

Appendix 15B: TIMSS Advanced 2015 Context Questionnaire Scales, Physics

Home Educational Resources Scale, Physics

The Home Educational Resources (HER) scale was created based on students' responses concerning the availability of four resources described below.

Items in the TIMSS Advanced 2015 Home Educational Resources Scale, Physics

PSBG04	Number of books in the home: 1) 0-10 2) 11-25 3) 26-100 4) 101-200 5) More than 200	Highest level of education of either parent: 1) Finished some primary or lower secondary or did not go to school 2) Finished lower secondary 3) Finished upper secondary 4) Finished post-secondary education 5) Finished university or higher	PSDGEDUP ¹
PSDG06S ¹	Number of home study supports: 1) None 2) Study desk/table or own room 3) Both		
PSDGOCCP ¹	Highest level of occupation of either parent: 1) Has never worked outside home for pay, general laborer, or semi-professional (skilled agricultural or fishery worker, craft or trade worker, plant or machine operator) 2) Clerical (clerk or service or sales worker) 3) Small business owner 4) Professional (corporate manager or senior official, professional, or technician or associate professional)		

¹ Derived variable. For more details, see Supplement 3 of the TIMSS Advanced 2015 User Guide for the [International Database](#).

Item Parameters for the TIMSS Advanced 2015 Home Educational Resources Scale, Physics

Item	delta	tau_1	tau_2	tau_3	tau_4	Infit
PSBG04	0.64929	-0.89914	-0.53587	0.86039	0.57462	1.09
PSDG06S	-0.90816	-0.25972	0.25972			1.11
PSDGEDUP	-0.11749	-0.59426	-0.48752	0.88533	0.19645	1.01
PSDGOCCP	0.37636	-0.64586	1.24705	-0.60119		0.99

Scale Transformation Constants for the TIMSS Advanced 2015 Home Educational Resources Scale, Physics

Scale Transformation Constants

A = 7.525439

B = 2.234962

Transformed Scale Score = 7.525439 + 2.234962 • Logit Scale Score

Equivalence Table of the Raw Score and the Transformed Scale Score for the TIMSS Advanced 2015 Home Educational Resources Scale, Physics

Raw Score	Transformed Scale Score	Cutpoint
0	1.31964	
1	3.68097	
2	4.88859	
3	5.77587	5.8
4	6.50614	
5	7.14369	
6	7.71485	
7	8.25370	
8	8.77829	
9	9.31522	
10	9.89707	
11	10.57858	
12	11.48758	11.4
13	13.18946	

SOURCE: IEA's Trends in International Mathematics and Science Study – TIMSS 2015

SOURCE: IEA's Trends in International Mathematics and Science Study – TIMSS 2015

Cronbach's Alpha Reliability Coefficient and Principal Components Analysis of the Items in the TIMSS Advanced 2015 Home Educational Resources Scale, Physics

Country	Cronbach's Alpha Reliability Coefficient	Percent of Variance Explained	Component Loadings for Each Item			
			PSB004	PSD006S	PSDGT0LP	PSDGT0CP
France	0.60	47	0.65	0.31	0.84	0.81
Italy	0.59	46	0.66	0.22	0.84	0.81
Lebanon	0.51	40	0.60	0.40	0.73	0.75
Norway	0.51	43	0.67	0.28	0.79	0.75
Portugal	0.67	51	0.75	0.08	0.87	0.84
Russian Federation	0.41	38	0.60	0.17	0.78	0.74
Slovenia	0.55	44	0.67	0.14	0.83	0.77
Sweden	0.58	46	0.70	0.42	0.76	0.77
United States	0.52	43	0.73	0.50	0.81	0.51
International Avg.	0.55	44	0.67	0.28	0.80	0.75

Relationship Between the TIMSS Advanced 2015 Home Educational Resources Scale, and TIMSS Advanced 2015 Physics Achievement

Country	Pearson's Correlation with Physics Achievement		Variance in Physics Achievement Accounted for by Difference Between Regions of the Scale (η^2)
	(r)	(r ²)	
France	0.33	0.11	0.07
Italy	0.14	0.02	0.01
Lebanon	0.19	0.04	0.02
Norway	0.26	0.07	0.05
Portugal	0.31	0.09	0.07
Russian Federation	0.15	0.02	0.01
Slovenia	0.21	0.04	0.04
Sweden	0.36	0.13	0.10
United States	0.32	0.10	0.08
International Median	0.26	0.07	0.05

SOURCE: IEA's Trends in International Mathematics and Science Study – TIMSS 2015

Safe and Orderly School-Teachers' Reports Scale, Physics

The Safe and Orderly School-Teachers' Reports (SOS) scale was created based on teachers' degree of agreement with the eight statements described below.

