

# Chapter 5

## TIMSS Advanced 2008 Survey Operations Procedures

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### **5.1 Introduction**

To standardize survey operations procedures, the TIMSS & PIRLS International Study Center worked with the IEA Secretariat, the IEA Data Processing and Research Center (DPC), and Statistics Canada to develop survey operations procedures for each stage of the assessment, including contacting schools and sampling classes, preparing materials for data collection, administering the assessment, scoring the assessment, and creating the data files. The survey operations were designed to be flexible enough to meet the needs of individual participants, while meeting the high quality standards of IEA.

Each National Center, under the direction of its National Research Coordinator (NRC), was responsible for the implementation of TIMSS Advanced in that country. The NRC was the contact person for all those involved in TIMSS Advanced 2008 within the country, as well as the representative of the country at the international level. The

contribution that the NRCs made was crucial to successful survey administration.

### **Documentation and Software**

The TIMSS Advanced 2008 Survey Operations Procedures were described in five units, each accompanied by additional materials (e.g., more specialized manuals and software packages), if necessary. All materials were organized and distributed according to different stages of the study.

The units and accompanying materials are listed below.

- ◆ *Unit 1, Parts 1 and 2 – Conducting the TIMSS Advanced 2008 Field Test*
- ◆ *Unit 2 – Contacting Schools and Sampling Classes for TIMSS Advanced 2008 Assessment*
- ◆ *Unit 3 – Preparing Materials for the TIMSS Advanced 2008 Data Collection and Administering the Assessment*
- ◆ *Unit 4 – Scoring the TIMSS Advanced 2008 Assessment*
- ◆ *Unit 5 – Creating the TIMSS Advanced 2008 Data Files*
- ◆ *The School Sampling Manual*
- ◆ *The School Coordinator Manual*
- ◆ *The Windows Within-school Sampling Software and Manual* (This software enabled participants to randomly select classes in each sampled school. The software also was used to track school, teacher, student, and student-teacher linkage information; prepare the survey tracking forms; and assign test instruments to students, including printing labels for all the test booklets and questionnaires.)

- ◆ *The Test Administrator Manual*
- ◆ *The International and National Quality Control Monitor Manuals*
- ◆ *The Scoring Guides for Constructed-response Items*
- ◆ *The Windows Data Entry Manager Software and Manual* (This software was used for entering, editing, and verifying the TIMSS Advanced 2008 data. Along with the software, countries also received codebooks that described the properties and the layout of the variables to be entered from each TIMSS Advanced 2008 assessment instrument.)
- ◆ *The Cross-Country Scoring Reliability Software and Manual (CCSRs)*

## **5.2 Arranging for Data Collection**

Operationally, the data collection involved several preparatory steps, including the field test administration, contacting schools, sampling classes, and completing survey instruments.

### **TIMSS Advanced 2008 Field Test**

The TIMSS Advanced 2008 field test was designed to test the TIMSS Advanced 2008 survey operations procedures, with a small representative sample. All instruments and operational procedures were field-tested under conditions approximating, as closely as possible, those of the final data collection. This enabled the NRCs and their staff to become acquainted with the procedures and refine their national operations, and to provide feedback that was used to improve the procedures for the data collection. The field test contributed significantly to the successful execution of TIMSS Advanced 2008.

### Contacting Schools and Sampling Classes

One of the essential first steps in the TIMSS Advanced survey activities was to establish good working relationships with the schools that had been sampled to participate in the study (for more information on all sampling procedures, please refer to Chapter 4). NRCs were responsible for contacting these schools and encouraging them to take part in the assessment. This often involved obtaining support from national or regional educational authorities, depending on the national context.

In cooperation with school principals, national centers identified and trained School Coordinators for all participating schools. The School Coordinator could be a teacher or guidance counselor in the school, but not a teacher of the students who were being assessed. Several national centers had their own personnel fill this role, assigning them several schools in an area. School coordinators were provided with a *School Coordinator Manual* that described their responsibilities in detail, encouraging them to contact the NRC if they had any questions.

