CHAPTER 13

Scaling the TIMSS Advanced 2015 Achievement Data

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Overview

The TIMSS Advanced assessments cover a wide range of topics in advanced mathematics and physics. Given this broad coverage, a matrix-sampling booklet design is used such that each student is administered only a subset of the entire TIMSS Advanced mathematics and physics item pools (see Chapter 4 of *TIMSS Advanced 2015 Assessment Frameworks*). Given the complexities of the data collection and the need to have student scores on the entirety of each assessment for analysis and reporting purposes, TIMSS Advanced relies on item response theory (IRT) scaling to describe student achievement and to provide accurate measures of trends. As each student responded to only a part of the assessment item pool, the TIMSS Advanced scaling approach uses multiple imputation—or plausible values—methodology to obtain proficiency scores in advanced mathematics and physics for all students. To enhance the reliability of the student scores, the TIMSS Advanced scaling approach uses conditioning, a process in which student responses to the items are combined with information about students' backgrounds.

This scaling chapter begins with a general description of the scaling approach and its use of plausible values. It then describes the concurrent calibration method used specifically to measure trends. Next, it explains how the proficiency scores are generated through the use of conditioning and describes the process of transforming the proficiency scores to place them on the metrics used to measure trends. A description of the technical details involved in the scaling can be found in Chapter 12: TIMSS Advanced 2015 Achievement Scaling Methodology.

Implementing the TIMSS Advanced Scaling Procedures

The application of IRT scaling and plausible values methodology to the data from the TIMSS Advanced assessments involves four major tasks: calibrating the achievement items (estimating model parameters for each item), creating principal components from the student questionnaire

data for use in conditioning, generating proficiency scores for advanced mathematics and physics, and placing these proficiency scores on the metrics used to report trend results from previous assessments. TIMSS Advanced has separate scales for advanced mathematics and physics. The scaling procedures also generate proficiency scores for the domains of the overall subjects: the content and cognitive domains of advanced mathematics and physics.

Linking Assessments Cycles with Concurrent Calibration

The metric of the TIMSS Advanced reporting scales for overall advanced mathematics and physics were originally established in TIMSS Advanced 1995 by setting the mean of the national average scores for all countries that participated in TIMSS Advanced 1995 to 500 and the standard deviation to 100. To enable measurement of trends over time, achievement data from successive TIMSS Advanced assessments were transformed to these same metrics. This is done by concurrently scaling the data from each successive assessment with the data from the previous assessment—a process known as concurrent calibration—and applying linear transformations to place the results from each successive assessment on the same scale as the results from the previous assessment. This procedure enables TIMSS Advanced to measure trends across all three assessment cycles: 1995, 2008, and 2015.[1]

The first step in linking the assessments for trend scaling is to estimate (calibrate) the item parameters for the items in the current assessment through a concurrent calibration of the data from the current assessment and from the previous assessment. In 2015, the TIMSS Advanced concurrent calibration consisted of combining achievement data from the 2015 and 2008 assessments.

In linking successive assessments, concurrent calibration relies on having a substantial number of trend items, items that are retained from one assessment to the next. The TIMSS Advanced assessment consists of 9 advanced mathematics item blocks and 9 physics item blocks. In TIMSS Advanced 2015, 6 of the advanced mathematics blocks and 6 of the physics blocks consisted of newly developed items. The remaining 3 advanced mathematics blocks and 3 physics blocks were carried forward from the TIMSS Advanced 2008 assessment and are the basis for linking TIMSS Advanced 2015 to the TIMSS Advanced achievement scale and maintaining trends over time. Exhibits 13.1 through 13.2 list the number of items present for TIMSS Advanced concurrent calibration by item type and content and cognitive domain for both subjects.

1 See Mazzeo and von Davier (2014) for a discussion of the linking procedure used by TIMSS.

Exhibit 13.1: TIMSS Advanced 2015 Advanced Mathematics Items for Concurrent Calibration

Item Type	Points	Items Released in 2008		Items Common in 2008 and 2015		Items Introduced in 2015		Total	
		Items	Points	Items	Points	Items	Points	Items	Points
Multiple-Choice	1	25	25	20	20	35	35	80	80
Constructed Response	1	13	13	5	5	22	22	40	40
	2	2	4	6	12	13	26	21	42
Total		**40**	**42**	**31**	**37**	**70**	**83**	**141**	**162**

TIMSS Advanced 2015 Advanced Mathematics Items for Concurrent Calibration by Content and Cognitive Domains

Advanced Mathematics Content Domains	Items Released in 2008		Items Common in 2008 and 2015		Items Introduced in 2015		Total	
	Items	Points	Items	Points	Items	Points	Items	Points
Algebra	13	14	12	14	25	29	50	57
Calculus	16	16	9	12	25	31	50	59
Geometry	11	12	10	11	20	23	41	46
Advanced Mathematics Cognitive Domains	**Items Released in 2008**		**Items Common in 2008 and 2015**		**Items Introduced in 2015**		**Total**	
	Items	Points	Items	Points	Items	Points	Items	Points
Knowing	16	16	11	12	21	23	48	51
Applying	14	14	17	21	23	27	54	62
Reasoning	10	12	3	4	26	33	39	49
Total	**40**	**42**	**31**	**37**	**70**	**83**	**141**	**162**

Exhibit 13.2: TIMSS Advanced 2015 Physics Items for Concurrent Calibration

Item Type	Points	Items Released in 2008		Items Common in 2008 and 2015		Items Introduced in 2015		Total	
		Items	Points	Items	Points	Items	Points	Items	Points
Multiple-Choice	1	20	20	20	20	39	39	79	79
Constructed Response	1	11	11	8	8	21	21	40	40
	2	6	12	3	6	11	22	20	40
Total		**37**	**43**	**31**	**34**	**71**	**82**	**139**	**159**

TIMSS Advanced 2015 Physics Items for Concurrent Calibration by Content and Cognitive Domains

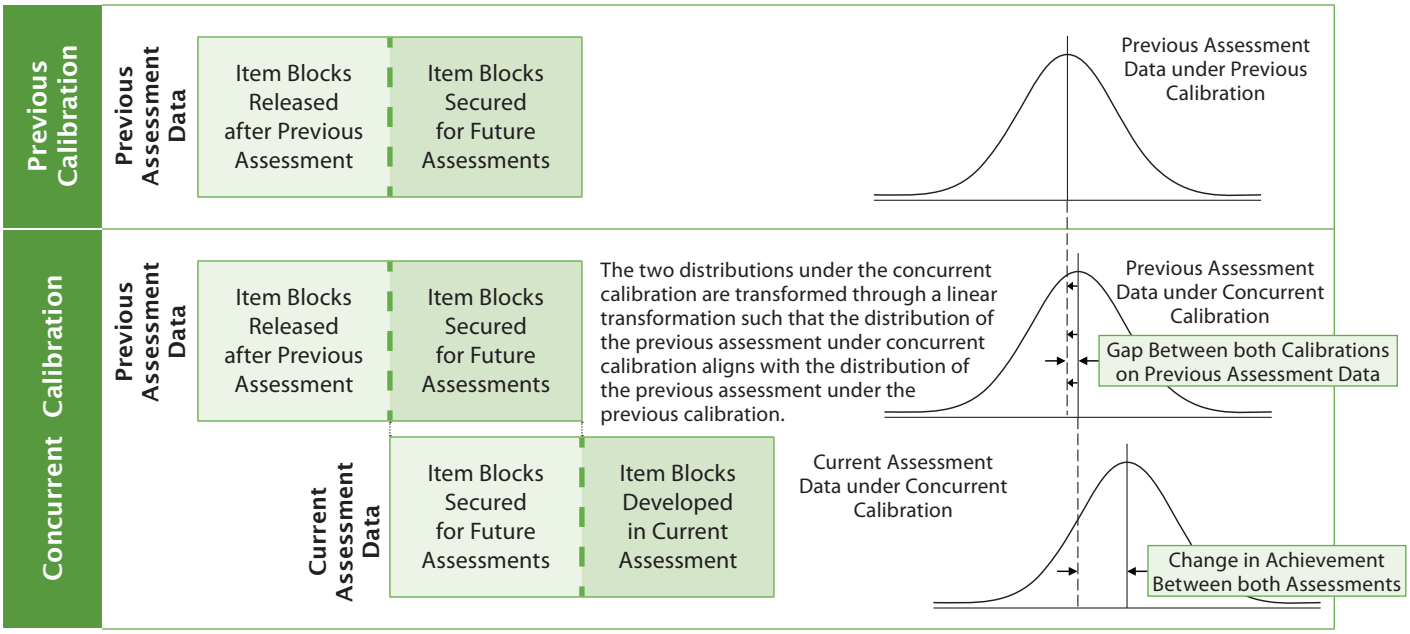
Physics Content Domains	Items Released in 2008		Items Common in 2008 and 2015		Items Introduced in 2015		Total	
	Items	Points	Items	Points	Items	Points	Items	Points
Electricity & Magnetism	12	13	8	9	20	23	40	45
Mechanics & Thermodynamics	18	22	13	15	26	32	57	69
Wave Phenomena & Atomic/ Nuclear Physics	7	8	10	10	25	27	42	45
Physics Cognitive Domains	**Items Released in 2008**		**Items Common in 2008 and 2015**		**Items Introduced in 2015**		**Total**	
	Items	Points	Items	Points	Items	Points	Items	Points
Knowing	9	9	10	11	21	21	40	41
Applying	18	20	14	15	27	35	59	70
Reasoning	10	14	7	8	23	26	40	48
Total	**37**	**43**	**31**	**34**	**71**	**82**	**139**	**159**