Items in the TIMSS Advanced 2015 Safe and Orderly School-Teachers' Reports Scale, Physics¹

		Agree a lot	Agree a little	Disagree a little	Disagree a lot
PTBG07A	1) This school is located in a safe neighborhood -----	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
PTBG07B	2) I feel safe at this school -----	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
PTBG07C	3) This school's security policies and practices are sufficient -----	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
PTBG07D	4) The students behave in an orderly manner -----	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
PTBG07E	5) The students are respectful of the teachers -----	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
PTBG07F	6) The students respect school property -----	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
PTBG07G	7) This school has clear rules about student conduct -----	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
PTBG07H	8) This school's rules are enforced in a fair and consistent manner -----	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Very Safe and Orderly Safe and Orderly Less than Safe and Orderly

9.8 6.4

¹ For the purpose of scaling, categories in which there were very few respondents were combined. The categories "Disagree a little" and "Disagree a lot" were combined for all variables. The scale statistics that are reported herein reflect analysis of the items following collapsing.

Item Parameters for the TIMSS Advanced 2015 Safe and Orderly School - Teachers' Reports Scale, Physics

Item	delta	tau_1	tau_2	Infit
PTBG07A	-0.79213	-1.28024	1.28024	1.62
PTBG07B	-1.54669	-1.28512	1.28512	0.91
PTBG07C	-0.40475	-1.47335	1.47335	0.97
PTBG07D	0.38110	-1.85404	1.85404	0.82
PTBG07E	0.25303	-2.01362	2.01362	0.81
PTBG07F	1.12283	-2.06225	2.06225	0.88
PTBG07G	0.11548	-1.62992	1.62992	1.02
PTBG07H	0.87113	-1.60812	1.60812	0.95

Scale Transformation Constants for the TIMSS Advanced 2015 Safe and Orderly School - Teachers' Reports Scale, Physics

Scale Transformation Constants

$$A = 8.10253$$

$$B = 0.992158$$

$$\text{Transformed Scale Score} = 8.10253 + 0.992158 \cdot \text{Logit Scale Score}$$

Equivalence Table of the Raw Score and the Transformed Scale Score for the TIMSS Advanced 2015 Safe and Orderly School - Teachers' Reports Scale, Physics

Raw Score	Transformed Scale Score	Cutpoint
0	3.45082	
1	4.70451	
2	5.37921	
3	5.89100	
4	6.33230	6.4
5	6.74144	
6	7.14044	
7	7.54539	
8	7.96637	
9	8.41273	
10	8.88463	
11	9.37552	
12	9.88022	9.8
13	10.40751	
14	10.99267	
15	11.73382	
16	13.03341	

SOURCE: IEA's Trends in International Mathematics and Science Study – TIMSS 2015

Cronbach's Alpha Reliability Coefficient and Principal Components Analysis of the Items in the TIMSS Advanced 2015 Safe and Orderly School - Teachers' Reports Scale, Physics

Country	Cronbach's Alpha Reliability Coefficient	Percent of Variance Explained	Component Loadings for Each Item							
			PTB607A	PTB607B	PTB607C	PTB607D	PTB607E	PTB607F	PTB607G	PTB607H
France	0.85	50	0.58	0.68	0.64	0.81	0.80	0.68	0.71	0.70
Italy	0.87	52	0.62	0.67	0.69	0.79	0.77	0.74	0.65	0.80
Lebanon	0.82	46	0.33	0.48	0.65	0.82	0.75	0.77	0.70	0.74
Norway	0.84	49	0.60	0.66	0.68	0.82	0.79	0.70	0.62	0.69
Portugal	0.84	49	0.34	0.63	0.67	0.76	0.84	0.80	0.71	0.73
Russian Federation	0.77	40	0.48	0.59	0.57	0.76	0.79	0.72	0.67	0.29
Slovenia	0.91	63	0.83	0.79	0.82	0.85	0.83	0.77	0.73	0.73
Sweden	0.83	48	0.42	0.59	0.75	0.79	0.80	0.76	0.58	0.76
United States	0.90	59	0.42	0.69	0.77	0.89	0.85	0.83	0.79	0.81
International Avg.	0.85	51	0.51	0.64	0.69	0.81	0.81	0.75	0.69	0.70

