the consensus approach used in developing the international reports.

7. A dash usually indicates that a background question was not administered in a country, but could also reflect translation problems or the administration of a question that was judged to be not internationally comparable. In the exhibits based on the separate science subjects, dashes for specific countries reflect the specific science subjects not included in each country.

References

Martin, M.O., Mullis, I.V.S., Gonzalez, E.J., Gregory, K.D., Smith, T.A., Chrostowski, S.J., Garden, R.A., & O'Connor, K.M. (2000). *TIMSS 1999 International Science Report: Findings from IEA's Repeat of the Third International Mathematics and Science Study at the Eighth Grade*. Chestnut Hill, MA: Boston College.

Mullis, I.V.S., Martin, M.O., Gonzalez, E.J., Gregory, K.D., Garden, R.A., O'Connor, K.M., Chrostowski, S.J., & Smith, T.A. (2000). *TIMSS 1999 International Mathematics Report: Findings from IEA's Repeat of the Third International Mathematics and Science Study at the Eighth Grade*. Chestnut Hill, MA: Boston College.