

CHAPTER 4

TIMSS 2023 Assessment Design

Liqun Yin
Pierre Foy

Overview

TIMSS is designed to provide countries with information about their students' mathematics and science achievement that can be used to inform evidence-based decisions for improving educational policy and practice. Conducted every four years since 1995, with each assessment linked to the one that preceded it, TIMSS provides regular and timely data for educators and policymakers on trends in students' mathematics and science achievement.

Central to TIMSS's mission is the measurement of student achievement in mathematics and science in a way that does justice to the breadth and richness of these subjects as they are taught in the participating countries, and that monitors countries' improvements or declines by tracking trends in student performance from one assessment cycle to the next. This requires an assessment that is wide ranging in its coverage and difficulties of mathematics and science and innovative in its measurement approach. With a diverse set of countries participating in TIMSS, with varying curricula and ability levels, this has always been a challenge. In the past, TIMSS has offered less difficult versions of mathematics that countries participating at the fourth grade could choose to administer, starting with TIMSS Numeracy in 2015¹ and following up with the TIMSS less difficult mathematics assessment in 2019.² These efforts were successful in expanding the TIMSS coverage of students at the lower end of the mathematics ability distribution. However, the linked parallel assessments were complex both conceptually and operationally. Most importantly, they did not address the need for more challenging mathematics material for higher achieving students or science.

TIMSS continues its tradition of innovation in each assessment cycle. TIMSS 2019 began the transition from paper-and-pencil to digital format, with about half of the countries choosing digital format and half keeping paper format as in previous TIMSS assessments. For TIMSS 2023, the vast majority of countries have transitioned, or are transitioning, to a digital assessment. Moreover, TIMSS 2023 is adopting a single unified assessment based on a new group adaptive assessment design to address the need for a broader range of assessment difficulty and better targeting of student ability. The group adaptive design was introduced in the PIRLS 2021 assessment and its rationale can be found in Appendix A of the PIRLS 2021 Assessment Design chapter.³

Since the majority of TIMSS 2023 countries have transitioned to a digital administration, the group adaptive assessment for TIMSS 2023 is available in digital format only. For the new or trend countries not ready for digital format, a paper assessment for TIMSS 2023 is provided and described in a later section.

The group adaptive design for TIMSS 2023 adopts the main aspects of the group adaptive design introduced in PIRLS 2021⁴ while maintaining the customary 14-block TIMSS design in order to minimize its impact on item and block development, and booklet assembly. The TIMSS 2023 group adaptive design has three levels of item block difficulty—difficult, medium, and easy—that are combined into two levels of booklet difficulty. Each country administers the entire assessment, but the balance of more difficult and less difficult booklets varies with the mathematics and science achievement level of the students in the country. TIMSS 2023 aims to improve the match between assessment difficulty and student ability in each country’s population by having a greater proportion of more difficult booklets in countries with relatively high achievement and a greater proportion of less difficult booklets in countries with relatively low achievement. Accordingly, the new design maximizes the information obtained from the assessment while limiting changes to the TIMSS assessment design.

Student Population Assessed

TIMSS assesses the mathematics and science achievement of students in their fourth and eighth years of formal schooling. Participating countries may choose to assess one or both populations, according to their policy priorities and resource availability. Because in TIMSS the number of years of formal schooling (four or eight) is the basis for comparison among participating countries, the TIMSS assessment is targeted at the grade levels that correspond to these. TIMSS defines the fourth year and eighth year of formal schooling according to the International Standard Classification of Education (ISCED) developed by the UNESCO Institute for Statistics⁵. The ISCED classification provides an international standard for describing levels of schooling across countries, and covers the full range of schooling, from early childhood education (Level 0) to doctoral or equivalent level study (Level 8). The target populations for TIMSS are defined as follows:

- At the fourth grade, the TIMSS target grade should be the grade that represents four years of schooling, counting from the first year of ISCED Level 1.
- At the eighth grade, the TIMSS target grade should be the grade that represents eight years of schooling, counting from the first year of ISCED Level 1.