In concurrent calibration, item parameters for the current assessment are estimated based on the data from both the current and previous assessments, recognizing that some items (the trend items) are common to both. It is then possible to estimate the latent ability distributions of students in both assessments using the item parameters from the concurrent calibration. The difference between these two distributions is the change in achievement between the previous and current assessments.

After the calibration, the next step is to find a linear transformation that transforms the distribution of the previous assessment data under the concurrent calibration to match the distribution of these same data under the calibration that was done in the previous assessment. The final step entails applying this linear transformation to the current assessment data scaled using the concurrent calibration. This places the current assessment data on the trend scale.

Exhibit 13.3 illustrates how the concurrent calibration approach is applied in the context of TIMSS Advanced trend scaling. The gap between the distributions of the previous assessment data (in this case TIMSS Advanced 2008) under the previous calibration and under the concurrent calibration is typically small and is the result of slight differences in the item parameter estimates from the two calibrations (Exhibit 13.3, second panel). The linear transformation removes this gap by shifting the two distributions from the concurrent calibration such that the distribution of the previous assessment data from the concurrent calibration aligns with the distribution of the previous assessment data from the previous calibration,[2] while preserving the gap between the previous and current assessment data under the concurrent calibration. This latter gap is the change in achievement between the previous and current assessments that TIMSS Advanced sets out to measure as trend.

Exhibit 13.3: Concurrent Calibration Model Used for TIMSS Advanced



Calibrating the TIMSS Advanced 2015 Assessment Data

Item calibration was conducted by the TIMSS & PIRLS International Study Center using the commercially-available Parscale software (Muraki & Bock, 1991) and included data from the previous assessment (TIMSS Advanced 2008) and data from the 2015 assessment for countries that participated in both assessment cycles. The calibration used all available item response data from each country's student samples and from both current and previous assessments. All student samples were weighted so that each country contributed equally to the item calibration.

2 The difference between the ability distributions of the previous assessment data under the two calibrations is a measure of the linkage error in the trend scaling procedure.

Exhibits 13.4 and 13.5 show the sample sizes for scaling the TIMSS Advanced 2015 data. A total of 9 countries from TIMSS Advanced 2015 contributed to the concurrent calibration at each subject.

Exhibit 13.4: TIMSS Advanced 2015 Sample Sizes for Scaling the Advanced Mathematics Data

Country	Item Calibration		Proficiency Estimation	
	2015	2008	2015	2008
Armenia	—	858	—	858
France	3,967	—	3,967	—
Iran, Islamic Rep. of	—	2,425	—	2,425
Italy	3,318	2,143	3,318	2,143
Lebanon	1,161	1,612	1,161	1,612
Netherlands	—	1,537	—	1,537
Norway	2,537	1,932	2,537	1,932
Portugal	4,068	—	4,068	—
Russian Federation	—	3,185	7,558	3,185
Russian Federation 6hr+	3,431	—	3,431	—
Slovenia	2,922	2,156	2,922	2,156
Sweden	3,937	2,303	3,937	2,303
United States	2,954	—	2,954	—
Total	**28,295**	**18,151**	**35,853**	**18,151**

Exhibit 13.5: TIMSS Advanced 2015 Sample Sizes for Scaling the Physics Data

Country	Item Calibration		Proficiency Estimation	
	2015	2008	2015	2008
Armenia	—	894	—	894
France	3,958	—	3,958	—
Iran, Islamic Rep. of	—	2,434	—	2,434
Italy	3,424	1,861	3,424	1,861
Lebanon	1,156	1,595	1,156	1,595
Netherlands	—	1,511	—	1,511
Norway	2,472	1,640	2,472	1,640
Portugal	1,783	—	1,783	—
Russian Federation	3,822	3,166	3,822	3,166
Slovenia	1,106	1,097	1,106	1,097
Sweden	3,727	2,291	3,727	2,291
United States	2,932	—	2,932	—
Total	**24,380**	**16,489**	**24,380**	**16,489**

The item parameters estimated from these concurrent calibrations, based on the countries that have participated in both the previous and current assessments, were used to estimate student proficiency for all countries participating in the TIMSS Advanced 2015 assessments. These item parameters were also used to estimate student proficiency in the advanced mathematics and physics content and cognitive domains. The item parameters estimated from the TIMSS Advanced concurrent calibrations for advanced mathematics and physics are presented in Appendix 13A-13B.

Treatment of Omitted and Not–Reached Responses

Given the matrix-sampling design used by TIMSS Advanced, whereby a student is administered only a sample of the assessment blocks (three advanced mathematics or three physics blocks) most items are missing by design for each student. However, missing data can also result from a student not answering an item, which can occur when the student does not know the answer, omits the item by mistake, or does not have sufficient time to attempt the item. An item is considered "not reached" when the item itself and the item immediately preceding it are not answered, and there are no other items completed in the remainder of the booklet.

Not-reached items are treated differently in estimating item parameters and in generating student proficiency scores. In estimating the values of the item parameters, items in the assessment booklets that are considered not to have been reached by students are treated as if they have not been administered. This approach is considered optimal for parameter estimation. However, not-reached items are always considered as incorrect responses when student proficiency scores are generated.

Evaluating Fit of IRT Models to the TIMSS Advanced Assessment Data

After the item calibrations were completed, checks were performed to verify that the item parameters obtained from Parscale adequately reproduce the observed distribution of student responses across the proficiency continuum. The fit of the IRT models to the TIMSS Advanced assessment data is examined by comparing the item response function curves generated using the item parameters estimated from the data with the empirical item response functions calculated from the latent abilities estimated for each student that responded to the item. When the empirical results for an item fall near the fitted curves, the IRT model fits the data well and provides an accurate and reliable measurement of the underlying proficiency scale. Graphical plots of these response function curves are called item characteristic curves (ICC).

The plots in the Exhibits 13.6 and 13.7 show examples of the empirical and fitted item response functions for dichotomously scored (right/wrong) multiple-choice and constructed response items, respectively. In each plot, the horizontal axis represents the proficiency scale, and the vertical

axis represents the probability of a correct response. The fitted curve based on the estimated item parameters is shown as a solid line. Empirical results are represented by circles. The empirical results are obtained by first dividing the proficiency scale into intervals of equal size and then counting the number of students responding to the item whose estimated latent abilities (EAP scores) from Parscale fall in each interval. Then the proportion of students in each interval that responded correctly to the item is calculated. In the exhibits, the center of each circle represents this empirical proportion of correct responses. The size of each circle is proportional to the number of students contributing to the estimation of the empirical proportion correct.