Relationship Between the TIMSS Advanced 2015 Safe and Orderly School - Teachers' Reports Scale, and TIMSS Advanced 2015 Physics Achievement

Country	Pearson's Correlation with Physics Achievement		Variance in Physics Achievement Accounted for by Difference Between Regions of the Scale (η^2)
	(r)	(r ²)	
France	0.08	0.01	0.01
Italy	0.03	0.00	0.00
Lebanon	0.07	0.00	0.01
Norway	0.11	0.01	0.02
Portugal	0.04	0.00	0.01
Russian Federation	0.03	0.00	0.00
Slovenia	0.19	0.04	0.04
Sweden	0.12	0.01	0.02
United States	0.25	0.06	0.12
International Median	0.08	0.01	0.01

SOURCE: IEA's Trends in International Mathematics and Science Study – TIMSS 2015

School Discipline Problems–Principals’ Reports Scale, Physics

The School Discipline Problems–Principals’ Reports (DAS) scale was created based on principals’ responses concerning the eleven potential school problems described below.

Items in the TIMSS Advanced 2015 School Discipline Problems–Principals’ Reports Scale, Physics

To what degree is each of the following a problem among twelfth grade students in your school?		Not a problem	Minor problem	Moderate problem	Serious problem
PCBG11A	1) Arriving late at school -----	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
PCBG11B	2) Absenteeism (i.e., unjustified absences) -----	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
PCBG11C	3) Classroom disturbance -----	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
PCBG11D	4) Cheating -----	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
PCBG11E	5) Profanity -----	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
PCBG11F	6) Vandalism -----	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
PCBG11G	7) Theft -----	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
PCBG11H	8) Intimidation or verbal abuse among students (including texting, emailing, etc.) -----	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
PCBG11 I	9) Physical injury to other students -----	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
PCBG11J	10) Intimidation or verbal abuse of teachers or staff (including texting, emailing, etc.) -----	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
PCBG11K	11) Physical injury to teachers or staff -----	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

←	→
Hardly Any Problems	Moderate to Severe Problems
10.0	7.2
Minor Problems	

Item Parameters for the TIMSS Advanced 2015 School Discipline Problems - Principals' Reports Scale, Physics

Item	delta	tau_1	tau_2	tau_3	Infit
PCBG11A	1.17877	-3.21012	-0.16690	3.37702	1.21
PCBG11B	1.46046	-2.19399	-0.42850	2.62249	1.13
PCBG11C	0.18891	-1.99828	-0.62084	2.61912	0.93
PCBG11D	0.80313	-2.53161	-0.66242	3.19403	1.11
PCBG11E	-0.22664	-1.90441	-0.40045	2.30486	0.84
PCBG11F	-0.50647	0.20063	-1.22273	1.02210	0.76
PCBG11G	-0.43015	-0.05140	-1.18166	1.23306	0.69
PCBG11H	-0.06170	-1.19025	-1.00895	2.19920	0.75
PCBG11I	-0.69241	0.65883	-1.47382	0.81499	0.64
PCBG11J	-0.67545	0.54715	-1.66947	1.12232	0.67

Scale Transformation Constants for the TIMSS Advanced 2015 School Discipline Problems - Principals' Reports Scale, Physics

Scale Transformation Constants	
A = 7.709439	Transformed Scale Score = 7.709439 + 0.955134 • Logit Scale Score
B = 0.955134	

Equivalence Table of the Raw Score and the Transformed Scale Score for the TIMSS Advanced 2015 School Discipline Problems - Principals' Reports Scale, Physics

Raw Score	Transformed Scale Score	Cutpoint
0	3.54143	
1	4.62379	
2	5.12325	
3	5.44481	
4	5.68073	
5	5.86766	
6	6.02294	
7	6.15980	
8	6.28303	
10	6.50367	
11	6.60698	
12	6.70877	
14	6.91459	
15	7.02423	
16	7.13973	7.2
17	7.26373	
18	7.39914	
19	7.54913	
20	7.71713	
21	7.90633	
22	8.12018	
23	8.35907	
24	8.62458	
25	8.91866	
26	9.24592	
27	9.61214	
28	10.02711	10.0
29	10.50216	
30	11.04762	
31	11.67530	
32	12.44148	
33	13.73438	

SOURCE: IEA's Trends in International Mathematics and Science Study – TIMSS 2015

Cronbach's Alpha Reliability Coefficient and Principal Components Analysis of the Items in the TIMSS Advanced 2015 School Discipline Problems - Principals' Reports Scale, Physics