ISCED Level 1 corresponds to primary education, or the first stage of basic education, and is considered to be the first stage of formal schooling. The target grade for the fourth grade TIMSS assessment typically is the fourth grade in most countries. Similarly, the target grade for eighth grade TIMSS is the eighth grade in most countries and usually corresponds to ISCED Level 2 or lower secondary education. However, given the cognitive demands of the assessments, TIMSS aims to avoid assessing very young students. Thus, TIMSS recommends that countries assess the next higher grade (i.e., fifth grade for fourth grade TIMSS, and ninth grade for eighth grade TIMSS) if, for fourth grade

students, the average age at the time of testing would be less than 9.5 years, and, for eighth grade students, less than 13.5 years.

Reporting Student Achievement

The TIMSS assessment is designed to provide a comprehensive picture of the mathematics and science achievement of fourth and eighth grade students in each participating country. This includes achievement in each of the content and cognitive domains (as defined in Chapters 1 and 2) as well as overall mathematics and science achievement.

A major consequence of TIMSS's ambitious reporting goals is that many more questions are required for the assessment than can be answered by any one student in the amount of testing time available. Accordingly, TIMSS uses a matrix sampling approach that involves packaging the entire assessment pool of mathematics and science items at each grade level into a set of booklets, or virtual eBooklets (booklets for short) in the digital version. Each item appears in two booklets, providing a mechanism for linking together the student responses from the various booklets when data from all booklets are taken together. To facilitate the process of creating the student achievement booklets, TIMSS groups the assessment items into a series of item blocks, with approximately 10 to 14 items in each block at the fourth grade and 12 to 18 at the eighth grade. As much as possible, the distribution of items across content and cognitive domains within each block matches the distribution across the item pool overall, as described in the *TIMSS 2023 Mathematics and Science Assessment Frameworks*.

To keep the assessment burden on any one student to a minimum, each student is presented with only one booklet which contains a sample of the items, as described in the next section. Following data collection, student responses to the items in each assessment are aggregated and converted to the TIMSS mathematics and science scale metrics at each grade level to provide a comprehensive picture of the assessment results for each country.

One of the major strengths of TIMSS is its measurement of trends over time in mathematics and science achievement. The TIMSS achievement scales provide established metrics on which countries can compare students' progress in mathematics and science from assessment to assessment at the fourth and eighth grades. The TIMSS mathematics and science achievement scales were created with the first TIMSS assessment in 1995, separately for each subject and each grade. The scale units were established so that 100 points on the scale was equivalent to one standard deviation of the distribution of achievement across all of the countries that participated in TIMSS 1995, and the scale midpoint of 500 was located at the mean of this international achievement distribution.

Using items that were administered in both 1995 and 1999 assessments as a basis for linking the two sets of assessment results, the TIMSS 1999 data also were placed on the scales so that countries could gauge changes in students' mathematics and science achievement since 1995. This was done separately for mathematics and science and for fourth and eighth grades. Using similar procedures, the data from TIMSS 2003, TIMSS 2007, TIMSS 2011, TIMSS 2015, and TIMSS 2019 were placed on the TIMSS scales⁶, as will be the data from TIMSS 2023. This will enable TIMSS 2023 countries that have participated in

TIMSS since its inception to have comparable achievement data from 1995, 1999, 2003, 2007, 2011, 2015, 2019, and 2023, and to plot changes in performance over this 28-year period.

In addition to the overall achievement scales for mathematics and science, TIMSS 2023 will construct scales for reporting relative student performance in each of the mathematics and science content and cognitive domains defined in the TIMSS 2023 Mathematics and Science Assessment Frameworks. Reporting scales will be constructed for each content and cognitive domain in mathematics and science at each grade level.

Because the TIMSS 2023 paper booklets are limited to trend blocks from the 2019 assessment, the TIMSS 2023 paper administration will provide only overall mathematics and science achievement results.

TIMSS 2023 Group Adaptive Design

The group adaptive testing design for TIMSS 2023 is modeled after the PIRLS 2021 group adaptive design. Consistent with the goal of comprehensive subject coverage, the TIMSS 2023 design preserves those main aspects of the PIRLS group adaptive design while maintaining the conventional 14-block design. The complete TIMSS 2023 group adaptive assessment has a total of 28 blocks at each grade, 14 consisting of mathematics items and 14 consisting of science items. Implementing the group adaptive design in TIMSS 2023 required grouping the item blocks into three levels of difficulty—easy, medium, and difficult—with five easy, four medium, and five difficult item blocks per subject and grade. Of the 14 item blocks by subject and grade needed for the design, eight were administered previously in TIMSS 2019 and available to support the measurement of trends and six were developed and field tested for first time use in TIMSS 2023. Exhibits 4.1 and 4.2 show how the existing trend item blocks fit into the subject-by-difficulty level scheme at the fourth grade and eighth grade, respectively, and also where the new item blocks belong.