Exhibit 13.6: Example of Item Response Function for a Dichotomous Multiple-Choice Item from the TIMSS Advanced 2015 Advanced Mathematics Assessment

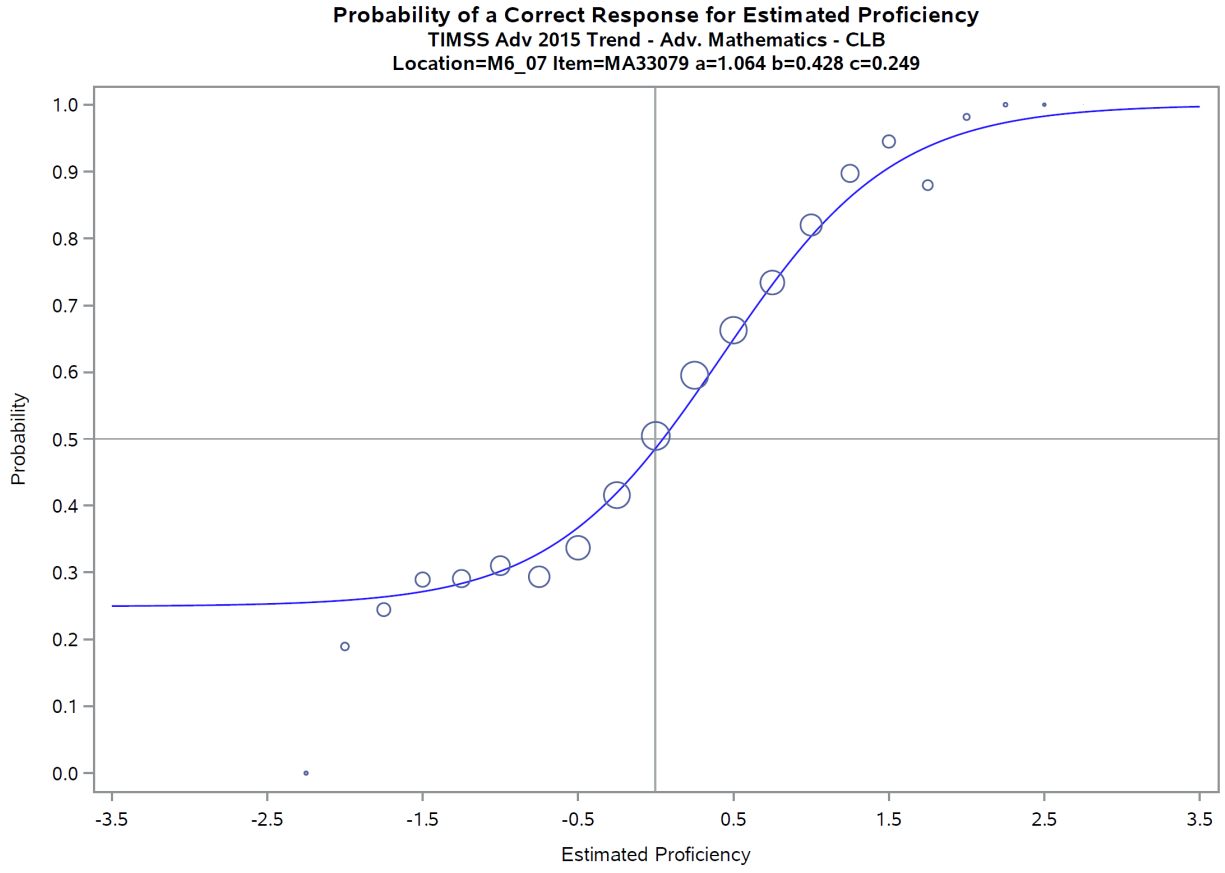
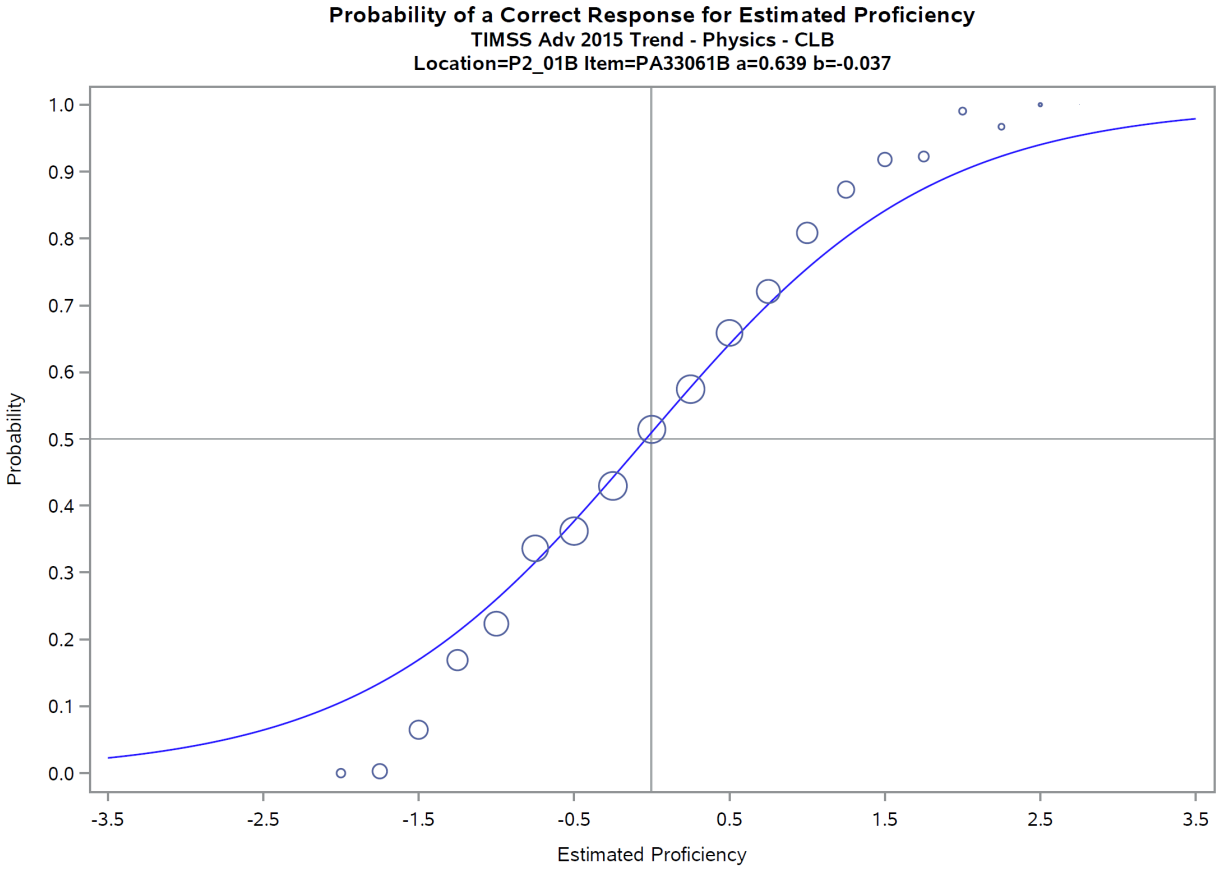
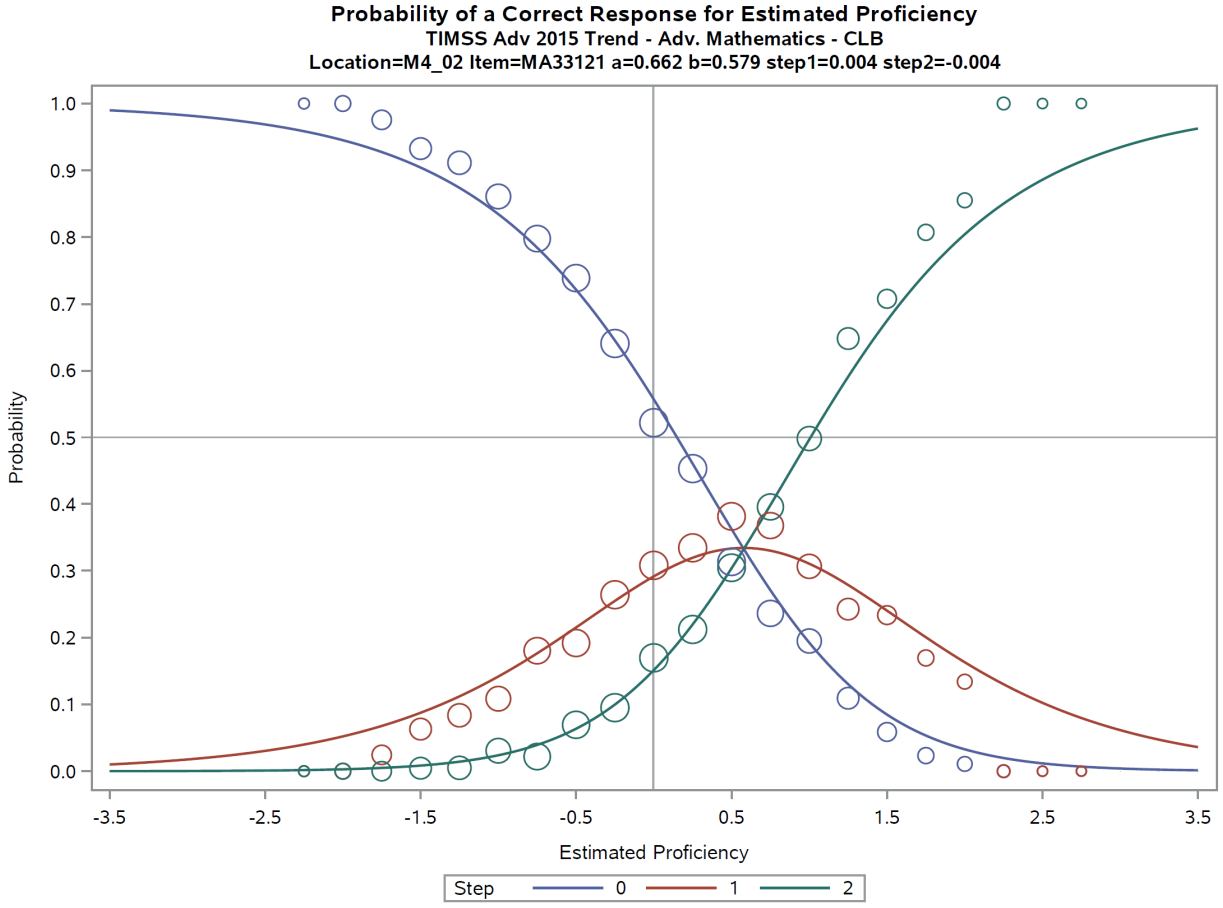


