Chapter 3

Developing the TIMSS 2003 Background Questionnaires

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3.1 Overview

For a fuller appreciation of what the TIMSS achievement results mean and how they may be used to improve student learning in mathematics and science, it is important to understand the contexts in which students learn. Therefore, TIMSS collects extensive information about the contexts for learning mathematics and science by administering a range of background questionnaires. Four types of background questionnaires were used in TIMSS 2003 to gather information at various levels of the educational system: (i) curriculum questionnaires addressed issues of system-wide curriculum design and support and curricular emphasis in mathematics and science; (ii) a school questionnaire asked school principals/headmasters of the students tested to provide information about curricular and instructional arrangements, school resources, and school climate; (iii) teacher questionnaires asked mathematics and science teachers of the students tested about their preparation to teach, their teaching activities and approaches, their attitudes toward teaching the subject matter, and the curriculum that is implemented in the classroom; and (iv) a questionnaire for the students

3.2.1 Development of the Contextual Framework

In conjunction with the updating of the original TIMSS assessment frameworks in mathematics and science (see Chapter 2), a new contextual framework was developed by the TIMSS & PIRLS International Study Center (ISC) in collaboration with the TIMSS 2003 Expert Panel.[1] The contextual framework, like the mathematics and science assessment frameworks, went through an extensive and widely consultative development process spanning approximately one year. This work was supported by a grant from the U.S. National Science Foundation, in response to the proposal "A New TIMSS for a New Century." The three overarching goals of this proposal were to update the TIMSS frameworks to ensure that the latest developments in mathematics and science would be addressed by the TIMSS 2003 assessment, develop detailed specificatc] n, ≠ pC tc]] pifi

Based on the input from the Expert Panel, ISC staff further revised the assessment frameworks for final review and approval by NRCs at the Second

the curriculum; defining the scope and content of the curriculum; organizing the curriculum, monitoring and evaluating the implemented curriculum; and providing curricular materials and support.

3.2.2.2 The Schools

In the TIMSS contextual model, the school is the institution through which the goals of the curriculum are implemented. TIMSS focuses on a set of indicators of school quality that research has shown to characterize schools that function as well-managed integrated systems supportive of teaching and

The development work began at the second NRC meeting in June 2001, when NRCs reviewed the TIMSS 1999 questionnaires in conjunction with the TIMSS 2003 contextual framework to advise what should be included in the 2003 assessment. Where questionnaire items had been used in the TIMSS 1999 international reports, NRCs decided that in general these items should be retained, preferably in the same form in order to measure trend. Items not reported in TIMSS 1999 were to be modified or deleted. NRCs also suggested to add or expand questions regarding the type of homework that students do, whether students get support for homework outside of school, the types of threats to safety that students experience, how teachers are licensed and evaluated, and the types of professional development that teachers undergo.

Working from the contextual framework and the TIMSS 1999 questionnaire review conducted by NRCs, staff at the International Study Center produced drafts of all the background questionnaires during the period of June through September 2001. The drafts were sent to members of the Questionnaire Item Review Committee for their review.[3] The first meeting of the Questionnaire Item Review Committee was held in October 2001 in Washington, D.C., at which the draft questionnaires were reviewed in detail. QIRC members suggested many improvements, as well as ways to reduce response burden by eliminating some questions thought to be less useful for reporting purposes. Following this meeting, the suggested revisions were implemented, and the revised drafts were submitted to further internal review at the ISC. The draft questionnaires were then provided to NRCs for their review at the Third TIMSS 2003 National Research Coordinators' Meeting, held in December 2001 in Madrid, Spain. NRCs suggested a number of improvements to the questionnaires that were to be field tested, and these revisions were implemented by the ISC during January 2002, in preparation for the field test. The field-test instruments were then provided to NRCs for translation, production, and administration.[4]

