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Data Collection and Data Preparation
for TIMSS 1999 Countries

7.2.1 Responsibilities of the National Research Coordinator

In each country, the national research coordinator was the key person in conducting the field operations. The NRC was responsible for collecting the data for the TIMSS assessment according to internationally agreed procedures and preparing the data according to international specifications. Earlier chapters of this report have outlined the tasks of the NRC with regard to choosing a sample of schools and translating the achievement tests and questionnaires.¹ This section focuses on NRC activities with regard to administering the assessment in participating schools. Specifically, it describes the international procedures for sampling classes within schools; tracking classes, teachers, and students in the sampled schools; and organizing the administration of the achievement tests and questionnaires.

7.2.2 Documentation and Software

Participating countries were provided with a comprehensive set of procedural manuals detailing all aspects of the data collection.

- The *Survey Operations Manual* (TIMSS, 1997b) was the essential handbook of the NRC, and described in detail all of the activities and responsibilities of the NRC, from the moment the TIMSS instruments arrived at the national center to the moment the cleaned data files and accompanying documentation were submitted to the IEA Data Processing Center.
- The *TIMSS-R School Sampling Manual* (TIMSS, 1997d) defined the TIMSS 1999 target population and sampling goals and described the procedures for the sampling of schools.
- The *School Coordinator Manual* (TIMSS, 1997a) described the activities of the school coordinator (the person in the school responsible for organizing the TIMSS test administration), from the time the testing materials arrived at the school to the time the completed materials were returned to the national TIMSS center.
- The *Test Administrator Manual* (TIMSS, 1997c) described in detail the procedures for administering the TIMSS tests and questionnaires, from the beginning of the test administration to the return of the testing materials to the school coordinator.

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1. See chapter 4 for details of the translation and cultural adaptation task and chapter 5 for information about sampling of schools by participating countries.

- The *Scoring Guides for Mathematics and Science Free-Response Items* (TIMSS, 1998c) contained instructions for scoring the short-answer and extended-response test items.
- The *Manual for Entering the TIMSS-R Data* (TIMSS, 1998a) provided the NRC with instructions for coding, entering, and

serve this purpose well, and so were chosen as the sampling units. In countries where students attended different classes for mathematics and science, classrooms were defined on the basis of mathematics instruction for sampling purposes.²

The TIMSS design required that for each student in each sampled class, all eighth-grade mathematics and science teachers of those students be identified and asked to complete a Teacher Questionnaire.

When sampling mathematics classes in a school, the procedure was as follows:

- The NRC asked the school coordinator for a list of all mathematics classes in the target (eighth) grade along with the names of their mathematics teachers.
- The school coordinator sent the requested list to the NRC.
- The NRC transcribed the information onto a document known as a Class Sampling Form and applied a prescribed sampling algorithm to select one or more classes.
- For each sampled class, the NRC prepared a Teacher-Student Linkage Form designed to link the students in the class to each of their eighth-grade mathematics and science teachers. The form was then sent to the school coordinator to be completed.
- The school coordinator completed the Teacher-Student Linkage Form by listing all of the students in the class (name or identification number, date of birth, and sex), together with their mathematics and science teachers and classroom identifiers as necessary, and returned it to the NRC.
- From the information provided in the Teacher-Student Linkage Form, the NRC produced a Student Tracking Form, which listed all students in the class to be tested together with their TIMSS identification numbers and booklet assignments, and a Teacher Tracking Form, which listed all mathematics and science teachers of the students in the class, their student-teacher link numbers, and their questionnaire assignments. These forms were sent to the school coordinator along with the test instruments.

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2. For countries where a suitable configuration of classes for sampling purposes could not be identified, TIMSS also provided a procedure for sampling individual students directly.

- During testing, the test administrator and school coordinator used the tracking forms to record student and teacher participation, and returned them to the NRC after the testing together with the completed test booklets and questionnaires.