The responsibilities of the School Coordinator included providing the necessary information about their school; coordinating the date, time, and place for testing; identifying and training a Test Administrator; coordinating the completion of the Student Tracking Forms<sup>1</sup> and Teacher Tracking Forms<sup>2</sup>; distributing teacher and school questionnaires; and obtaining parental permission (if necessary). School Coordinators also ensured that all testing materials were received by the schools, kept secure at all times, and returned to the national center after the test administration.

A Class Listing Form was sent to each school coordinator to provide information on all the eligible classes in the school. Using this information, the national centers sampled classes within the schools. Intact classes had to be sampled, ensuring that every student

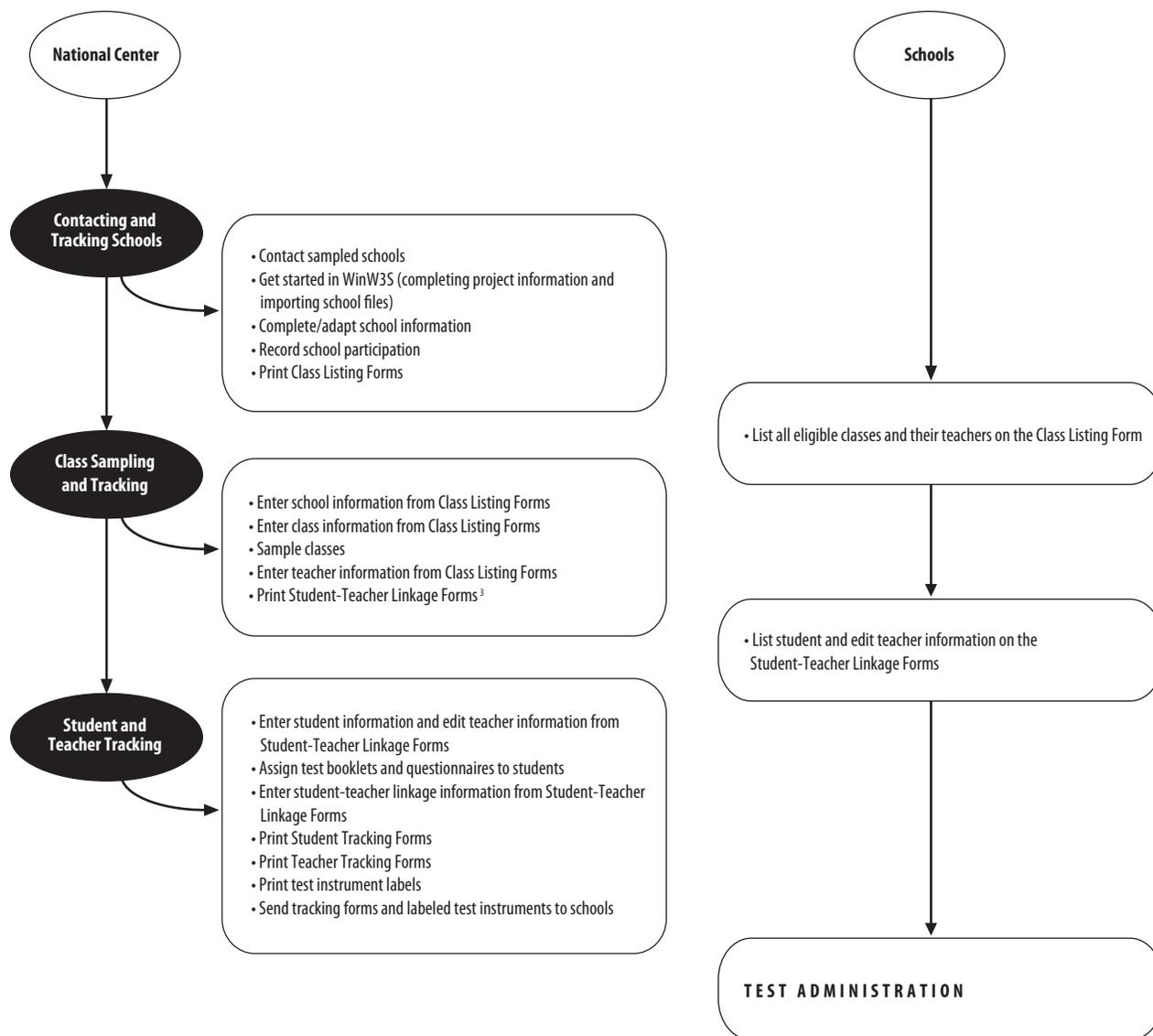
1 This form was created in WinW3S and sent to the schools with the students' test booklets and questionnaires for completion by the Test Administrators during test administration. The Test Administrators used this form to verify the assignment of test instruments to students and to indicate student participation.