Exhibit 4.1: Subject and Difficulty Level for TIMSS 2023 Fourth Grade Item Blocks

Subject	Difficulty Level	TIMSS 2023 Item Block Label	TIMSS 2019 Trend Block Label*
Mathematics	Difficult	MD1	ME08 (19)
		MD2	ME09 (15)
		MD3	New item block for 2023
		MD4	MI01 (19)
		MD5	New item block for 2023
	Medium	MM1	New item block for 2023
		MM2	ME04 (19)
		MM3	ME10 (19)
		MM4	ME14 (19)
	Easy	ME1	New item block for 2023
		ME2	ME11 (15)
		ME3	New item block for 2023
		ME4	ME13 (15)
		ME5	New item block for 2023
		ME6	New item block for 2023
Science	Difficult	SD1	SE10 (19)
		SD2	SE13 (15)
		SD3	New item block for 2023
		SD4	SI02 (19)
		SD5	New item block for 2023
	Medium	SM1	New item block for 2023
		SM2	SE09 (15)
		SM3	SE12 (19)
		SM4	SE08 (19)
	Easy	SE1	New item block for 2023
		SE2	SE14 (19)
		SE3	New item block for 2023
		SE4	SE04 (19)
		SE5	New item block for 2023
		SE6	New item block for 2023

* The number in parentheses is the assessment year in which the item block was first introduced.

Exhibit 4.2: Subject and Difficulty Level for TIMSS 2023 Eighth Grade Item Blocks

Subject	Difficulty Level	TIMSS 2023 Item Block Label	TIMSS 2019 Trend Block Label*
Mathematics	Difficult	MD1	ME08 (19)
		MD2	ME12 (19)
		MD3	New item block for 2023
		MD4	MI02 (19)
		MD5	New item block for 2023
	Medium	MM1	New item block for 2023
		MM2	ME04 (19)
		MM3	ME14 (19)
		MM4	ME10 (19)
	Easy	ME1	New item block for 2023
		ME2	ME11 (15)
		ME3	New item block for 2023
		ME4	ME13 (15)
		ME5	New item block for 2023
		ME6	New item block for 2023
Science	Difficult	SD1	SE04 (19)
		SD2	SE09 (15)
		SD3	New item block for 2023
		SD4	SI01 (19)
		SD5	New item block for 2023
	Medium	SM1	New item block for 2023
		SM2	SE11 (15)
		SM3	SE10 (19)
		SM4	SE14 (19)
	Easy	SE1	New item block for 2023
		SE2	SE12 (19)
		SE3	New item block for 2023
		SE4	SE13 (15)
		SE5	New item block for 2023
		SE6	New item block for 2023

* The number in parentheses is the assessment year in which the item block was first introduced.

In 2019, the TIMSS computer-based assessments included Problem Solving and Inquiry (PSI) tasks—two item blocks for mathematics and two item blocks for science at each grade—arranged in two separate assessment booklets. Half of the PSI item blocks—one per subject and grade—were secured for use as trend blocks in TIMSS 2023. Also, the TIMSS fourth grade assessment was accompanied by a less difficult mathematics assessment consisting of the same science item blocks, and with 10 of the 14 mathematics item blocks designed specifically with easier material, six of which were secured for future

use. Since relatively few countries were exposed to these less difficult mathematics item blocks in 2019, they were considered as suitable candidates for the new easy fourth grade mathematics item blocks required for the TIMSS 2023 group adaptive design. Taking all of these materials together, there were eight regular TIMSS trend item blocks and one PSI trend item block available at each subject and grade for 2023, as well as six less difficult mathematics item blocks available as new easy item blocks for fourth grade mathematics. Five of the six available TIMSS 2019 less difficult mathematics item blocks were included in the TIMSS 2023 field test, with the intent of including the three more suitable candidates for inclusion as new easy item blocks.