The TIMSS 2003 field test was conducted during April through June

After administering the field test, countries prepared their data files and sent them to the IEA Data Processing Center for checking and cleaning. After the field-test data were verified and transformed into the international format, they were sent to the International Study Center for analysis, and for review by the QIRC and NRCs. To facilitate review of the questionnaire data, the ISC prepared three data almanacs each for fourth and eighth grades, one for the school questionnaire, one for the teacher questionnaire, and one for the student questionnaire. For every country that participated, each almanac displayed student-weighted distributions of responses to each item in the questionnaires. For categorical variables, the weighted percentage of respondents choosing each option was shown together with the corresponding average student achievement in mathematics and science. For questions with numeric responses, the mean, mode, and selected percentiles were given. The almanacs were the basic data summaries that were used by ISC staff, the QIRC, and NRCs in assessing the quality of the field-test instruments and in making suggestions for the instruments to be used in the main data collection.

The initial review of the field-test results was conducted by the International Study Center in early July 2002. The questionnaire items were reviewed in terms of how well they worked both across countries and within individual countries. Based on this review, ISC staff made some improvements to the school, teacher, and student questionnaires, upon consultation with the QIRC. Also at this time, drafts of the curriculum questionnaires (which were not field tested) were completed.

At its second meeting, in July 2002 in Amsterdam, QIRC members reviewed the field-test results for the school, teacher, and student questionnaires, examining the statistics for each item and determining if there were any anomalies. Items that did not work well were deleted. The committee also discussed potential improvements suggested by the ISC, suggested modifications to some items, and arrived at a set of recommended changes to be brought before NRCs at their next meeting. The QIRC also proposed some refinements to the draft curriculum questionnaires.

During the latter half of July 2002, staff at the International Study Center prepared draft instruments for the main survey and documented the recommended changes from the field-test version for review by NRCs at the Fifth TIMSS 2003 National Research Coordinators' Meeting, held in late July and early August 2002 in Tunis, Tunisia. The draft instruments were well received and widely discussed by NRCs, who recommended a number of additional improvements. A substantial organizational change was made to the fourth grade teacher questionnaire, to facilitate data collection in coun-

tries where mathematics and science at fourth grade were taught by different teachers. Immediately after the NRC meeting, ISC staff finalized the instruments, and these were provided to NRCs during the latter part of August, for translation, production, and administration in the main TIMSS 2003 data collection, which was held during September through November 2002 in southern hemisphere countries and during February through July 2003 in northern hemisphere countries.

3.3.2 Content of the Background Questionnaires

The curriculum, school, teacher, and student questionnaires used in TIMSS 2003 were developed from the TIMSS 1999 questionnaires. While most of the questions were thematically similar in both assessments, some questions from 1999 were eliminated, some were modified with the intention of refining them, and some new questions were introduced in 2003, either as replacements for eliminated items or to provide additional information in areas deemed important to the study. In general, every effort was made to streamline the questionnaires in order to limit response burden. Based upon the guidelines specified in the contextual framework, new emphasis was placed upon the areas of teacher preparation and professional development, and the access to and use of technology for teaching and learning.

The organization of the questionnaires was improved so that the questions were more clearly organized into logical blocks, each with a heading. The design and layout also was improved to make the questionnaires easier to complete, especially where filter questions were used. Parallel questions were used in different questionnaires to measure the same constructs from different sources, and wherever possible the wording of such questions was identical. Questions that addressed the focus areas of teacher preparation and professional development, and use of technology for teaching and learning, were included in the four different questionnaire types.

The content of the TIMSS 2003 background questionnaires used to collect information about the contexts for learning mathematics and science is described below.