7.2.4 Excluding Students from Testing

Although all students enrolled in the target grade were part of the target population and were eligible to be selected for testing, TIMSS recognized that some students in every school would be unable to take part in the 1999 assessment because of some physical or mental disability. Accordingly, the sampling procedures provide for the exclusion of

Each student listed on the Student Tracking Form was assigned a student identification number. This was a seven-digit number consisting of the five-digit class ID plus a two-digit number corresponding to the student's sequential position on the Student Tracking Form. All students listed on the Student Tracking Form, including those marked for exclusion, had to be assigned a student ID.

All mathematics and science teachers of the selected classes (those listed on the Teacher Tracking Form) were assigned an ID that consisted of the three-digit school ID plus a two-digit number for the teacher. Since a teacher could be teaching both mathematics and science to some or all of the students in a class, a unique identification number was needed for each teacher/class and teacher/subject combination. This was achieved by adding a two-digit link number to the five digits of the teacher ID, giving a unique seven-digit teacher/class identification number. These procedures had to be carefully followed so that later each class could be linked to a teacher, and student outcomes could be analyzed in relation to teacher-level variables.

7.2.7 Assigning Testing Materials to Students and Teachers

Eight different test booklets were distributed to the students in each sampled class. Each student was required to complete one booklet and the student questionnaire. Booklets were assigned to students by the NRC using a random assignment procedure, and the assignment was recorded on the Student Tracking Form.

Each teacher listed on the Teacher Tracking Form was assigned a Mathematics or a Science Teacher Questionnaire. Where teachers taught both mathematics and science to the class, every



- Distributing the Teacher Questionnaires to the teachers listed on the Teacher Tracking Form, ensuring that the questionnaires were returned completed, and recording teacher participation information on the Teacher Tracking Form
- Preparing a report for the NRC about the test administration in the school
- Returning both completed and unused test materials and all tracking forms to the NRC.

The NRC prepared two packages for each sampled class. One contained the test booklets for all students listed on the Student Tracking Form and the other the Student Questionnaires. For each participating school, the test booklets and Student Questionnaires were bundled together with the Teacher Tracking Form and Teacher Questionnaires, the School Questionnaire, and the materials prepared for briefing school coordinators and test administrators, and were sent to the school coordinator. A set of labels and prepaid envelopes addressed to the NRC was included to facilitate the return of testing materials.

7.3 National Quality Control Program

The International Study Center implemented an international quality control program whereby international quality control monitors visited a sample of 15 schools in each country and observed the test administration. In addition, NRCs were expected to organize a national quality control program, based upon the international model. The national program required quality control monitors to document data collection activities in their country. They visited a 10% sample of TIMSS 1999 schools, observed testing sessions, and recorded compliance with prescribed procedures.

The International Study Center prepared the *Manual for National Quality Control Monitors* (TIMSS, 1998b), which contained information about TIMSS 1999 and detailed the role and responsibilities of the national quality control monitors.

Practice sets were created for the more difficult guides. These papers illustrated a range of responses, beginning with several clear-cut examples. About 10 to 15 responses were enough for most guides, but sometimes more practice was necessary.

7.5.2 Documenting the Reliability of the Free-Response Scoring

In order to demonstrate the quality of the TIMSS 1999 data, it was important to document the agreement between scorers. To establish the scoring reliability, NRCs were required to have a 25% random sample of each booklet type independently scored by two scorers. The degree of agreement between the two scores assigned was a measure of the reliability of the scoring process. Neither scorer knew the scores assigned by the other.

Since the purpose of the double scoring was to document scoring consistency, the procedure used in the reliability sample had to be as close as possible to that used for scoring the booklets in general. The recommended procedure was designed to blend the scoring of the sample in with the normal scoring activity, to take place throughout the scoring process, and to be systematically implemented across student responses and scorers.

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In scoring the booklets for the main data set, scorers entered their scores directly into the student booklets. Therefore, in order that the reliability scoring be done “blind” (i.e., so that the two scorers did not know each other’s scores), it had to be done before the main data were scored, and the reliability scores had to be recorded on a separate scoring sheet rather than in the booklets.