Of the six new item blocks per subject and grade, three will be easy item blocks, one will be medium, and two will be difficult. However, for the three new fourth grade easy item blocks, three item blocks from the TIMSS 2019 less difficult mathematics assessment will be used. The exhibits also include an item block label for each item block to facilitate the assignment of item blocks to booklets. The item block labels begin with either as ME or MI for mathematics, SE or SI for science.

Item Block Difficulty Level

For the group adaptive design to be effective, it is necessary that there be distinctive differences in the average difficulties of the item blocks across the difficulty groups (difficult, medium, easy). Reasonable difficulty goals in terms of average percent correct across student populations would be 40% for the difficult group, 55% for the medium group, and 70% for the easy group. New item blocks developed for TIMSS 2023 will aim for these difficulty levels, but there is less flexibility with the existing trend item blocks, which make up about 60% of the assessments.

As shown in Exhibit 4.3, the difficulties of the existing trend blocks are not well differentiated across the three difficulty groups at both grades and subjects. In particular, the existing trend blocks designated as easy are far more difficult than the long-term goal of 70% for this group. However, by combining the existing item blocks with new blocks developed to be closer to the target difficulties, it will be possible to make progress toward the long-term goals in each of the three difficulty groups.

**Exhibit 4.3: Average Difficulties of Existing Trend Blocks from 2019 and Target Difficulties for 2023
(Average Percent Correct)**

Subject	Item Block Level	Difficulty of Trend Blocks from 2019	Target Difficulty for 2023
Fourth Grade Mathematics	Difficult	46%	44%
	Medium	49%	50%
	Easy	51%	64%
Fourth Grade Science	Difficult	47%	44%
	Medium	54%	55%
	Easy	57%	65%
Eighth Grade Mathematics	Difficult	37%	38%
	Medium	42%	46%
	Easy	45%	60%
Eighth Grade Science	Difficult	44%	42%
	Medium	48%	50%
	Easy	51%	63%

Booklet Design

In TIMSS, each student is randomly assigned a test booklet (or booklet equivalent in the context of computer-based assessments) consisting of two mathematics item blocks and two science item blocks. In TIMSS 2023, the 14 mathematics and 14 science item blocks at each grade are arranged into 14 booklets with two mathematics and two science blocks each, with each item block appearing in two booklets and paired with different item blocks each time. Exhibit 4.4 summarizes the item block pairings among the mathematics and science item blocks that make up each booklet. The pairing pattern is identical at both grades. The direction of the arrows indicates which item block comes first in the booklet. For example, an arrow points from block ME1, an easy block, to MM1, a medium block, indicating these two blocks share a booklet, with ME1 preceding MM1. Note that when blocks of different difficulties are paired in the same booklet, the easier of the two always comes first. Because each booklet consists of two mathematics and two science item blocks, the matching pairs of mathematics and science blocks appear in the same booklet. For example, ME1 & MM1 appear in the same booklet as their science counterparts SE1 and SM1.

Exhibit 4.4: Item Block Pairings for Each Assessment Booklet

Subject	Difficult Item Blocks	Medium Item Blocks	Easy Item Blocks
Mathematics	MD1	MM1	ME1
	MD2	MM2	ME2
	MD3	MM3	ME3
	MD4	MM4	ME4
	MD5	—	ME5
Science	SD1	SM1	SE1
	SD2	SM2	SE2
	SD3	SM3	SE3
	SD4	SM4	SE4
	SD5	—	SE5

The 14 assessment booklets at each grade are divided into two levels of difficulty, as follows:

- More difficult booklets (7) composed of either two difficult item blocks or one medium and one difficult item block for each subject;
- Less difficult booklets (7) composed of either two easy item blocks or one easy and one medium item block for each subject.

Exhibit 4.5 shows the item block assignments for the 14 TIMSS booklets, with booklets 1-7 being the more difficult booklets and booklets 8-14 the less difficult ones. The assignments are identical for both grades.