3.3.2.1 Curriculum Questionnaire

The fourth- and eighth-grade curriculum questionnaires for mathematics and science were addressed to National Research Coordinators, who were asked to supply information about their nation's mathematics and science curricula in the target grades, drawing on the expertise of curriculum specialists in their countries. The curriculum questionnaires were designed to collect basic information about the organization of and support for the intended mathematics

and science curriculum in each country, and whether the mathematics and science topics included in the TIMSS 2003 assessment were included in the country's intended curriculum through the target grade. The four versions of the curriculum questionnaire were the same in structure and very similar

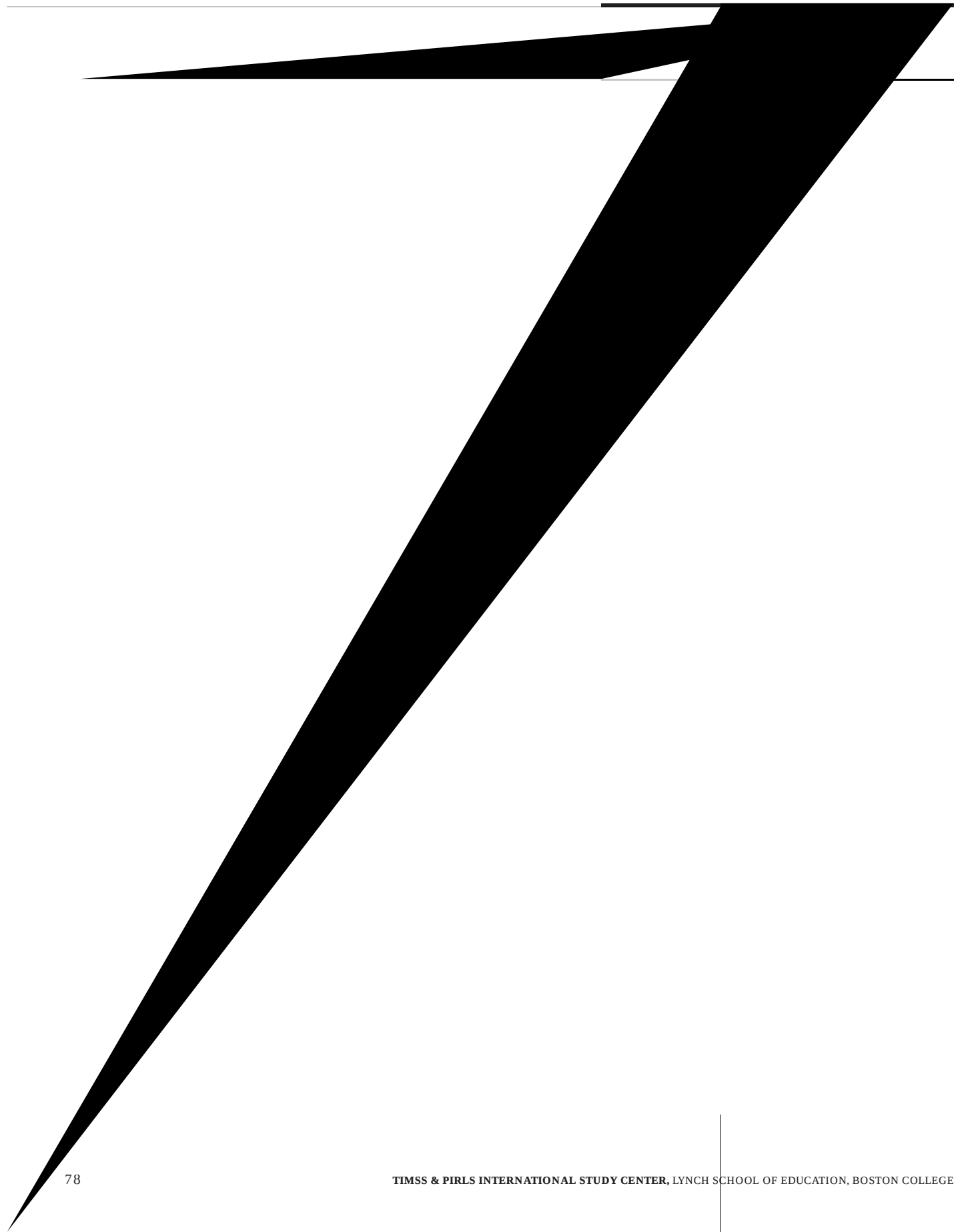

Exhibit 3. 2 **Content of the TIMSS 2003 School Questionnaires at the Eighth and Fourth Grades** *(...Continued)*