Country	Cronbach's Alpha Reliability Coefficient	Percent of Variance Explained	Component Loadings for Each Item										
			PCBG1A	PCBG1B	PCBG1C	PCBG1D	PCBG1E	PCBG1F	PCBG1G	PCBG1H	PCBG1I	PCBG1J	PCBG1K
France	0.94	65	0.61	0.65	0.79	0.70	0.88	0.89	0.80	0.88	0.91	0.87	0.85
Italy	0.96	72	0.51	0.76	0.85	0.72	0.80	0.94	0.91	0.91	0.95	0.93	0.93
Lebanon	0.98	84	0.84	0.88	0.90	0.87	0.94	0.95	0.96	0.91	0.94	0.93	0.94
Norway	0.82	41	0.56	0.55	0.54	0.60	0.68	0.80	0.74	0.50	0.75	0.74	0.53
Portugal	0.95	66	0.55	0.77	0.84	0.72	0.77	0.90	0.89	0.87	0.89	0.87	0.81
Russian Federation	0.77	37	0.55	0.61	0.61	0.54	0.70	0.67	0.54	0.70	0.56	-	-
Slovenia	0.76	36	0.15	0.40	0.61	0.67	0.64	0.54	0.66	0.59	0.74	0.58	0.74
Sweden	0.84	42	0.50	0.54	0.61	0.59	0.67	0.77	0.70	0.68	0.69	0.78	0.50
United States	0.87	46	0.69	0.66	0.74	0.67	0.77	0.55	0.71	0.76	0.59	0.78	0.41
International Avg.	0.88	54	0.55	0.65	0.72	0.68	0.76	0.78	0.77	0.76	0.78	0.81	0.71

A dash (-) indicates comparable data not available.

Relationship Between the TIMSS Advanced 2015 School Discipline Problems - Principals' Reports Scale, and TIMSS Advanced 2015 Physics Achievement

Country	Pearson's Correlation with Physics Achievement		Variance in Physics Achievement Accounted for by Difference Between Regions of the Scale (η^2)
	(r)	(r ²)	
France	0.12	0.01	0.00
Italy	0.23	0.05	0.03
Lebanon	0.07	0.00	0.00
Norway	0.07	0.00	0.01
Portugal	0.05	0.00	0.00
Russian Federation	0.05	0.00	0.01
Slovenia	0.18	0.03	0.03
Sweden	0.18	0.03	0.02
United States	0.16	0.03	0.01
International Median	0.12	0.01	0.01

SOURCE: IEA's Trends in International Mathematics and Science Study – TIMSS 2015

School Supports Advanced Mathematics and Physics Education–Principal Version Scale, Physics

The School Supports Advanced Mathematics and Physics Education–Principal Version (SMP) scale was created based on principals’ responses characterizing the seven aspects described below.

Items in the TIMSS Advanced 2015 School Supports Advanced Mathematics and Physics Education–Principal Version Scale, Physics¹

How much do you agree with these statements about advanced mathematics and physics education within your school?	
	<div> Agree a lot Agree a little Disagree a little Disagree a lot </div>
PCBG10A	1) The school encourages students to study advanced mathematics and physics -----○-----○-----○-----○
PCBG10B	2) The school promotes professional development for teachers of advanced mathematics and physics -----○-----○-----○-----○
PCBG10C	3) The school provides students with information about career options in advanced mathematics and physics -----○-----○-----○-----○
PCBG10D	4) The school has initiatives to promote student interest in advanced mathematics and physics (e.g., student clubs, competitions) -----○-----○-----○-----○
PCBG10E	5) The school has partnership initiatives with industry/businesses in advanced mathematics and physics -----○-----○-----○-----○
PCBG10F	6) Advanced mathematics and physics teachers are admired by other teachers in the school -----○-----○-----○-----○
PCBG10G	7) Students at this school respect students who excel in advanced mathematics and physics -----○-----○-----○-----○

¹ For the purpose of scaling, categories in which there were very few respondents were combined. The categories “Disagree a little” and “Disagree a lot” were combined for all variables. The scale statistics that are reported herein reflect analysis of the items following collapsing.

