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## TIMSS Questionnaire Development<sup>1</sup>

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### 3.1 Overview

Just as the TIMSS Benchmarking study used the U.S. versions of



Building on this view of the educational process, TIMSS in 1995 sought to assess, through context questionnaires, the factors likely to influence students' learning of mathematics and the sciences at the national (or regional), school, classroom, and student level (Schmidt and Cogan, 1996).

### 3.3 Research Questions

Consistent with TIMSS 1995, TIMSS 1999 posed four general research questions to guide the development of the tests and questionnaires and to provide a focus for the analysis and reporting of results: What kinds of mathematics and science are students expected to learn? Who provides the instruction? How is instruction organized? What have students learned?

What students know and are expected to learn was addressed by questionnaires distributed to mathematics and science curriculum experts in participating countries. The characteristics and preparation of mathematics and science teachers were addressed by questionnaires distributed to school principals and teachers. The third question, on instructional approaches to the teaching of mathematics and science, was also addressed by questionnaires to principals and teachers, as well as to students. The fourth question, what students had learned, was examined by measuring performance on the TIMSS 1999 achievement tests.

The research questions cast a broad net for exploring factors potentially associated with achievement in mathematics and science. For example, in attempting to answer the question "Who provides the instruction?" the questionnaires tapped characteristics of the instructor, such as gender, age, years of experience, attitude toward the subject, and time spent preparing lessons. The national options also allowed the U.S. and Benchmarking jurisdictions to gain additional information on teachers' professional development activities. The background questionnaires enable researchers to investigate the most influential characteristics of the people, practices, and policies affecting student achievement.

### 3.4 Curriculum Questionnaires

The TIMSS 1999 study included Curriculum Questionnaires that were not available for the 1995 survey. These were designed to collect basic information about the organization of the mathematics and science curriculum in each country and Benchmarking jurisdiction, and about the topics intended to be covered up to the eighth grade. Coordinators in each country and jurisdiction were



### 3.5 School Questionnaire

The School Questionnaire was completed by the school principal and was designed to elicit information concerning some of the major factors thought to influence student achievement. Several important research questions addressed by the School Questionnaire were:

- What staffing and resources are available at each school?
- What are the roles and responsibilities of the teachers and staff?
- How is the mathematics curriculum organized?
- How is the science curriculum organized?
- What is the school climate?

In addition to questions asked internationally, the U.S. and Benchmarking School Questionnaire gathered information on the percentage of students at each school eligible to receive free or reduced-price lunches, to be used as an indicator of socio-economic status.

#### 3.5.1 Changes from the 1995 Questionnaire

For the most part, the TIMSS 1999 international School Questionnaire was very similar to the 1995 version. Four questions about scheduled time for teachers were removed, since they seemed more appropriate to the Teacher Questionnaires. Questions on computer availability were revised and extended to include access to the Internet for instructional or educational purposes. Finally, questions dealing with provisions for students of different abilities were extensively revised, since responses to the original questions were not as informative as expected.

The complete contents of the School Questionnaire are described further in Exhibit 3.4.

### 3.6 Teacher Questionnaires

Typically, a single mathematics class in each participating school was sampled for the TIMSS 1999 testing. The mathematics teacher of that class was asked to complete a questionnaire that sought information on the teacher's background, beliefs, attitudes, educational preparation, and teaching load, as well as details of the instructional approach used in teaching mathematics to the class. The science teacher (or teachers) of the students in that class was asked to complete another questionnaire, which in many respects paralleled that for the mathematics teachers. Although the general background questions were the same for the two versions, questions pertaining to instructional

practices, content coverage, classroom organization, teachers' perceptions about teaching, and their views of subject matter were geared toward mathematics or science. Many questions, such as those related to classroom characteristics, activities and



The second section of the Teacher Questionnaires dealt with teaching mathematics or science to the class sampled for TIMSS 1999 testing. This section was shortened, mainly by omitting a set of questions on teaching activities in a recent lesson. A lengthy set of questions on the coverage of mathematics and science topics in class was also simplified and shortened considerably. Additions to the Teacher Questionnaires for 1999 included questions on subject matter emphasis in class, use of computers and the Internet in class, and teacher activities in class. Two further sections of the original questionnaires, dealing with opportunity to learn and pedagogical approach, were judged by NRCs to be too lengthy; these were omitted from the field-test versions, and consequently also from the TIMSS 1999 final questionnaires.