Fqbi Kri bo		Fqbi @lkqbkq	Abp`ofmqflk
Do^ab 5	Do^ab 1		
15	15	Differentiation of science curriculum	How the school organizes science instruction for students with different levels of ability
16	16	Tracking in science	Whether the students are grouped by ability in their science classes
17	17	Enrichment/ remedial science	Whether the school offers enrichment and remedial courses in science
18	18	Teacher vacancies	Difficulty in filling teacher vacancies in mathematics, science, and computer science/information technology (4th grade version does not ask about specific subjects)
19	19		

in that class was asked to complete a science teacher questionnaire, which paralleled that for the mathematics teacher. Although the general background questions were essentially the same for all versions, questions pertain !

- What is the educational attainment of the students' parents, and what are the students' own educational aspirations?
- What is students' affinity for learning mathematics and science, and how do they perceive success in and the utility of learning mathematics and science?
- What types of learning activities do students engage in in their mathematics and science lessons?
- Do students use a computer, where, and for what learning activities?
- What are students' perceptions about school climate and school safety?
- How do students spend their time outside of school?
- How much homework do students do?

The TIMSS 2003 student questionnaires were designed to take about 30 minutes to complete. The complete contents of the TIMSS 2003 student questionnaires are described in Exhibit 3.5 for the eighth grade and in Exhibit 3.6 for the fourth grade.

Exhibit 3. 3 **Content of the TIMSS 2003 Mathematics and Science Teacher Questionnaires at the Eighth Grade**

Fabi Kri bo		Fabi @lkabka	Abp`ofmqflk
J^qebi^qf`p Ob^`ebo Nrbpqflkk^fob	P`fbk`b Ob^`ebo Nrbpqflkk^fob		
1	1	Age	Teacher's age
2	2	Gender	Teacher's gender
3	3	Teaching experience	Number of years as a teacher
4	4	Formal education	Highest level of formal education completed by the teacher
5	5	Teacher training	Number of years of pre-service teacher training completed by the teacher
6	6	Major area of study	Teacher's major area of study during post-secondary education
7	7	Teaching requirements	Requirements the teacher had to satisfy in order to become a teacher
8	8	Teaching license	Whether the teacher has a teaching license or certificate, and the type of license
9	9	Preparation to teach	How ready the teacher feels to teach the topics included in the TIMSS mathematics/science test
10	10	Teaching load	Number of periods for which the teacher is formally scheduled per week for various activities, and number of minutes in a period
11	11	Extra working time	Number of hours teacher spends on teaching-related

Exhibit 3. 5 **Content of the TIMSS 2003 Student Questionnaire at the Eighth Grade**

Fab i Kr i bo		
Dbkbo^i p`fbk`b sbopfl k	Fab i @l kabka	Abp`ofmqfl k

Exhibit 3. 5 **Content of the TIMSS 2003 Student Questionnaire at the Eighth Grade**
(...Continued)

Fqbi Kri bo			
Dbkbo^i p`fbk`b sboopflk	**Pbm^o^qb p`fbk`b pr_gb`qp sboopflk**	**Fabi @lkabka**	**Abp`ofmqflk**
-	19	Study chemistry	Whether the student is studying chemistry this year
-	20	Liking chemistry	How much the student likes and feels competent at chemistry
-	21	Valuing chemistry	Importance and value the student attributes to chemistry
-	22	Learning activities in chemistry	Frequency with which student does various learning activities in chemistry lessons
-	23	Study physics	Whether the student is studying physics this year
-	24	Liking physics	How much the student likes and feels competent at physics
-	25	Valuing physics	Importance and value the student attributes to physics
-	26	Learning activities in physics	Frequency with which student does various learning activities in physics lessons
14	27	Computers	Whether student uses a computer, where uses it, and frequency with which student uses a computer for various educational activities
15	28	School climate	Student's affinity for school, and perception of other students' motivastudents'