Item Parameters for the TIMSS Advanced 2015 School Supports Advanced Mathematics and Physics Education - Principal Version Scale, Physics

Item	delta	tau_1	tau_2	Infit
PCBG10A	-0.96174	-1.03132	1.03132	0.84
PCBG10B	-0.48986	-1.17668	1.17668	0.91
PCBG10C	-0.82638	-1.18249	1.18249	0.91
PCBG10D	-0.45940	-0.92144	0.92144	0.92
PCBG10E	1.76069	-0.59088	0.59088	1.05
PCBG10F	1.04013	-0.61623	0.61623	1.03
PCBG10G	-0.06344	-0.95292	0.95292	1.08

Scale Transformation Constants for the TIMSS Advanced 2015 School Supports Advanced Mathematics and Physics Education - Principal Version Scale, Physics

Scale Transformation Constants

$$A = 8.69507$$

$$B = 1.384086$$

$$\text{Transformed Scale Score} = 8.69507 + 1.384086 \cdot \text{Logit Scale Score}$$

Equivalence Table of the Raw Score and the Transformed Scale Score for the TIMSS Advanced 2015 School Supports Advanced Mathematics and Physics Education - Principal Version Scale, Physics

Raw Score	Transformed Scale Score	Cutpoint
0	3.03255	
1	4.78821	
2	5.74762	
3	6.48485	6.5
4	7.12106	
5	7.70041	
6	8.24387	
7	8.76353	
8	9.27161	
9	9.78476	
10	10.31709	
11	10.89611	10.8
12	11.57031	
13	12.46547	
14	14.14715	

SOURCE: IEA's Trends in International Mathematics and Science Study – TIMSS 2015

SOURCE: IEA's Trends in International Mathematics and Science Study – TIMSS 2015

Cronbach's Alpha Reliability Coefficient and Principal Components Analysis of the Items in the TIMSS Advanced 2015 School Supports Advanced Mathematics and Physics Education - Principal Version Scale, Physics

Country	Cronbach's Alpha Reliability Coefficient	Percent of Variance Explained	Component Loadings for Each Item							
			PCBc10A	PCBc10B	PCBc10C	PCBc10D	PCBc10E	PCBc10F	PCBc10G	
France	0.66	34	0.70	0.60	0.62	0.56	0.50	0.60	0.46	
Italy	0.77	42	0.81	0.71	0.75	0.61	0.66	0.47	0.46	
Lebanon	0.75	41	0.61	0.65	0.74	0.76	0.56	0.60	0.57	
Norway	0.70	37	0.65	0.47	0.47	0.70	0.56	0.69	0.67	
Portugal	0.76	41	0.53	0.68	0.62	0.65	0.58	0.73	0.67	
Russian Federation	0.67	40	0.57	0.73	0.70	0.63	0.36	0.62	0.73	
Slovenia	0.73	39	0.60	0.70	0.66	0.71	0.72	0.47	0.45	
Sweden	0.73	40	0.76	0.79	0.78	0.75	0.44	0.21	0.40	
United States	0.80	47	0.64	0.69	0.74	0.78	0.50	0.69	0.73	
International Avg.	0.73	40	0.65	0.67	0.68	0.68	0.54	0.56	0.57	

Relationship Between the TIMSS Advanced 2015 School Supports Advanced Mathematics and Physics Education - Principal Version Scale, and TIMSS Advanced 2015 Physics Achievement

Country	Pearson's Correlation with Physics Achievement		Variance in Physics Achievement Accounted for by Difference Between Regions of the Scale (η^2)
	(r)	(r ²)	
France	0.03	0.00	0.00
Italy	0.05	0.00	0.01
Lebanon	0.04	0.00	0.01
Norway	0.07	0.01	0.00
Portugal	-0.02	0.00	0.00
Russian Federation	0.19	0.04	0.06
Slovenia	0.25	0.06	0.04
Sweden	0.14	0.02	0.02
United States	0.01	0.00	0.00
International Median	0.05	0.00	0.01

SOURCE: IEA's Trends in International Mathematics and Science Study – TIMSS 2015

School Supports Advanced Mathematics and Physics Education–Teacher Version Scale, Physics

The School Supports Advanced Mathematics and Physics Education–Teacher Version (SMP) scale was created based on teachers’ responses characterizing the seven aspects described below.