The complete contents of the Mathematics and Science Teacher Questionnaires are described further in Exhibit 3.5.

### 3.7 Student Questionnaire

Each student in the sampled class was asked to complete a Student Questionnaire, which sought information about the student's home background, attitudes and beliefs about mathematics and science, and experiences in mathematics and science class. As in TIMSS 1995, two versions of the questionnaire were used internationally:

- The **General Science Version** was intended for systems where science is taught as a single integrated subject
- The **Separate Science Subject Version** was intended for systems where science is taught as separate subjects (i.e., biology, chemistry, earth science, and physics)

Countries administered the version that was consistent with the way in which science instruction was organized at the target grade. U.S. and Benchmarking entities administered the general science version. Although the two versions differed with respect to the science questions, the general background and mathematics-related questions were identical across the two. In the general science version, science-related questions pertaining to students' attitudes and classroom activities were based on single questions asking about "science," to which students were to respond in terms of the "general or integrated science" course they were taking. In the separate science subject version, several

questions were asked about each science subject area, and students were to respond with respect to each science course they were taking. This structure accommodated the diverse systems that participated in TIMSS.

Consistent with the other questionnaires, the Student Questionnaires were designed to elicit information on some of the major factors thought to influence student achievement. Several important research questions were:

- What educational resources do students have in their homes?
- What are the academic expectations of students, their families, and their friends?
- How do students spend their out-of-school time during the school week?
- How do students perceive success in mathematics and science?
- What are students' attitudes toward mathematics and science?

Changes from the 1995 Questionnaire

Five questions from the TIMSS 1995 Student Questionnaire that were considered to be of lesser importance were moved from the body of the questionnaire to the "international option" section at the end. Questions added to the TIMSS 1999 Student Questionnaire dealt with the following topics:

- Student self-concept in mathematics and science
- Internet access and use for mathematics and science activities
- Instructional activities in mathematics and science class

Experience with the TIMSS 1995 video study helped frame the questions on activities in mathematics and science class. The complete contents of the Student Questionnaires are described further in Exhibit 3.6.

### 3.8 Summary

The U.S. versions of the background questionnaires were very similar to the international versions; however, the U.S. chose to develop and include an additional section in the Teacher Questionnaire related to professional development activities. In addition, the mathematics and science international Curriculum Questionnaires were adapted to apply in the context of states and districts.

The School, Teacher, and Student Questionnaires used in the





Exhibit 3.2 Contents of the Science Curriculum Questionnaire

Question Number	Item Content	Description
PART I: Structure of the Curriculum		

**Exhibit 3.3 Contents of the Benchmarking Curriculum Survey and Interview**

State-level Question	District-level Question	Item Content	Description
NA	1	Level of Curriculum Development	Indicates the administrative level at which the curriculum is developed - state, district, or school and whether it is based on state standards.
1	NA	Curriculum Frameworks/ Content Standards	Indicates the title, date and organization of the state curriculum framework or content standards
2	2	Status of Assessments	Indicates current status of development of new assessments.
3		Assessments	Indicates assessments administered including criterion-referenced assessments and norm-referenced assessments.
3	NA	Consequences of Assessments	Indicates whether the state requires students to pass an exam for graduation, as well as other consequences for the student, school, or district based on results (includes sanctions and rewards).