Exhibit 4.5: Assessment Booklets with Item Block Assignments

Student Assessment Booklets	Part 1		Part 2		
More Difficult Booklets	Booklet 1	SM1	SD1	MM1	MD1
	Booklet 2	MD2	MD3	SD2	SD3
	Booklet 3	SM2	SD2	MM2	MD2
	Booklet 4	MD5	MD1	SD5	SD1
	Booklet 5	SM3	SD3	MM3	MD3
	Booklet 6	MM4	MD4	SM4	SD4
	Booklet 7	SD4	SD5	MD4	MD5
Less Difficult Booklets	Booklet 8	ME1	MM1	SE1	SM1
	Booklet 9	SE1	SE2	ME1	ME2
	Booklet 10	ME2	MM2	SE2	SM2
	Booklet 11	SE3	SE5	ME3	ME5
	Booklet 12	ME3	MM3	SE3	SM3
	Booklet 13	SE4	SM4	ME4	MM4
	Booklet 14	ME5	ME4	SE5	SE4

Exhibits 4.6 and 4.7 also present the item block assignments for each booklet, this time showing where the existing trend blocks belong and where the new item blocks developed for 2023, including the fourth grade less difficult mathematics blocks, will go. Exhibit 4.6 shows the fourth grade booklets, Exhibit 4.7 shows the eighth grade booklets.

Exhibit 4.6: Fourth Grade Assessment Booklets with Trend and New Block Assignments

Student Assessment Booklets		Part 1		Part 2	
More Difficult Booklets	Booklet 1	New SM1 (23)	SE10 (19)	New MM1 (23)	ME08 (19)
	Booklet 2	ME09 (15)	New MD3 (23)	SE13 (15)	New SD3 (23)
	Booklet 3	SE09 (15)	SE13 (15)	ME04 (19)	ME09 (15)
	Booklet 4	New MD5 (23)	ME08 (19)	New SD5 (23)	SE10 (19)
	Booklet 5	SE12 (19)	New SD3 (23)	ME10 (19)	New MD3 (23)
	Booklet 6	ME14 (19)	MI01 (19)	SE08 (19)	SI02 (19)
	Booklet 7	SI02 (19)	New SD5 (23)	MI01 (19)	New MD5 (23)
Less Difficult Booklets	Booklet 8	New ME1(23)	New MM1 (23)	New SE1 (23)	New SM1 (23)
	Booklet 9	New SE1 (23)	SE14 (19)	New ME1 (23)	ME11 (15)
	Booklet 10	ME11 (15)	ME04 (19)	SE14 (19)	SE09 (15)
	Booklet 11	New SE3 (23)	New SE5 (23)	New ME3 (23)	New ME5 (23)
	Booklet 12	New ME3 (23)	ME10 (19)	New SE3 (23)	SE12 (19)
	Booklet 13	SE04 (19)	SE08 (19)	ME13 (15)	ME14 (19)
	Booklet 14	New ME5(23)	ME13 (15)	New SE5 (23)	SE04 (19)

Exhibit 4.7: Eighth Grade Assessment Booklets with Trend and New Block Assignments