To implement the scoring plan effectively the scorers were divided into two equivalent teams (Team A and Team B) and booklets into two equivalent sets (Set A and Set B). The scorers in Team A scored 25% of the booklets in Set B and all the booklets in Set A, while the scorers in Team B scored 25% of the booklets in Set A and all of the booklets in Set B. Each team, therefore, handled both sets of booklets. For the set it handled first, the team scored every fourth booklet and recorded the results on a separate answer sheet (this was the reliability sample). In the other set, the team scored all booklets and wrote the scores directly into the booklets.

Periodically during the day, Team B scored the reliability sample (every fourth booklet) in the Set A batches, while Team A scored the reliability sample in the Set B batches. It was important that every fourth booklet be scored, and not just the top quarter in the set. When the reliability scoring was finished, Team B scorers marked it as completed and forwarded the batch to the Team A scorers. Similarly, the Team A scorers forwarded their scored reliability booklets from Set B to the Team B scorers. Once the booklets from Set A had been distributed to Team A scorers and the Set B booklets to the Team B scorers, all the free-response items were scored, and the scores were entered directly into the booklets.

7.6 Data Entry

The DPC provided an integrated computer program for data entry and data verification known as the DataEntryManager (DEM). This program worked on all IBM-compatible personal computers running under DOS, OS/2 or Windows 3.x, 95 or 98. It facilitated data entry directly from the tracking forms and test instruments and provided a convenient checking and editing mechanism. DEM also offered data and file management capabilities, interactive error detection, reporting, and quality control procedures. Detailed information and operational instructions were provided

in the DataEntryManager Manual. Since DEM incorporated the international codebooks describing all variables, use of the software ensured that the data files were produced according to the TIMSS 1999 rules and standards for data entry.

Although use of DEM for all data entry tasks was strongly recommended, NRCs were permitted to use their own procedures and computer programs as long as all data files conformed to the specifications of the international codebooks. NRCs who chose not to use DEM were responsible for ensuring that all data files were delivered to the DPC in the international format.

Even if NRCs did not use the DEM program for data entry, they still had to apply the data verification options of this program to verify their data before sending them to the DPC. The DEM data-checking facility could (1) identify problems in the identification variables, and invalid codes; and (2) identify problems in the structure of the data files, which could then be corrected before submission to the NRC.

Data files were regarded as having been satisfactorily checked only if the reports generated by the DEM program indicated no errors.

During the TIMSS 1999 main survey operations, data were gathered from several sources, including students, teachers, and principals, as well as from a range of tracking forms. Before beginning data entry, the NRC had to ensure that the corresponding tracking forms and instruments had been completed and sorted correctly. The data were entered into one of six data files, as follows:

- The School Background File contained information from the School Background Questionnaire
- The Mathematics Teacher Background File contained information from the Mathematics Teacher Questionnaire
- The Science Teacher Background File contained information from the Science Teacher Questionnaire
- The Student Background File contained information from the Student Background Questionnaire

When all data files had passed the DEM quality control checks, they were dispatched to the IEA Data Processing Center in Hamburg for further checking and processing.

7.7 Survey Activities Report

NRCs were requested to maintain a record of their experiences during the TIMSS 1999 data collection and to send a report to the International Study Center when data-collection activities were completed. This document described any problems or unusual occurrences in selecting the sample or securing school participation, translating or preparing the data-collection instruments, administering the tests and questionnaires, scoring the free-response items, or creating and checking the data files.

7.8 Summary

This chapter summarizes the design and implementation of the TIMSS 1999 international field operations from the point of first contact with the sampled schools to the return of the cleaned data files to the IEA Data Processing Center. Although the procedures were sometimes complex, each step was clearly documented in the TIMSS operations manuals and supported by training sessions at the NRC meetings. Chapter 8 describes the implementation of the field operation procedures within the United States in the TIMSS Benchmarking jurisdictions.

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