Exhibit 13.7: Example of Item Response Function for a Dichotomous Constructed Response Item from the TIMSS Advanced 2015 Physics Assessment



The plot in Exhibit 13.8 shows the empirical and fitted item response functions for a polytomous item (scored 0, 1, or 2). As for the dichotomous item plots, the horizontal axis represents the proficiency scale, but in this example the vertical axis represents the probability of having a response in a given response category. The fitted curves based on the estimated item parameters are shown as solid lines and again the empirical results are represented by circles. The interpretation of the circles is the same as in Exhibits 13.6 and 13.7. The curve starting at the top left of the chart plots the probability of a score of zero on the item. This probability decreases as proficiency increases. The bell-shaped curve shows the probability of a score of one point—partial credit, starting low for low-ability students, reaching a maximum for medium-ability students, and decreasing for high-ability students. The curve ending at the top right corner of the chart shows the probability of a score of two points—full credit, starting low for low-ability students and increasing as proficiency increases.

Exhibit 13.8: Example of Item Response Function for a Polytomous Constructed Response Item from the TIMSS Advanced 2015 Advanced Mathematics Assessment



Variables for Conditioning the TIMSS Advanced Assessment Data

Conditioning is the practice of using all available students' background information to improve the reliability of the estimated student proficiency scores. Ideally all background data would be included in the conditioning model, but because TIMSS Advanced has so many student background variables that could be used in conditioning, the TIMSS & PIRLS International Study Center follows the practice established by NAEP and followed by other large-scale studies of using principal components analysis to reduce the number of variables while explaining most of their common variance. Principal components for the TIMSS Advanced student background variables were constructed as follows:

- For categorical variables (questions with a small number of fixed response options), a dummy coded variable was created for each response option, with a value of one if the option is chosen and zero otherwise. If a student omitted or was not administered

a particular question, all dummy coded variables associated with that question were assigned the value zero.

- Background variables with numerous response options (such as year of birth) were recoded using criterion scaling.[3] This was done by replacing the response option with the mean interim achievement score of all students choosing that option. Criterion scaling maximizes the correlation between the scaled variable and achievement. For TIMSS Advanced, the interim achievement score was the average of the advanced mathematics and physics EAP scores produced from the item calibrations.
- Separately for each country, all the dummy-coded and criterion-scaled variables were included in a principal components analysis. Those principal components accounting for 90 percent of the variance of the background variables were retained for use as conditioning variables.[4] Because the principal components analysis was performed separately for each country, different numbers of principal components were required to account for 90% of the common variance in each country's background variables.

In addition to the principal components, student gender (dummy coded), the language of the test (dummy coded), an indicator of the classroom in the school to which a student belongs (criterion scaled), and an optional country-specific variable (dummy coded) were included as primary conditioning variables, thereby accounting for most of the variance between students and preserving the between-classroom and within-classroom variance structure in the scaling model. Exhibits 13.9 and 13.10 provide details on the conditioning models used for proficiency estimation in advanced mathematics and physics, respectively.

3 The process of generating criterion-scaled variables is described in Beaton (1969).

4 The number of principal components retained is limited to no more than 5% of a country's student sample size, thereby possibly reducing the percentage of variance accounted for, to avoid over-specification of the conditioning model.

Exhibit 13.9: TIMSS Advanced 2015 Conditioning Models for Advanced Mathematics Proficiency Estimation

Country	2015				2008			
	Number of Primary Conditioning Variables	Number of Principal Components Available	Number of Principal Components Retained	Percentage of Variance Explained	Number of Primary Conditioning Variables	Number of Principal Components Available	Number of Principal Components Retained	Percentage of Variance Explained
France	2	349	180	90	—	—	—	—
Armenia	—	—	—	—	2	271	42	52
Iran, Islamic Rep. of	—	—	—	—	2	279	121	80
Italy	2	355	165	86	2	270	107	78
Lebanon	3	354	58	56	3	277	80	63
Netherlands	—	—	—	—	2	269	76	65
Norway	2	355	126	77	2	270	96	74
Portugal	2	354	178	90	—	—	—	—
Russian Federation	3	354	182	90	2	277	157	90
Russian Federation 6hr+	2	354	171	89	—	—	—	—
Slovenia	2	355	146	83	2	270	107	78
Sweden	2	351	182	90	2	268	115	81
United States	10	350	147	86	—	—	—	—

Exhibit 13.10: TIMSS Advanced 2015 Conditioning Models for Physics Proficiency Estimation

Country	2015				2008			
	Number of Primary Conditioning Variables	Number of Principal Components Available	Number of Principal Components Retained	Percentage of Variance Explained	Number of Primary Conditioning Variables	Number of Principal Components Available	Number of Principal Components Retained	Percentage of Variance Explained
Armenia	—	—	—	—	2	275	44	53
France	2	347	177	90	—	—	—	—
Iran, Islamic Rep. of	—	—	—	—	2	282	121	79
Italy	2	355	171	87	2	206	93	78
Lebanon	3	355	57	56	3	281	79	63
Netherlands	—	—	—	—	2	272	75	64
Norway	2	354	123	76	2	272	82	68
Portugal	2	353	89	69	—	—	—	—
Russian Federation	2	354	178	90	2	283	158	90
Slovenia	2	355	55	56	2	272	54	53
Sweden	2	351	180	90	2	268	114	79
United States	10	350	146	86	—	—	—	—

Generating IRT Proficiency Scores for the TIMSS Advanced Assessment Data

Educational Testing Service's MGROUP program (Sheehan, 1985) was used to generate the IRT proficiency scores. This program takes as input the students' responses to the items they were given, the item parameters estimated at the calibration stage, and the conditioning variables, and generates as output the plausible values that represent student proficiency. TIMSS Advanced estimates overall advanced mathematics and physics using two separate MGROUP runs.

A useful feature of MGROUP is its ability to perform multi-dimensional scaling using the responses to all items across the proficiency scales and the correlations among the scales to improve the reliability of each individual scale. This feature of MGROUP was used to generate proficiency scores for the TIMSS Advanced 2015 content and cognitive domains using the item parameters estimated for the overall advanced mathematics and overall physics scales as well the same conditioning variables. The content domain scaling used two three-dimensional models, one to estimate proficiency scores for the three content domains in advanced mathematics and a second for the three physics content domains. The cognitive domain scaling relied on two three-dimensional models to estimate the three cognitive domains in advanced mathematics and physics.

In addition to generating plausible values on the overall advanced mathematics and physics scales for the 2015 assessment data, the item parameters estimated at the calibration stage also were used to generate plausible values for the TIMSS Advanced 2008 assessment for the countries included in the concurrent calibration. These additional plausible values were used to establish the linear transformation necessary to place the 2015 assessment data on the appropriate trend scales.