2 This form was created in WinW3S and sent to School Coordinators with the teacher questionnaires. The School Coordinators used this form to indicate completion of the teacher questionnaires.

in the school was in only one class (course). Such an organization was necessary for a random sample of classes to result in a representative sample of students.

Exhibit 5.1 presents the major activities conducted by the national centers for working with schools to sample classes; track school, teacher, student, and student-teacher linkage information; and prepare for test administration.

**Exhibit 5.1 Procedures for Working with Schools to Prepare for Test Administration**



3 This form was created in WinW3S for each sampled class and sent to the school coordinators for completion. The school coordinators listed the names of the students and their teachers in the sampled classes; students' dates of birth, sex, and exclusion codes; and linked the students to their teachers.

### Linking Students to their Schools, Classes, and Teachers

To track students, teachers, classes, and schools, a system of hierarchical identification codes (IDs) was set up. The hierarchical identification numbers that uniquely identify the selected schools, classes, students, and teachers were created by the WinW3S software, as shown in Exhibit 5.2.

**Exhibit 5.2 Hierarchical Identification (ID) System**

Unit	ID Components	ID Structure	Numerical Example
School	School	CCCC	0001
Class	School + Class Within School	CCCCKK	000101
Student	School + Class Within School + Student Within Class	CCCCKKSS	00010103
Teacher	School + Teacher Within School	CCCCTT	000101
Teacher / Class Combination	School + Teacher Within School with Link Number	CCCCTT-LL	000101-02

Since in some cases a teacher might have taught more than one sampled class in a given school, it was necessary to have a unique identification number to distinguish the combinations of teacher and class. This was achieved by creating a two-digit link number so that, in combination with the teacher ID, insured student data were linked to the appropriate teacher data.

### Preparing the Test Instruments for Data Collection

The TIMSS Advanced achievement booklets and questionnaires were developed using the Adobe® InDesign® layout program. The TIMSS & PIRLS International Study Center provided countries with all the necessary instrument-production files, including fonts, style guides, graphics files, and explicit instructions (*TIMSS Advanced 2008 Survey Operations Procedures Unit 3*) on how to use the materials in order to produce high quality test instruments.

The goal of the test instrument preparation was to create internationally comparable assessment booklets and background questionnaires that were appropriately adapted for the national context. This began with translating the text of the test instruments from English into the language(s) used in the participating countries. All the translated contents of the test instruments (i.e., item blocks, introductory texts, cover pages, and questionnaires) were submitted to IEA for international translation verification, where independent translators provided suggested changes in the texts (for more information on translation and national adaptations of the TIMSS Advanced 2008 test instruments, please refer to Chapter 3).

Once the translation verification was done and the changes implemented into the test instrument production files, the item blocks, cover pages, and introductory texts were assembled into assessment booklets. The student questionnaires also required some assembly, since the general part was the same for students assessed in advanced mathematics and for students assessed in physics. School and teacher background questionnaires consisted of a single Adobe®InDesign® file and did not require any assembling.

#### **TIMSS & PIRLS International Study Center Review**

Before the test booklets and questionnaires were printed and administered to students, NRCs were required to submit a print-ready copy of each test instrument to the TIMSS & PIRLS International Study Center for layout verification and review of national adaptations. The national test instruments were checked against the international version to identify any deviations, and for any discrepancies in pagination, page breaks, item sequence, response options, text formats, graphics, etc.