Items in the TIMSS Advanced 2015 School Supports Advanced Mathematics and Physics Education–Teacher Version Scale, Physics¹

How much do you agree with these statements about advanced mathematics and physics education within your school?	
	<div> Agree a lot Agree a little Disagree a little Disagree a lot </div>
PTBG06A	1) The school encourages students to study advanced mathematics and physics -----○-----○-----○-----○
PTBG06B	2) The school promotes professional development for teachers of advanced mathematics and physics -----○-----○-----○-----○
PTBG06C	3) The school provides students with information about career options in advanced mathematics and physics -----○-----○-----○-----○
PTBG06D	4) Advanced mathematics and physics teachers are admired by other teachers in the school -----○-----○-----○-----○
PTBG06E	5) Teachers have high expectations for student achievement in advanced mathematics and physics -----○-----○-----○-----○
PTBG06F	6) Students at this school respect students who excel in advanced mathematics and physics -----○-----○-----○-----○
PTBG06G	7) Parents expect their children to study advanced mathematics and physics -----○-----○-----○-----○

¹ For the purpose of scaling, categories in which there were very few respondents were combined. The categories “Disagree a little” and “Disagree a lot” were combined for all variables. The scale statistics that are reported herein reflect analysis of the items following collapsing.

Item Parameters for the TIMSS Advanced 2015 School Supports Advanced Mathematics and Physics Education - Teacher Version Scale, Physics

Item	delta	tau_1	tau_2	Infit
PTBG06A	-0.69327	-1.09016	1.09016	0.87
PTBG06B	0.42027	-0.81515	0.81515	1.05
PTBG06C	-0.23350	-1.24334	1.24334	0.96
PTBG06D	0.88624	-0.64947	0.64947	0.99
PTBG06E	-0.40883	-1.40288	1.40288	0.93
PTBG06F	-0.39632	-1.00752	1.00752	1.16
PTBG06G	0.42541	-1.28652	1.28652	1.01

Scale Transformation Constants for the TIMSS Advanced 2015 School Supports Advanced Mathematics and Physics Education - Teacher Version Scale, Physics

Scale Transformation Constants

A = 9.52146

B = 1.382519

Transformed Scale Score = 9.52146 + 1.382519 • Logit Scale Score

Equivalence Table of the Raw Score and the Transformed Scale Score for the TIMSS Advanced 2015 School Supports Advanced Mathematics and Physics Education - Teacher Version Scale, Physics

Raw Score	Transformed Scale Score	Cutpoint
0	4.00781	
1	5.74570	
2	6.68506	
3	7.40122	7.5
4	8.01543	
5	8.57240	
6	9.09310	
7	9.58929	
8	10.07291	
9	10.56143	
10	11.06907	
11	11.62470	11.6
12	12.28126	
13	13.16777	
14	14.85545	

SOURCE: IEA's Trends in International Mathematics and Science Study – TIMSS 2015

Cronbach's Alpha Reliability Coefficient and Principal Components Analysis of the Items in the TIMSS Advanced 2015 School Supports Advanced Mathematics and Physics Education - Teacher Version Scale, Physics

Country	Cronbach's Alpha Reliability Coefficient	Percent of Variance Explained	Component Loadings for Each Item							
			PTBC06A	PTBC06B	PTBC06C	PTBC06D	PTBC06E	PTBC06F	PTBC06G	
France	0.63	32	0.56	0.47	0.42	0.51	0.65	0.66	0.62	
Italy	0.78	44	0.72	0.60	0.70	0.64	0.73	0.51	0.70	
Lebanon	0.77	43	0.64	0.73	0.65	0.51	0.68	0.65	0.71	
Norway	0.60	31	0.69	0.38	0.62	0.66	0.52	0.60	0.26	
Portugal	0.72	38	0.71	0.71	0.66	0.48	0.51	0.61	0.57	
Russian Federation	0.77	44	0.76	0.79	0.65	0.61	0.54	0.73	0.48	
Slovenia	0.70	36	0.71	0.70	0.57	0.69	0.65	0.38	0.40	
Sweden	0.70	35	0.73	0.70	0.56	0.47	0.57	0.57	0.51	
United States	0.84	51	0.66	0.80	0.78	0.69	0.68	0.58	0.80	
International Avg.	0.72	39	0.69	0.65	0.62	0.58	0.62	0.59	0.56	

Relationship Between the TIMSS Advanced 2015 School Supports Advanced Mathematics and Physics Education - Teacher Version Scale, and TIMSS Advanced 2015 Physics Achievement

Country	Pearson's Correlation with Physics Achievement		Variance in Physics Achievement Accounted for by Difference Between Regions of the Scale (η^2)
	(r)	(r ²)	
France	0.05	0.00	0.00
Italy	-0.01	0.00	0.00
Lebanon	-0.03	0.00	0.00
Norway	0.02	0.00	0.00
Portugal	0.01	0.00	0.01
Russian Federation	0.08	0.01	0.02
Slovenia	0.23	0.05	0.03
Sweden	0.10	0.01	0.00
United States	0.23	0.05	0.01
International Median	0.05	0.00	0.00

SOURCE: IEA's Trends in International Mathematics and Science Study – TIMSS 2015

Students Like Learning Physics Scale

The Students Like Learning Physics (SLP) scale was created based on students' degree of agreement with the twelve statements described below.