Transforming the Overall Scores to Measure Trends

To provide results for the TIMSS Advanced 2015 assessments on the existing TIMSS Advanced achievement scales, the 2015 proficiency scores (plausible values) for overall advanced mathematics and overall physics had to be transformed to the TIMSS Advanced reporting metric. This was accomplished through a set of linear transformations as part of the concurrent calibration approach. These linear transformations were given by:

$$PV^{*}_{k,i} = A_{k,i} + B_{k,i} \times PV_{k,i}$$

where

$PV_{k,i}$ is the TIMSS Advanced 2015 plausible value i of scale k prior to transformation;
$PV^{*}_{k,i}$ is the TIMSS Advanced 2015 plausible value i of scale k after transformation; and
$A_{k,i}$ and $B_{k,i}$ are the linear transformation constants.

The linear transformation constants were obtained by first computing the international means and standard deviations of the proficiency scores for the overall advanced mathematics and physics scales using the plausible values produced in 2008 based on the 2008 item calibrations for the trend countries. These were the plausible values published in 2008. Next, the same calculations were done using the plausible values from the re-scaled TIMSS 2008 assessment data based on the 2015 concurrent item calibrations for the same set of countries. From these calculations, the linear transformation constants were defined as:

$$B_{k,i} = \sigma_{k,i} / \sigma^*_{k,i}$$

$$A_{k,i} = \mu_{k,i} - B_{k,i} \cdot \mu^*_{k,i}$$

where

$\mu_{k,i}$ is the international mean of scale k based on plausible value i published in 2008;

$\mu^*_{k,i}$ is the international mean of scale k based on plausible value i from the 2008 assessment based on the 2015 concurrent calibration;

$\sigma_{k,i}$ is the international standard deviation of scale k based on plausible value i published in 2008;

$\sigma^*_{k,i}$ is the international standard deviation of scale k based on plausible value i from the 2008 assessment based on the 2015 concurrent calibration.

There are five sets of transformation constants for each scale, one for each plausible value. The trend countries contributed equally in the calculation of these transformation constants. Exhibits 13.11 and 13.12 show the TIMSS Advanced 2015 transformation constants for each subject, respectively.

Exhibit 13.11: TIMSS Advanced 2015 Linear Transformation Constants for Advanced Mathematics Achievement Scores

Overall Mathematics	TIMSS Advanced 2008 Published Scores		TIMSS Advanced 2008 Re-Scaled Scores		$A_{k,i}$	$B_{k,i}$
	Mean	Standard Deviation	Mean	Standard Deviation		
PV1	482.08004	102.02112	0.02399	0.96695	479.54919	105.50867
PV2	484.06485	101.87143	0.01989	0.97315	481.98240	104.68254
PV3	481.55003	101.94905	0.01522	0.98122	479.96851	103.90001
PV4	483.32440	101.66813	0.02280	0.97990	480.95897	103.75383
PV5	483.13244	102.27646	0.01689	0.98610	481.38015	103.71804

Exhibit 13.12: TIMSS Advanced 2015 Linear Transformation Constants for Physics Achievement Scores

Overall Physics	TIMSS Advanced 2008 Published Scores		TIMSS Advanced 2008 Re-Scaled Scores		$A_{k,i}$	$B_{k,i}$
	Mean	Standard Deviation	Mean	Standard Deviation		
PV1	498.80619	105.32288	0.20174	0.87253	474.45477	120.70987
PV2	499.21094	104.17338	0.19521	0.87781	476.04490	118.67351
PV3	498.78611	105.03022	0.19684	0.87638	475.19542	119.84490
PV4	498.93406	104.72493	0.19855	0.87162	475.07806	120.14980
PV5	498.86035	105.38060	0.20000	0.88298	474.99048	119.34691

These linear transformation constants were applied to the overall proficiency scores—advanced mathematics and physics—for all participating countries. This provided student achievement scores for the TIMSS Advanced 2015 assessments that are directly comparable to the scores from all previous assessments.

The linear transformation constants for the overall scales also were applied to the scales for the content and cognitive domains. The transformation constants for advanced mathematics were applied to the proficiency scores of the advanced mathematics content domains and cognitive domains, and the transformation constants for physics were applied to the proficiency scores of the physics content domains and cognitive domains. In this approach to measuring trends in content and cognitive domains, achievement changes over time are established in the context of achievement in each subject overall. Trends are not established separately for each content or cognitive domain; rather differential changes in performance in the domains are considered in the light of trends in the subject overall.

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Appendix 13A: TIMSS Advanced 2015 Advanced Mathematics Item Parameters from Concurrent Calibration

TIMSS Advanced 2015 Advanced Mathematics Item Parameters from Concurrent Calibration

Item		Slope (a_j)	Location (b_j)	Guessing (c_j)	Step 1 (d_{j1})	Step 2 (d_{j2})
Items Released in 2008:						
M1_01	MA13001	1.070 (0.069)	-0.322 (0.059)	0.111 (0.027)		
M1_02	MA13002	1.325 (0.099)	0.118 (0.051)	0.204 (0.025)		
M1_03	MA13003	0.580 (0.073)	0.532 (0.139)	0.200 (0.043)		
M1_04	MA13004	0.941 (0.090)	0.176 (0.087)	0.275 (0.034)		
M1_06	MA13006	0.895 (0.068)	0.390 (0.057)	0.095 (0.023)		
M1_07	MA13007	0.913 (0.083)	0.398 (0.073)	0.192 (0.029)		
M1_08	MA13008	1.064 (0.080)	-0.293 (0.074)	0.205 (0.034)		
M1_09	MA13009	0.732 (0.082)	0.538 (0.101)	0.221 (0.035)		
M3_01	MA13021	0.453 (0.069)	0.031 (0.292)	0.278 (0.070)		
M3_04	MA13024	1.243 (0.116)	0.572 (0.055)	0.255 (0.023)		
M3_05A	MA13025A	0.567 (0.034)	0.152 (0.048)			
M3_05B	MA13025B	0.877 (0.062)	1.922 (0.093)			
M3_06A	MA13026A	0.600 (0.035)	-0.340 (0.052)			
M3_06B	MA13026B	0.847 (0.052)	1.449 (0.064)			
M3_07	MA13027	0.468 (0.016)	0.770 (0.037)		-2.253 (0.119)	2.253 (0.124)
M3_08	MA13028	0.469 (0.044)	2.422 (0.192)			
M3_09	MA13029	0.426 (0.016)	0.548 (0.040)		-1.736 (0.109)	1.736 (0.112)
M6_01	MA23069	1.036 (0.124)	0.460 (0.077)	0.170 (0.030)		
M6_02	MA23135	0.573 (0.046)	0.013 (0.067)			
M6_03	MA23208	0.896 (0.127)	0.799 (0.089)	0.166 (0.030)		
M6_04	MA23165	0.645 (0.051)	0.460 (0.066)			
M6_05	MA23039	0.718 (0.080)	-0.306 (0.131)	0.151 (0.045)		
M6_06	MA23159	0.640 (0.048)	-0.420 (0.066)			
M6_07	MA23198	1.237 (0.084)	0.681 (0.042)			
M6_08	MA23042	1.046 (0.166)	0.571 (0.102)	0.333 (0.036)		
M6_09	MA23055	0.964 (0.112)	0.500 (0.076)	0.134 (0.029)		
M6_10	MA23080	1.182 (0.119)	0.272 (0.063)	0.135 (0.027)		
M6_11	MA23021	1.931 (0.286)	1.191 (0.055)	0.160 (0.016)		
M7_01	MA23004	0.797 (0.152)	0.904 (0.136)	0.300 (0.044)		
M7_02	MA23063	1.242 (0.207)	1.477 (0.087)	0.144 (0.020)		
M7_03	MA23141	1.030 (0.076)	0.953 (0.053)			

TIMSS Advanced 2015 Advanced Mathematics Item Parameters from Concurrent Calibration (Continued)