As a result of the translation process, the test instruments from the participating countries varied in text length. The international versions, however, were designed with extra space in the margins to accommodate the use of longer texts and different sized paper without extensive layout changes. All deviations or errors were documented in the layout verification report forms and sent to the NRCs for their consideration. NRCs were expected to comment on whether or not each of the suggested changes had been made, and to include an explanation if a suggestion was not adopted.

This entire development and production process was designed to ensure that students from different countries experienced the test instruments in the same way, apart from the translation of text.

### **5.3 Administering the TIMSS Advanced 2008 Assessment**

Once they were printed, distributing the materials to the schools required careful organization and planning on the part of the NRC. Using labels and the Student Tracking Form produced by WinW3S, each sampled student was assigned one achievement booklet. The test booklets were assigned in a systematic rotation so that each booklet was assigned to an equal number of students. Each student was also assigned a student questionnaire that was labeled so as to be linked to his or her achievement booklet. These materials were packaged for each sampled class. In addition, a teacher questionnaire was assigned and sent for each teacher listed on the Teacher Tracking Form and a School Questionnaire for the principal. The packaged materials were sent to the School Coordinator prior to the testing date who was asked to confirm the receipt of all instruments. The school questionnaire and teacher questionnaires were distributed, while the other instruments were kept in a secure room until the testing date.

Each sampled class was assigned a Test Administrator whose role was to administer the tests and student questionnaires, according to procedures described in the *Test Administrator Manual*. This person was chosen and trained by the school coordinator, although, in some cases, the School Coordinator also filled the Test Administrator role. The Test Administrator was responsible for distributing materials to the appropriate students, as well as leading students through the assessment and timing the sessions accurately. Following the assessment, they administered the student questionnaires.

The administration of the TIMSS Advanced 2008 assessment consisted of two parts. The first part concerned the achievement booklets and was followed by the completion of the student questionnaire. The time allotted for the achievement test was standardized to 90 minutes, while students were given at least 30 minutes to complete the student questionnaire, and were allowed to continue if extra time was necessary. If a student had completed the achievement test before the allotted time was over, he or she was allowed to review his or her answers or read quietly at his or her table but was not allowed to leave the testing room. The Test Administrators were required to document the starting and ending time of each part on the Test Administration Form.

The Test Administrator used the Student Tracking Form to distribute the booklets to the proper students and to document student participation. The School Coordinator used the information on the participation status to calculate the participation rate. If this was below 90 percent in any class, it was the School Coordinator's responsibility to hold a makeup session for the absent students before returning all of the testing materials to the national center.

The national centers entered the information recorded on the student and teacher tracking forms into the WinW3S software.

## 5.4 Scoring the TIMSS Advanced 2008 Assessment

About one third of the TIMSS Advanced 2008 assessment items were constructed-response items, and scoring them in a reliable manner was critical to the quality of the TIMSS Advanced 2008 results. Reliable scoring was accomplished through the provision of explicit scoring guides and extensive training in their use, as well as continuous monitoring of the quality of the work.

An international scoring training session was held, where the NRCs (or the country representative(s) appointed by the NRC) were trained to score the constructed-response items in the TIMSS Advanced 2008 assessment. At this session, the *TIMSS Advanced 2008 Scoring Guides for Constructed-response Items* (which are more thoroughly discussed in Chapter 2) were reviewed together with examples of student responses for each category. These example responses represented a range selected to demonstrate the guides as clearly as possible. Following this, NRCs practiced applying the scoring guides to a different set of student responses. The scores NRCs gave to these “practice papers” were shared with the group and all discrepancies discussed. NRCs were given a set of the correct scores for these example papers along with rationales.

To prepare for scoring students responses to the constructed-response items, NRCs were provided with suggestions about how to organize staff, materials, and procedures. NRCs were encouraged to hire scorers who were attentive to detail and familiar with education, particularly those with a background in mathematics or physics instruction at the senior secondary level. The TIMSS & PIRLS International Study Center also provided guidelines about how to train scorers to accurately and reliably score the constructed-response achievement items.