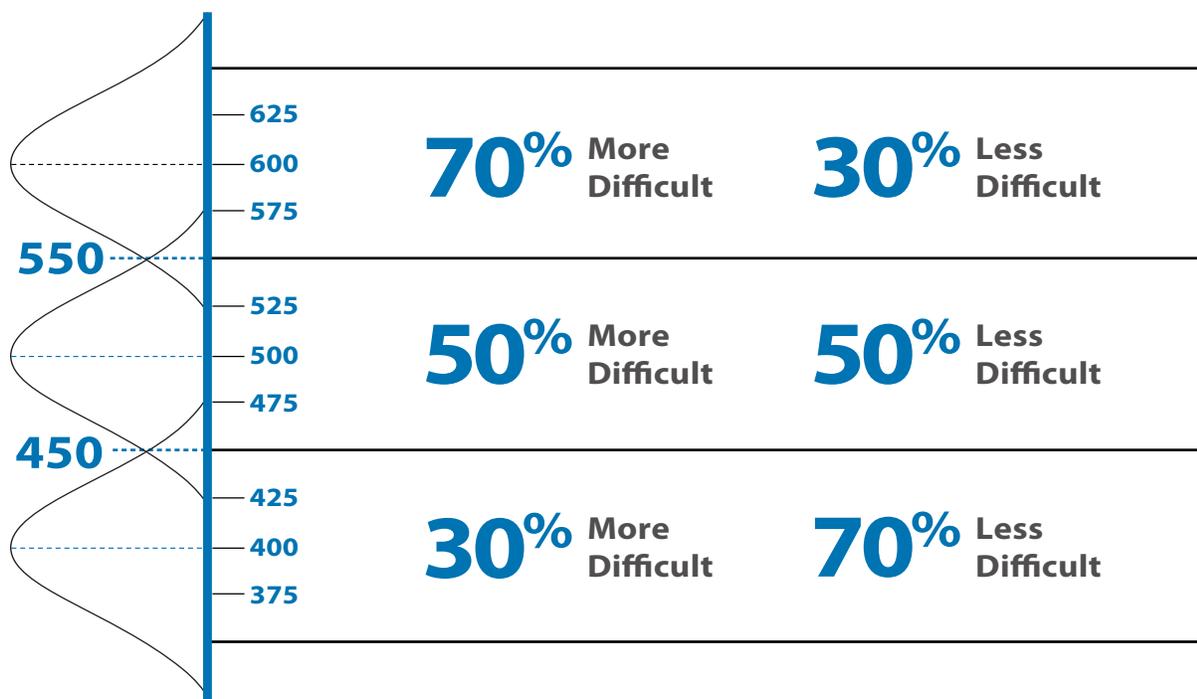
Student Assessment Booklets		Part 1		Part 2	
More Difficult Booklets	Booklet 1	New SM1 (23)	SE04 (19)	New MM1 (23)	ME08 (19)
	Booklet 2	ME12 (19)	New MD3 (23)	SE09 (15)	New SD3 (23)
	Booklet 3	SE11 (15)	SE09 (15)	ME04 (19)	ME12 (19)
	Booklet 4	New MD5 (23)	ME08 (19)	New SD5 (23)	SE04 (19)
	Booklet 5	SE10 (19)	New SD3 (23)	ME14 (19)	New MD3 (23)
	Booklet 6	ME10 (19)	MI02 (19)	SE14 (19)	SI01 (19)
	Booklet 7	SI01 (19)	New SD5 (23)	MI02 (19)	New MD5 (23)
Less Difficult Booklets	Booklet 8	New ME1(23)	New MM1 (23)	New SE1 (23)	New SM1 (23)
	Booklet 9	New SE1 (23)	SE12 (19)	New ME1 (23)	ME11 (15)
	Booklet 10	ME11 (15)	ME04 (19)	SE12 (19)	SE11 (15)
	Booklet 11	New SE3 (23)	New SE5 (23)	New ME3 (23)	New ME5 (23)
	Booklet 12	New ME3 (23)	ME14 (19)	New SE3 (23)	SE10 (19)
	Booklet 13	SE13 (15)	SE14 (19)	ME13 (15)	ME10 (19)
	Booklet 14	New ME5(23)	ME13 (15)	New SE5 (23)	SE13 (15)

Booklet Assignment within Countries

To ensure that the same assessment is conducted in every country, all 14 booklets in the TIMSS 2023 group adaptive design are distributed in every country, but with varying proportions of the more and less difficult booklets depending on the average mathematics and science abilities of the student population. This is estimated based on performance in prior TIMSS assessments, or in the field test for countries participating for the first time. Higher performing countries assign proportionally more of the more difficult booklets while lower performing countries assign proportionally more of the less difficult booklets, with the goal of a better match between assessment difficulty and student ability in each country.

Exhibit 4.8 illustrates the differential booklet assignment plan for higher, middle, and lower performing countries. As a general objective, countries with higher average performance (above 550 on the TIMSS mathematics and science achievement scales) would randomly assign proportionally more of the more difficult booklets (70%), and fewer of the less difficult booklets (30%). Countries with performance between 450 and 550 would assign equal proportions of the more and less difficult booklets. Countries with lower average performance (below 450 on the TIMSS mathematics and science achievement scales) would assign proportionally fewer of the more difficult booklets (30%) and more of the less difficult booklets (70%).