M7_04	MA23133	0.937 (0.135)	1.207 (0.085)	0.108 (0.024)		
M7_05	MA23158	1.486 (0.211)	1.304 (0.064)	0.124 (0.017)		
M7_06	MA23151	0.833 (0.133)	0.749 (0.116)	0.227 (0.041)		
M7_07A	MA23035A	0.995 (0.069)	0.424 (0.045)			
M7_07B	MA23035B	0.897 (0.076)	1.250 (0.076)			
M7_08	MA23050	1.085 (0.226)	1.482 (0.111)	0.237 (0.027)		
M7_09	MA23041	0.882 (0.144)	1.014 (0.101)	0.185 (0.035)		
M7_10	MA23182	1.291 (0.166)	0.660 (0.069)	0.198 (0.030)		
M7_11	MA23170	1.005 (0.077)	0.833 (0.054)			
Items Common in 2008 and 2015:						
M1_01	MA13011	0.925 (0.060)	0.201 (0.056)	0.155 (0.024)		
M1_02	MA13012	1.098 (0.089)	1.030 (0.043)	0.176 (0.015)		
M1_03	MA13013	1.051 (0.067)	0.088 (0.055)	0.207 (0.025)		
M1_05	MA13015	0.682 (0.054)	-0.171 (0.117)	0.214 (0.041)		
M1_06	MA13016	0.579 (0.079)	1.694 (0.105)	0.154 (0.025)		
M1_07	MA13017	0.743 (0.055)	0.790 (0.055)	0.091 (0.020)		
M1_08	MA13018	0.364 (0.040)	-0.530 (0.315)	0.186 (0.071)		
M1_09	MA13019	1.136 (0.138)	1.793 (0.074)	0.185 (0.012)		
M1_10	MA13020	1.580 (0.156)	1.308 (0.042)	0.274 (0.012)		
M3_01	MA23005	0.554 (0.053)	0.270 (0.121)	0.179 (0.038)		
M3_02	MA23145	0.561 (0.027)	0.595 (0.044)			
M3_03	MA23187	0.321 (0.010)	-0.145 (0.036)		-1.660 (0.092)	1.660 (0.090)
M3_04	MA23201	0.813 (0.031)	0.031 (0.027)			
M3_05	MA23154	0.449 (0.012)	-0.164 (0.027)		-1.246 (0.069)	1.246 (0.067)
M3_06	MA23206	1.232 (0.074)	-0.048 (0.046)	0.227 (0.022)		
M3_07	MA23166	1.158 (0.057)	1.542 (0.048)			
M3_08	MA23043	0.560 (0.016)	0.969 (0.031)		-1.102 (0.060)	1.102 (0.069)
M3_09	MA23076	0.744 (0.056)	0.177 (0.075)	0.171 (0.028)		
M3_10	MA23176	0.734 (0.074)	0.417 (0.096)	0.308 (0.031)		
M3_11	MA23098	1.044 (0.109)	1.096 (0.056)	0.275 (0.017)		
M5_01	MA23144	1.045 (0.086)	0.965 (0.045)	0.182 (0.016)		
M5_02	MA23185	0.733 (0.072)	0.787 (0.077)	0.195 (0.027)		
M5_03	MA23054	0.593 (0.018)	0.851 (0.027)		-0.546 (0.048)	0.546 (0.056)
M5_04	MA23064	0.753 (0.074)	1.207 (0.064)	0.138 (0.020)		
M5_05A	MA23131A	0.927 (0.036)	0.434 (0.026)			
M5_05B	MA23131B	0.889 (0.043)	1.490 (0.052)			
M5_06	MA23157	0.675 (0.025)	0.798 (0.027)		0.489 (0.035)	-0.489 (0.046)

TIMSS Advanced 2015 Advanced Mathematics Item Parameters from Concurrent Calibration (Continued)

M5_07	MA23045	1.133 (0.121)	1.531 (0.059)	0.175 (0.012)		
M5_08	MA23082	0.739 (0.074)	0.356 (0.104)	0.300 (0.034)		
M5_09	MA23020	0.892 (0.107)	1.157 (0.071)	0.316 (0.021)		
M5_10	MA23094	0.491 (0.019)	1.547 (0.054)		-0.479 (0.059)	0.479 (0.082)
Items Introduced in 2015:						
M2_01	MA33086	0.989 (0.097)	-0.371 (0.109)	0.160 (0.054)		
M2_02	MA33225	0.517 (0.023)	-0.186 (0.039)		-0.786 (0.090)	0.786 (0.087)
M2_03	MA33142	0.693 (0.049)	0.816 (0.065)			
M2_04	MA33044	0.792 (0.142)	1.109 (0.118)	0.251 (0.037)		
M2_05	MA33179	1.134 (0.064)	0.485 (0.036)			
M2_06	MA33076	0.414 (0.131)	1.128 (0.389)	0.245 (0.100)		
M2_07	MA33140	0.809 (0.102)	0.335 (0.115)	0.145 (0.047)		
M2_08	MA33007	0.878 (0.096)	0.105 (0.105)	0.149 (0.046)		
M2_09	MA33214	1.100 (0.068)	0.934 (0.048)			
M2_10	MA33171	0.898 (0.105)	0.456 (0.089)	0.147 (0.037)		
M2_11	MA33039	0.805 (0.049)	0.025 (0.043)			
M2_12	MA33180	0.541 (0.043)	0.892 (0.084)			
M4_01	MA33008	0.780 (0.050)	0.356 (0.047)			
M4_02	MA33121	0.662 (0.034)	0.579 (0.039)		0.004 (0.060)	-0.004 (0.072)
M4_03	MA33240	0.439 (0.022)	0.318 (0.047)		-0.627 (0.095)	0.627 (0.101)
M4_04	MA33050	0.945 (0.095)	0.502 (0.065)	0.070 (0.027)		
M4_05	MA33046	0.766 (0.090)	-0.608 (0.187)	0.177 (0.078)		
M4_06	MA33162	1.094 (0.143)	0.629 (0.077)	0.243 (0.031)		
M4_07	MA33163	1.214 (0.122)	0.223 (0.065)	0.175 (0.031)		
M4_08	MA33066	0.804 (0.096)	0.507 (0.089)	0.098 (0.037)		
M4_09	MA33182	1.014 (0.127)	0.606 (0.078)	0.191 (0.032)		
M4_10	MA33232	0.726 (0.032)	0.338 (0.032)		-0.378 (0.063)	0.378 (0.068)
M4_11	MA33178	0.709 (0.050)	0.202 (0.052)			
M6_01	MA33201	0.992 (0.169)	0.869 (0.100)	0.340 (0.034)		
M6_02	MA33016	1.171 (0.196)	0.758 (0.093)	0.419 (0.031)		
M6_03	MA33083	0.846 (0.053)	0.286 (0.042)			
M6_04	MA33143	1.055 (0.066)	0.801 (0.045)			
M6_05	MA33198	0.572 (0.101)	-0.223 (0.323)	0.243 (0.100)		
M6_06	MA33227	0.875 (0.061)	0.983 (0.059)			
M6_07	MA33079	1.064 (0.132)	0.428 (0.085)	0.249 (0.036)		
M6_08	MA33220	0.543 (0.030)	0.145 (0.039)		-0.039 (0.075)	0.039 (0.077)
M6_09	MA33150	0.545 (0.080)	-0.294 (0.268)	0.072 (0.095)		

TIMSS Advanced 2015 Advanced Mathematics Item Parameters from Concurrent Calibration (Continued)