### **Documenting Scoring Reliability**

To establish the reliability of the scoring within each country, two different scorers independently *scored 25 percent of* all student responses. The random sample of test booklets to be scored twice was selected by the WinW3S software. The degree of agreement between the scores assigned by the two scorers is a measure of the reliability of the scoring process. The scoring procedure recommended by the TIMSS & PIRLS International Study Center incorporated scoring the reliability sample together with the normal scoring activity, with both taking place simultaneously in a systematic manner. In collecting the reliability data, reliability scoring sheets were used so that scores were assigned independently.

Estimating the reliability of the scoring process *across* countries necessitated at least two scorers from the TIMSS Advanced scoring team in each country able to score student responses written in English. Computing the level of agreement across countries provides information about how consistently the scoring guides were applied from one country to the next. The student responses included in the cross-country reliability scoring were scanned, stored on CDs, and provided to the countries along with the Cross-Country Scoring Reliability Software (CCSRS), which was developed by the IEA DPC. The CD also included a manual on how to install and use the software.

### **5.5 Creating the TIMSS Advanced 2008 Data Files**

As described earlier in this chapter, the IEA DPC provided a Windows-based program called WinDEM to facilitate data entry and verification. Detailed information on installing and using the program was provided in the manual accompanying the software. The program worked in conjunction with WinW3S software so that it was not necessary to re-enter tracking information that had been recorded into WinW3S.

WinDEM was primarily used for the entry of data from test booklets and questionnaires. The software also offered data and file management capabilities, a convenient checking and editing mechanism, interactive error detection, and reporting and quality-control procedures.

One of the very important benefits of using WinDEM was that it incorporated the international codebooks describing all variables and their characteristics, thus ensuring that the data files met the TIMSS Advanced 2008 standards for data entry. There was one codebook for each of the background questionnaires, one for the test booklets, and one for the constructed-response reliability scoring sheets. Data files for entering the TIMSS Advanced 2008 data were created based on these codebooks. The codebooks however had to match the national instruments exactly so that the answers of the respondents could be entered properly. Any adaptations to the international instruments also required adaptations of the international codebooks.

The adapted national codebooks were used for creating the TIMSS Advanced 2008 data files within each participating country. Data from the background questionnaires, achievement booklets, and reliability scoring sheets were recorded in WinDEM data files as follows:

- ◆ School background file contained responses from the *School Questionnaire*.
- ◆ Advanced mathematics teacher background file contained responses from the *Advanced Mathematics Teacher Questionnaire*.
- ◆ Physics teacher background file contained responses from the *Physics Teacher Questionnaire*.
- ◆ Advanced mathematics student background file contained responses recorded from the *Advanced Mathematics Student Questionnaire*.

- ◆ Physics student background file contained responses recorded from the *Physics Student Questionnaire*.
- ◆ Student achievement file contained responses from the test booklets.
- ◆ Reliability scoring file contained codes from the constructed-response reliability scoring sheets.

Quality control throughout the data entry process was essential in maintaining accurate data. Therefore, NRCs were responsible for performing periodic reliability checks during the data entry and for applying a series of data verification checks provided by the WinDEM software prior to submitting the data files to the IEA DPC. As part of this process, NRCs required their data entry staff to double enter at least 5 percent of each instrument type to ensure reliable data entry process. An error rate of 1 percent or less was acceptable for the background files. An error rate of 0.1 percent or less was required for the student achievement files and the reliability scoring files. If the required agreement was not reached, retraining of the data entry staff was required.

The data verification module of WinDEM identified a range of problems such as inconsistencies of identification codes and out-of-range or otherwise invalid codes. WinDEM software also allows to verify the integrity of the linkage between the students, teachers, and schools entered into the WinDEM data files and the tracking information for those specified in WinW3S.

When all data files had passed the WinDEM quality control checks, they were submitted to the IEA DPC along with data documentation for further checking and processing. For information on data processing at the IEA DPC, please refer to Chapter 7.

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