Exhibit 3.4 Contents of the School Questionnaire

International Question Number	U.S. Question Number	Item Content	Description
1	1	Community	Situates the school within a community of a specific type.
2-4	2-4	Staff	Describes the school's professional full and part-time staff and the percentage of teachers at the school for 5 or more years.
5	5	Years Students Stay with Teacher	Indicates the number of years students typically stay with the same teacher.
6	6	Collaboration Policy	Identifies the existence of a school policy promoting teacher cooperation and collaboration.
7	7	Principal's Time	Indicates the amount of time the school's lead administrator typically spends on particular roles and functions.
8	8	School Decisions	Identifies who has the responsibility for various decisions for the school.
9	9	Curriculum Decisions	Identifies the amount of influence various individuals and educational and community groups have on curriculum decisions.
10	10	Formal Goals Statement	Indicates the existence of school-level curriculum goals for mathematics and science.
11-12	11-12	Instructional Resources	Describes the material factors limiting the school's instructional activities.
13	13	Students in the school	Provides total school enrollment and attendance data.
	13 (e.)	Students in the school	Provides percentage of students receiving free or reduced-price lunches.
14	14	Students in the target grade	Provides target grade enrollment and attendance data, student's enrollment in mathematics and science courses, and typical class sizes.
15	15	Number of Computers	Provides the number of computers for use by students in the target grade, by teachers, and in total.
16	16	Internet Access	Identifies whether the school has Internet access as well as identifying whether the school actively posts any school information on the world wide web.
17	17	Student Behaviors	

**Exhibit 3.5 Contents of the Teacher Questionnaires**

Question Number	U.S. Number	Item Content	Description
<b>Section A</b>			
1-2	1-2	Age and Sex	Identifies teacher's sex and age range.
	2b	Race / Ethnicity	Identifies teacher's race/ethnicity
3	3	Teaching Experience	Describes the teacher's number of years of teaching experience.
4-5	4-5	Instructional Time	Identifies the number of hours per week the teacher devotes to teaching mathematics, science, and other subjects.
6	6	Administrative Tasks	Identifies the number of hours per week spent on administrative tasks such as student supervision and counseling.
7	7	Other Teaching-Related Activities	Describes the amount of time teachers are involved in various professional responsibilities <i>outside</i> the formally-scheduled school day.
8	8	Teaching Activities	Describes the total number of hours per week spent on teaching activities.
9	9	Meet with Other Teachers	Describes the frequency with which teachers collaborate and consult with their colleagues.
10	10	Teacher's Influence	Describes the amount of influence that teachers perceive they have on various instructional decisions.
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Exhibit 3.6 Contents of the Student Questionnaires

Question Number		Item Content	Description
General Version (U.S.)	Separate Science Version		
1-4	1-4	Student Demographics	Provides basic demographic information such as age, sex, language of the home, whether born in country and if not how long he/she has lived in country. (U.S. version includes a question on race/ethnicity.)
5	5	Academic Activities Outside of School	Provides information on students' activities that can affect their academic achievement (e.g., extra lessons, science club).
6	6	Time Spent Outside of School	Provides information about the amount of time student spends on homework and leisure activities on a normal school day.
7	7	Parents' Education	Provides information about the educational level of the student's mother and father. Used as an indicator of the home environment and socioeconomic status.
8	8	Student's Future Educational Plans	Identifies the student's plans for further education.
9	9	Parents' Country of Birth	Provides information regarding immigrant status.
10	10	Books in the home	Provides information about the number of books in the home. Used as an indicator of the home environment and socioeconomic status.
11	11	Possessions in the home	Provides information about possessions found in the home (e.g., calculator, computer, dictionary, study desk, and country-specific items). Used as an indicator of academic support in the home environment as well as an indicator of socioeconomic status.
12	12	Mother's Values	Provides information about the student's perception of the degree of importance his/her mother places on academics and other activities. Used as an indicator of the home environment and general academic press.
13	13	Student's Behavior in Mathematics Class	Describes typical student behavior during mathematics lessons.
14	14	Peers' Values	Provides information about the student's perception of the degree of importance peers place on academics and other activities. Used as an indicator of peers' values and student's social environment.
15	15	Student's Values	Provides information about the degree of importance the student places on academics and other activities. Used as an indicator of student's values.
16	16	Competence in Mathematics / Science	Provides an indication of student's self-description of academic competence in mathematics and science (specialized version asks about biology, earth science, chemistry, and physics separately).
17	17	Difficulty of Mathematics	Describes student's perception of the difficulty level of mathematics.
18	18	Doing Well in Mathematics	Identifies student's attributions for doing well in mathematics.
19	19-22	Difficulty of Science	Provides a description of student's perception of the difficulty level of science (specialized version asks about biology, earth science, chemistry, and physics separately)
20	23	Doing Well in Science	Identifies student's attributions for doing well in science.