Items in the TIMSS Advanced 2015 Students Like Learning Physics Scale

How much do you agree with these statements about the physics you are studying?		Agree a lot	Agree a little	Disagree a little	Disagree a lot
PSBP20A	1 I enjoy conducting experiments or investigations in physics				
PSBP20B	2) I get a sense of satisfaction when I solve physics problems				
PSBP20C*	3) I feel bored when I do my physics schoolwork*				
PSBP20D	4) I like studying for my physics class outside of school				
PSBP20E	5) It is interesting to learn physics laws and principles				
PSBP20F*	6) I dread my physics class*				
PSBP20G	7) I am studying physics because I like to learn new things				
PSBP20H	8) I enjoy figuring out challenging physics				
PSBP20 I	9) Physics is one of my favorite subjects				
PSBP20J	10) Jobs that require physics skills seem interesting to me				
PSBP20K*	11) I wish I did not have to study physics*				
PSBP20L	12) I enjoy thinking about the world in terms of laws of physics				

* Reverse coded

Very Much Like Learning Physics 11.4 Like Learning Physics 8.8 Do Not Like Learning Physics

Item Parameters for the TIMSS Advanced 2015 Students Like Learning Physics Scale, Physics

Item	delta	tau_1	tau_2	tau_3	Infit
PSBP20A	-0.51423	-1.07025	-0.41990	1.49015	1.15
PSBP20B	-0.90801	-0.86799	-0.43946	1.30745	1.10
PSBP20C*	0.51315	-1.69256	-0.14245	1.83501	1.23
PSBP20D	1.03682	-1.72677	-0.08320	1.80997	1.11
PSBP20E	-0.21380	-1.38699	-0.26425	1.65124	0.90
PSBP20F*	-0.39443	-1.02035	0.04349	0.97686	1.82
PSBP20G	-0.18466	-1.35598	-0.31080	1.66678	0.81
PSBP20H	0.04092	-1.36190	-0.07935	1.44125	0.85
PSBP20I	0.54534	-0.86829	-0.06458	0.93287	0.75
PSBP20J	0.17389	-0.97760	-0.33432	1.31192	0.94
PSBP20K*	-0.07291	-0.60736	-0.22268	0.83004	1.02
PSBP20L	-0.02208	-1.18389	-0.23501	1.41890	1.02

* Reverse coded

Scale Transformation Constants for the TIMSS Advanced 2015 Students Like Learning Physics Scale, Physics

Scale Transformation Constants

A = 8.81822

B = 1.464843

Transformed Scale Score = 8.81822 + 1.464843 • Logit Scale Score

**Equivalence Table of the Raw Score and the Transformed Scale Score
for the TIMSS Advanced 2015 Students Like Learning Physics Scale,
Physics**

Raw Score	Transformed Scale Score	Cutpoint
0	2.29834	
1	3.92594	
2	4.70005	
3	5.22580	
4	5.63169	
5	5.97016	
6	6.26389	
7	6.52678	
8	6.76750	
9	6.99121	
10	7.20367	
11	7.40630	
12	7.60136	
13	7.79069	
14	7.97591	
15	8.15835	
16	8.33926	
17	8.51979	
18	8.70102	8.8
19	8.88404	
20	9.06991	
21	9.25980	
22	9.45491	
23	9.65655	
24	9.86615	
25	10.08468	
26	10.31566	
27	10.56116	
28	10.82464	
29	11.11077	
30	11.42601	11.4
31	11.77922	
32	12.18651	
33	12.67364	
34	13.29295	
35	14.17455	
36	15.92718	

SOURCE: IEA's Trends in International Mathematics and Science Study – TIMSS 2015

Cronbach's Alpha Reliability Coefficient and Principal Components Analysis of the Items in the TIMSS Advanced 2015 Students Like Learning Physics Scale, Physics