M6_10	MA33233	0.459 (0.019)	0.530 (0.045)		-1.741 (0.122)	1.741 (0.128)
M6_11	MA33157	0.657 (0.114)	1.047 (0.122)	0.124 (0.044)		
M6_12	MA33155	1.093 (0.090)	1.584 (0.085)			
M7_01	MA33202	0.902 (0.100)	0.493 (0.077)	0.103 (0.034)		
M7_02	MA33042	0.978 (0.057)	-0.323 (0.040)			
M7_03	MA33094	0.587 (0.044)	0.079 (0.057)			
M7_04	MA33123	1.153 (0.147)	0.844 (0.065)	0.180 (0.026)		
M7_05	MA33137	0.894 (0.124)	0.655 (0.095)	0.201 (0.038)		
M7_06	MA33067	1.347 (0.075)	0.392 (0.031)			
M7_07	MA33012	0.831 (0.039)	1.005 (0.039)		-0.430 (0.062)	0.430 (0.077)
M7_08	MA33075	1.250 (0.157)	0.926 (0.060)	0.161 (0.022)		
M7_09	MA33212	1.496 (0.209)	1.000 (0.059)	0.234 (0.021)		
M7_10	MA33186	1.113 (0.186)	0.763 (0.096)	0.379 (0.033)		
M7_11	MA33239	0.467 (0.026)	0.874 (0.058)		-0.629 (0.094)	0.629 (0.111)
M7_12	MA33038	0.847 (0.060)	0.695 (0.054)			
M8_01	MA33027	1.007 (0.106)	-0.035 (0.092)	0.183 (0.043)		
M8_02	MA33091	0.518 (0.042)	0.430 (0.070)			
M8_03	MA33106	1.461 (0.164)	0.601 (0.053)	0.211 (0.023)		
M8_04	MA33090	0.527 (0.027)	0.280 (0.040)		-0.327 (0.077)	0.327 (0.083)
M8_05	MA33126	0.999 (0.131)	0.225 (0.106)	0.301 (0.042)		
M8_06	MA33118	0.311 (0.021)	0.458 (0.069)		-0.477 (0.123)	0.477 (0.135)
M8_07	MA33243	0.657 (0.027)	0.887 (0.040)		-1.967 (0.133)	1.967 (0.141)
M8_08	MA33229	1.220 (0.091)	1.390 (0.069)			
M8_09	MA33011	0.851 (0.084)	0.314 (0.073)	0.050 (0.032)		
M8_10	MA33159	0.921 (0.058)	0.600 (0.046)			
M8_11	MA33054	0.891 (0.124)	0.962 (0.082)	0.129 (0.028)		
M9_01	MA33085	1.228 (0.138)	0.319 (0.073)	0.253 (0.033)		
M9_02	MA33190	0.449 (0.039)	-0.664 (0.088)			
M9_03	MA33115	1.059 (0.166)	1.097 (0.085)	0.249 (0.027)		
M9_04	MA33237	0.933 (0.056)	0.407 (0.041)			
M9_05	MA33077	0.769 (0.118)	0.678 (0.122)	0.210 (0.045)		
M9_06	MA33132	0.611 (0.130)	0.915 (0.188)	0.263 (0.059)		
M9_07	MA33218	0.636 (0.026)	0.737 (0.038)		-1.373 (0.099)	1.373 (0.107)
M9_08	MA33236	0.621 (0.029)	0.809 (0.043)		-0.519 (0.074)	0.519 (0.087)
M9_09	MA33181	0.697 (0.097)	-0.240 (0.210)	0.202 (0.079)		
M9_10	MA33002	0.822 (0.053)	0.430 (0.047)			
M9_11	MA33169	1.228 (0.252)	1.341 (0.103)	0.373 (0.024)		
M9_12	MA33235	1.248 (0.082)	0.970 (0.047)			

Appendix 13B: TIMSS Advanced 2015 Physics Item Parameters from Concurrent Calibration

TIMSS Advanced 2015 Physics Item Parameters from Concurrent Calibration

Item		Slope (a_j)	Location (b_j)	Guessing (c_j)	Step 1 (d_{j1})	Step 2 (d_{j2})
Items Released in 2008:						
P1_01	PA13001	0.670 (0.099)	0.478 (0.173)	0.337 (0.052)		
P1_02	PA13002	1.089 (0.110)	0.451 (0.076)	0.304 (0.032)		
P1_03	PA13003	1.059 (0.094)	0.114 (0.082)	0.253 (0.037)		
P1_04	PA13004	0.578 (0.056)	-1.001 (0.231)	0.199 (0.079)		
P1_05	PA13005	0.720 (0.088)	-0.266 (0.205)	0.352 (0.066)		
P1_06	PA13006	1.047 (0.183)	1.676 (0.099)	0.283 (0.020)		
P1_09	PA13009	0.877 (0.143)	1.571 (0.096)	0.234 (0.024)		
P3_01	PA13021	0.812 (0.090)	0.644 (0.087)	0.190 (0.035)		
P3_02	PA13022	0.693 (0.026)	1.214 (0.036)		-0.890 (0.065)	0.890 (0.077)
P3_03	PA13023	0.635 (0.038)	0.030 (0.045)			
P3_04	PA13024	0.671 (0.027)	1.093 (0.036)		-0.466 (0.056)	0.466 (0.068)
P3_05	PA13025	0.589 (0.024)	1.267 (0.043)		-0.815 (0.070)	0.815 (0.085)
P3_06	PA13026	1.051 (0.076)	1.817 (0.080)			
P3_07A	PA13027A	0.834 (0.053)	1.234 (0.057)			
P6_01	PA23050	1.010 (0.201)	1.148 (0.109)	0.330 (0.035)		
P6_02	PA23056	0.441 (0.085)	-0.032 (0.385)	0.273 (0.091)		
P6_03	PA23142	1.231 (0.169)	0.727 (0.078)	0.261 (0.033)		
P6_04	PA23072	0.677 (0.053)	0.352 (0.057)			
P6_05	PA23022	0.473 (0.027)	1.702 (0.087)		-1.701 (0.150)	1.701 (0.179)
P6_06	PA23030	1.727 (0.253)	1.395 (0.058)	0.111 (0.015)		
P6_07	PA23078	0.320 (0.043)	0.870 (0.139)			
P6_08	PA23113	0.880 (0.184)	1.268 (0.122)	0.284 (0.038)		
P6_09	PA23128	0.454 (0.047)	0.874 (0.100)			
P6_10	PA23058	1.163 (0.167)	0.767 (0.084)	0.267 (0.034)		
P6_11	PA23115	1.365 (0.196)	1.171 (0.063)	0.165 (0.022)		
P7_01	PA23110	0.651 (0.124)	0.897 (0.169)	0.233 (0.055)		
P7_02	PA23014	0.570 (0.049)	0.190 (0.067)			
P7_03	PA23025	0.779 (0.040)	1.323 (0.047)		-0.831 (0.088)	0.831 (0.104)
P7_04	PA23028	1.024 (0.142)	0.626 (0.098)	0.247 (0.041)		
P7_05	PA23034	0.448 (0.050)	1.293 (0.128)			
P7_06	PA23044	0.795 (0.067)	1.328 (0.080)			

TIMSS Advanced 2015 Physics Item Parameters from Concurrent Calibration (Continued)

P7_07	PA23082	0.719 (0.055)	0.169 (0.055)			
P7_08	PA23140	0.687 (0.138)	1.328 (0.140)	0.194 (0.044)		
P7_09	PA23084	0.752 (0.038)	1.297 (0.045)		-1.635 (0.136)	1.635 (0.146)
P7_10	PA23059	0.587 (0.083)	-0.666 (0.286)	0.258 (0.087)		
P7_11	PA23138	1.436 (0.198)	0.302 (0.096)	0.429 (0.040)		
P7_12	PA23137	0.591 (0.052)	0.674 (0.070)			
Items Common in 2008 and 2015:						
P1_01	PA13011	0.301 (0.057)	0.750 (0.411)	0.230 (0.077)		
P1_02	PA13012	1.392 (0.110)	1.357 (0.037)	0.099 (0.009)		
P1_03	PA13013	0.914 (0.112)	1.525 (0.072)	0.240 (0.017)		
P1_04	PA13014	0.896 (0.069)	0.512 (0.059)	0.201 (0.024)		
P1_05	PA13015	0.903 (0.116)	0.616 (0.105)	0.555 (0.025)		
P1_06	PA13016	1.132 (0.097)	1.341 (0.045)	0.124 (0.012)		
P1_07	PA13017	0.301 (0.043)	0.276 (0.360)	0.189 (0.069)		
P1_08	PA13018	0.633 (0.082)	1.147 (0.097)	0.254 (0.030)		
P1_09	PA13019	0.521 (0.080)	1.626 (0.117)	0.178 (0.031)		
P3_01	PA23071	0.674 (0.140)	1.595 (0.139)	0.470 (0.025)		
P3_02	PA23146	0.665 (0.028)	-0.170 (0.033)			
P3_03	PA23029	1.108 (0.066)	0.424 (0.038)	0.127 (0.017)		
P3_04	PA23104	0.725 (0.082)	0.723 (0.094)	0.301 (0.030)		
P3_05	PA23038	0.788 (0.061)	0.628 (0.058)	0.138 (0.022)		
P3_06	PA23041	0.584 (0.026)	-0.584 (0.043)			
P3_07	PA23053	0.509 (0.016)	0.589 (0.028)		-0.403 (0.051)	0.403 (0.057)
P3_08	PA23148	0.446 (0.055)	-0.054 (0.254)	0.254 (0.062)		
P3_09	PA23119	0.484 (0.014)	1.508 (0.044)		-1.893 (0.088)	1.893 (0.101)
P3_10	PA23088	0.726 (0.029)	-0.081 (0.030)			
P3_11	PA23066	0.699 (0.030)	0.636 (0.035)			
P5_01	PA23048	0.616 (0.064)	-0.638 (0.226)	0.390 (0.062)		
P5_02	PA23039	0.797 (0.091)	1.266 (0.070)	0.220 (0.021)		
P5_03	PA23035	0.830 (0.032)	0.104 (0.027)			
P5_04	PA23042	0.857 (0.108)	1.127 (0.077)	0.349 (0.023)		
P5_05	PA23012	0.841 (0.039)	1.308 (0.047)			
P5_06 *	PA23131	0.984 (0.160)	1.606 (0.093)	0.253 (0.022)		
P5_07	PA23051	0.982 (0.037)	0.504 (0.025)			
P5_08	PA23085	0.882 (0.117)	1.391 (0.077)	0.309 (0.020)		
P5_09	PA23130	0.502 (0.014)	1.102 (0.033)		-1.489 (0.071)	1.489 (0.080)
P5_10	PA23086	0.535 (0.030)	1.284 (0.067)			
P5_11	PA23064	0.784 (0.078)	0.643 (0.081)	0.264 (0.029)		

* Item P5_06 is not included in the TIMSS Advanced 2015 Physics Framework. All responses to the item in the 2015 assessment were set to Not Administered.