Exhibit 4.8: Booklet Assignment Plan for Higher, Middle, and Lower Performing Countries



While TIMSS 2023 is a transition cycle towards meeting the long-term goals of the group adaptive design, as shown by the 2023 target difficulty levels in Exhibit 4.3, the objective for 2023 is to have the group adaptive design impact fewer countries during this transition cycle. To that end, most countries participating in TIMSS 2023 will assign equal proportions of the more and less difficult booklets, while countries with achievement above 565 will assign more of the more difficult booklets, and countries with achievement below 435 will assign more of the less difficult booklets.

Although the TIMSS 2023 group adaptive design was developed to provide a better match between assessment difficulty and student ability at the country level, it is possible to apply the group adaptive approach for subgroups within a country, provided the country has clearly defined subpopulations that differ substantially in student achievement. In addition, the implementation of the TIMSS 2023 group adaptive design can vary by grade, but not by subject.

TIMSS 2023 Paper Assessments

The TIMSS 2023 group adaptive design is devised specifically for countries that have transitioned or are transitioning to computer-based administration in 2023. Although the vast majority of TIMSS 2023 countries will implement the digital assessments, a few countries will not be ready for digital administration in 2023. The TIMSS 2023 paper assessments provide a limited paper-based administration for those countries, with eight assessment booklets at each grade consisting solely of trend items from the TIMSS 2019 paper-based assessments. For countries that are transitioning to digital administration in 2023, the administration of these paper booklets paired with the administration of the digital TIMSS 2023 group adaptive assessments will allow them to examine mode differences between the two modes of administration based on trend items. Finally, TIMSS 2023 also provides an alternate set of eight paper booklets at the fourth grade based on the secured trend item blocks from the TIMSS 2019 fourth grade less difficult mathematics assessment for lower performing countries not yet transitioning to a digital administration.

The TIMSS 2023 paper assessments utilize the eight secured regular trend item blocks from each subject from the TIMSS 2019 paper-based assessments to form eight booklets at each grade. Exhibit 4.9 illustrates the TIMSS 2023 paper booklet design, showing the trend item block labels from TIMSS 2019. The booklet design is identical at both grades. Six of the eight booklets—booklets 2 through 7—are identical to booklets that were administered in TIMSS 2019. Booklets 1 and 8 are made up to complete the rotation of trend blocks. As usual, each item block appears in two booklets in different positions and each booklet contains two mathematics and two science item blocks.

Exhibit 4.9: TIMSS 2023 Paper Booklets with Trend Item Blocks – Fourth and Eighth Grades

TIMSS 2023 Paper Booklets	Part 1		Part 2	
Booklet 1	MP04	MP08	SP04	SP08
Booklet 2	SP08	SP09	MP08	MP09
Booklet 3	MP09	MP10	SP09	SP10
Booklet 4	SP10	SP11	MP10	MP11
Booklet 5	MP11	MP12	SP11	SP12
Booklet 6	SP12	SP13	MP12	MP13
Booklet 7	MP13	MP14	SP13	SP14
Booklet 8	SP14	SP04	MP14	MP04

An alternate set of paper booklets is available for lower performing countries administering the TIMSS 2023 paper assessment at the fourth grade. It is based on the TIMSS 2019 less difficult mathematics assessment and also consists of trend item blocks. Exhibit 4.10 presents the eight paper booklets and item blocks from the TIMSS 2019 fourth grade less difficult mathematics assessment. Six of the eight mathematics trend item blocks are unique to the TIMSS 2019 less difficult assessment and identifiable by the letters “MN” in the item block labels. The other two mathematics item blocks—MP08 and MP13, as well as all science item blocks are identical with the regular TIMSS 2023 paper assessment shown in Exhibit 4.9.

Exhibit 4.10: TIMSS 2023 Paper Booklets with Item Blocks from Fourth Grade Less Difficult Mathematics

TIMSS 2023 Paper Booklets	Part 1		Part 2	
Booklet 1	MN04	MP08	SP04	SP08
Booklet 2	SP08	SP09	MP08	MN09
Booklet 3	MN09	MP13	SP09	SP10
Booklet 4	SP10	SP11	MP13	MN11
Booklet 5	MN11	MN12	SP11	SP12
Booklet 6	SP12	SP13	MN12	MN13
Booklet 7	MN13	MN14	SP13	SP14
Booklet 8	SP14	SP04	MN14	MN04

The design of TIMSS 2023 paper booklets at both grades, including the less difficult mathematics version, follow the same administration procedures as in the past. The trend item blocks being from 2019 means they are all of roughly the same difficulty level at each subject and grade. Consequently, the group adaptive design is not present in their implementation. The less difficult paper assessment allows some measure of adaptability for lower performing countries with respect to fourth grade mathematics.