TIMSS Advanced 2015 Physics Item Parameters from Concurrent Calibration (Continued)

Items Introduced in 2015:						
P2_01A	PA33061A	1.223 (0.118)	0.664 (0.051)	0.096 (0.019)		
P2_01B	PA33061B	0.639 (0.042)	-0.037 (0.053)			
P2_02	PA33004	0.749 (0.049)	0.679 (0.058)			
P2_03	PA33044	0.487 (0.131)	1.771 (0.218)	0.161 (0.048)		
P2_04	PA33075	0.623 (0.042)	0.248 (0.057)			
P2_05A	PA33102A	0.284 (0.032)	-1.777 (0.203)			
P2_05B	PA33102B	0.366 (0.034)	-0.168 (0.087)			
P2_06	PA33121	0.990 (0.172)	0.958 (0.102)	0.358 (0.029)		
P2_07	PA33115	1.070 (0.126)	0.765 (0.067)	0.165 (0.024)		
P2_08	PA33005	0.631 (0.041)	-0.509 (0.058)			
P2_09A	PA33101A	0.647 (0.090)	0.181 (0.158)	0.185 (0.054)		
P2_09B	PA33101B	0.492 (0.053)	2.319 (0.229)			
P4_01	PA33078	0.701 (0.078)	0.310 (0.098)	0.082 (0.036)		
P4_02	PA33088	1.149 (0.099)	-0.122 (0.064)	0.140 (0.029)		
P4_03	PA33058	0.462 (0.019)	0.200 (0.044)		-1.190 (0.104)	1.190 (0.109)
P4_04	PA33057	0.870 (0.122)	0.835 (0.089)	0.192 (0.029)		
P4_05	PA33047	0.567 (0.067)	2.686 (0.281)			
P4_06	PA33012	0.892 (0.127)	1.050 (0.087)	0.159 (0.025)		
P4_07	PA33120	0.862 (0.153)	1.326 (0.110)	0.178 (0.027)		
P4_08A	PA33079A	0.802 (0.124)	0.894 (0.103)	0.217 (0.032)		
P4_08B	PA33079B	0.828 (0.051)	0.524 (0.051)			
P4_09	PA33116	0.986 (0.114)	0.497 (0.076)	0.185 (0.028)		
P4_10	PA33070	0.591 (0.039)	-0.716 (0.064)			
P4_11	PA33011	0.466 (0.037)	0.041 (0.072)			
P6_01	PA33059	0.581 (0.106)	-0.300 (0.315)	0.351 (0.083)		
P6_02	PA33073	0.481 (0.025)	0.027 (0.043)		-0.177 (0.084)	0.177 (0.087)
P6_03	PA33019	1.282 (0.244)	1.429 (0.097)	0.250 (0.018)		
P6_04	PA33015	0.650 (0.113)	0.752 (0.141)	0.216 (0.045)		
P6_05	PA33086	0.782 (0.129)	0.904 (0.110)	0.226 (0.035)		
P6_06	PA33035	0.315 (0.033)	-0.232 (0.100)			
P6_07	PA33119	0.558 (0.035)	2.005 (0.112)		-1.533 (0.155)	1.533 (0.201)
P6_08	PA33046	0.765 (0.048)	0.229 (0.048)			
P6_09	PA33083	0.715 (0.092)	0.061 (0.139)	0.186 (0.050)		
P6_10	PA33069	0.728 (0.046)	-0.994 (0.063)			
P6_11	PA33114	0.559 (0.106)	-0.218 (0.326)	0.338 (0.085)		
P6_12	PA33080	0.832 (0.056)	0.871 (0.062)			

TIMSS Advanced 2015 Physics Item Parameters from Concurrent Calibration (Continued)

P7_01	PA33065	0.936 (0.174)	0.876 (0.114)	0.382 (0.032)		
P7_02A	PA33009A	0.693 (0.032)	1.099 (0.050)		-0.811 (0.083)	0.811 (0.102)
P7_02B	PA33009B	0.895 (0.116)	0.527 (0.090)	0.200 (0.034)		
P7_03	PA33002	0.725 (0.113)	-0.498 (0.248)	0.411 (0.071)		
P7_04	PA33098	0.769 (0.135)	0.991 (0.116)	0.236 (0.035)		
P7_05A	PA33028A	0.545 (0.023)	0.811 (0.047)		-1.434 (0.108)	1.434 (0.120)
P7_05B	PA33028B	0.730 (0.097)	0.051 (0.146)	0.217 (0.052)		
P7_06A	PA33054A	1.312 (0.290)	1.551 (0.114)	0.304 (0.018)		
P7_06B	PA33054B	0.866 (0.065)	1.351 (0.086)			
P7_07	PA33040	0.475 (0.113)	0.316 (0.359)	0.295 (0.089)		
P7_08A	PA33095A	0.720 (0.047)	-1.107 (0.067)			
P7_08B	PA33095B	0.671 (0.105)	0.466 (0.146)	0.207 (0.050)		
P8_01A	PA33066A	0.686 (0.198)	1.422 (0.197)	0.410 (0.038)		
P8_01B	PA33066B	0.823 (0.131)	-0.175 (0.190)	0.466 (0.053)		
P8_02	PA33090	0.383 (0.022)	0.796 (0.070)		-0.603 (0.105)	0.603 (0.127)
P8_03A	PA33064A	0.323 (0.034)	0.233 (0.106)			
P8_03B	PA33064B	0.552 (0.027)	1.355 (0.070)		-1.079 (0.105)	1.079 (0.133)
P8_04	PA33110	0.335 (0.119)	-0.607 (1.247)	0.352 (0.213)		
P8_05	PA33118	0.465 (0.153)	1.582 (0.264)	0.281 (0.061)		
P8_06	PA33109	0.755 (0.090)	0.202 (0.110)	0.149 (0.041)		
P8_07	PA33029	0.488 (0.077)	0.512 (0.171)	0.050 (0.057)		
P8_08	PA33097	0.595 (0.041)	-0.575 (0.061)			
P8_09	PA33099	0.684 (0.124)	0.666 (0.152)	0.292 (0.046)		
P8_10	PA33008	0.209 (0.017)	-0.795 (0.101)		-0.694 (0.197)	0.694 (0.181)
P9_02	PA33072	0.440 (0.036)	-0.932 (0.094)			
P9_03	PA33063	1.187 (0.198)	0.792 (0.091)	0.414 (0.027)		
P9_04	PA33077	0.623 (0.025)	0.501 (0.037)		-1.007 (0.085)	1.007 (0.092)
P9_05A	PA33111A	0.642 (0.026)	0.509 (0.036)		-0.936 (0.082)	0.936 (0.089)
P9_05B	PA33111B	0.900 (0.153)	0.910 (0.106)	0.277 (0.034)		
P9_06	PA33003	0.813 (0.109)	-0.831 (0.224)	0.384 (0.075)		
P9_07	PA33081	0.963 (0.192)	1.259 (0.114)	0.324 (0.027)		
P9_08	PA33045	0.512 (0.128)	0.566 (0.310)	0.358 (0.075)		
P9_09A	PA33094A	0.419 (0.039)	0.837 (0.108)			
P9_09B	PA33094B	0.628 (0.146)	1.208 (0.169)	0.282 (0.046)		
P9_09C	PA33094C	0.848 (0.048)	1.263 (0.052)		-0.098 (0.060)	0.098 (0.088)