The TIMSS 2023 paper assessments will provide countries with overall scores in mathematics and science linked to the TIMSS reporting metrics. However, because the TIMSS 2019 trend item blocks represent about 60% of the entire TIMSS assessment frameworks in terms of items, achievement scores for the content or cognitive domains will not be available. This is true for countries administering the paper assessments instead of the computer-based assessments, as well as digital countries administering the paper booklets for performing mode comparison studies.

Student Testing Time

As summarized in Exhibit 4.11, each student completes one student achievement booklet consisting of two parts, followed by a student questionnaire. The individual student response time for the TIMSS 2023 assessment, including non-digital paper assessment, is the same as it has been since TIMSS 2007. That is, the TIMSS administration consists of two 36-minute sessions, one for each part, separated by a short break, and then followed by a 30-minute session for the student questionnaire at fourth grade. At the eighth grade, the administration consists of two 45-minute sessions, followed by a 30-minute session for the student questionnaire.

Exhibit 4.11: TIMSS 2023 Student Testing Time – Fourth and Eighth Grades

Activity	Fourth Grade	Eighth Grade
Student Achievement Booklet – Part 1	36 minutes	45 minutes
	Break	
Student Achievement Booklet – Part 2	36 minutes	45minutes
	Break	
Student Questionnaire	30 minutes	30 minutes

References

- 1 Martin, M. O., Mullis, I.V.S., & Foy, P. (2013). TIMSS 2015 assessment design. In Mullis, I.V.S. & Martin, M.O. (Eds.), *TIMSS 2015 Assessment Frameworks*. Retrieved from Boston College, TIMSS & PIRLS International Study Center website: https://timssandpirls.bc.edu/timss2015/downloads/T15_FW_Chap4.pdf
- 2 Martin, M. O., Mullis, I.V.S., & Foy, P. (2017). TIMSS 2019 assessment design. In Mullis, I.V.S., & Martin, M. O. (Eds.), *TIMSS 2019 Assessment Frameworks*. Retrieved from Boston College, TIMSS & PIRLS International Study Center website: <https://timss2019.org/wp-content/uploads/frameworks/T19-Assessment-Frameworks-Chapter-4.pdf>
- 3 Martin, M. O., von Davier, M., Foy, P., & Mullis, I.V.S. (2019). PIRLS 2021 assessment design. In I.V.S. Mullis, & M. O. Martin (Eds.), *PIRLS 2021 Assessment Frameworks*. Retrieved from Boston College, TIMSS & PIRLS International Study Center website: http://pirls2021.org/frameworks/wp-content/uploads/sites/2/2019/04/P21_FW_Ch3_AssessDesign.pdf
- 4 Martin, M. O., von Davier, M., Foy, P., & Mullis, I.V.S. (2019). PIRLS 2021 assessment design. In I.V.S. Mullis, & M. O. Martin (Eds.), *PIRLS 2021 Assessment Frameworks*. Retrieved from Boston College, TIMSS & PIRLS International Study Center website: http://pirls2021.org/frameworks/wp-content/uploads/sites/2/2019/04/P21_FW_Ch3_AssessDesign.pdf
- 5 UNESCO. (2012). *International standard classification of education ISCED 2011*. Retrieved from <http://uis.unesco.org/sites/default/files/documents/international-standard-classification-of-education-isced-2011-en.pdf>
- 6 Foy, P., Fishbein, B., von Davier, M., & Yin, L. (2020). Implementing the TIMSS 2019 scaling methodology. In M. O. Martin, M. von Davier, & I.V.S. Mullis (Eds.), *Methods and Procedures: TIMSS 2019 Technical Report* (pp. 12.1–12.146). Retrieved from Boston College, TIMSS & PIRLS International Study Center website: <https://timssandpirls.bc.edu/timss2019/methods/chapter-12.html>