Country	Cronbach's Alpha Reliability Coefficient	Percent of Variance Explained	Component Loadings for Each Item											
			PSBP20A	PSBP20B	PSBP20C*	PSBP20D	PSBP20E	PSBP20F*	PSBP20G	PSBP20H	PSBP20I	PSBP20J	PSBP20K*	PSBP20L
France	0.89	47	0.59	0.50	0.63	0.70	0.78	0.30	0.78	0.75	0.83	0.69	0.80	0.66
Italy	0.90	49	0.62	0.54	0.60	0.78	0.78	0.33	0.81	0.79	0.82	0.77	0.75	0.64
Lebanon	0.83	39	0.67	0.59	0.34	0.48	0.70	0.16	0.75	0.72	0.81	0.73	0.51	0.67
Norway	0.89	47	0.44	0.35	0.69	0.67	0.78	0.44	0.78	0.79	0.85	0.74	0.77	0.68
Portugal	0.89	47	0.58	0.67	0.61	0.70	0.76	0.40	0.78	0.78	0.82	0.68	0.73	0.66
Russian Federation	0.92	53	0.53	0.78	0.63	0.76	0.82	0.38	0.79	0.81	0.85	0.82	0.67	0.70
Slovenia	0.87	41	0.50	0.59	0.48	0.57	0.70	0.49	0.72	0.77	0.80	0.73	0.59	0.64
Sweden	0.91	51	0.52	0.61	0.69	0.72	0.79	0.51	0.79	0.81	0.84	0.74	0.78	0.69
United States	0.92	52	0.63	0.61	0.55	0.66	0.82	0.63	0.78	0.80	0.85	0.75	0.75	0.78
International Avg.	0.89	47	0.56	0.58	0.58	0.67	0.77	0.41	0.78	0.78	0.83	0.74	0.71	0.68

* Reverse coded

Relationship Between the TIMSS Advanced 2015 Students Like Learning Physics Scale, and TIMSS Advanced 2015 Physics Achievement

Country	Pearson's Correlation with Physics Achievement		Variance in Physics Achievement Accounted for by Difference Between Regions of the Scale (η^2)
	(r)	(r ²)	
France	0.46	0.22	0.18
Italy	0.39	0.15	0.13
Lebanon	0.22	0.05	0.04
Norway	0.50	0.25	0.22
Portugal	0.43	0.18	0.17
Russian Federation	0.38	0.15	0.13
Slovenia	0.44	0.20	0.15
Sweden	0.44	0.20	0.16
United States	0.41	0.17	0.16
International Median	0.43	0.18	0.16

SOURCE: IEA's Trends in International Mathematics and Science Study – TIMSS 2015

Students' Sense of School Belonging Scale, Physics

The Students' Sense of School Belonging (SSB) scale was created based on students' degree of agreement with the nine statements described below.

Items in the TIMSS Advanced 2015 Students' Sense of School Belonging Scale, Physics

What do you think about your school? Tell how much you agree with these statements.		Agree a lot	Agree a little	Disagree a little	Disagree a lot
PSBP22A	1) I enjoy school-----	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
PSBP22B	2) I feel safe when I am at school -----	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
PSBP22C	3) I feel like I belong at this school -----	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
PSBP22D	4) I like to see my classmates at school -----	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
PSBP22E	5) Teachers at my school are fair to me -----	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
PSBP22F	6) I am proud to go to this school -----	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
PSBP22G	7) I learn a lot in school -----	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
PSBP22H	8) My classmates respect students who excel in school subjects -----	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
PSBP22 I	9) My classmates respect students who struggle learning school subjects -----	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

High Sense of School Belonging 10.5 Sense of School Belonging 7.6 Little Sense of School Belonging

Item Parameters for the TIMSS Advanced 2015 Students' Sense of School Belonging Scale, Physics

Item	delta	tau_1	tau_2	tau_3	Infit
PSBP22A	0.42482	-1.13862	-0.66108	1.79970	1.06
PSBP22B	-0.19651	-0.90823	-0.65897	1.56720	0.94
PSBP22C	0.27155	-1.09791	-0.37350	1.47141	0.87
PSBP22D	-0.77499	-0.66078	-0.69906	1.35984	1.04
PSBP22E	0.02649	-1.36739	-0.55367	1.92106	1.10
PSBP22F	0.36287	-1.16971	-0.42176	1.59147	0.93
PSBP22G	-0.30178	-1.41507	-0.65833	2.07340	0.98
PSBP22H	-0.08185	-1.20393	-0.55128	1.75521	1.09
PSBP22I	0.26940	-1.37985	-0.44086	1.82071	1.29

Scale Transformation Constants for the TIMSS Advanced 2015 Students' Sense of School Belonging Scale, Physics

Scale Transformation Constants

A = 7.921577

B = 1.242992

Transformed Scale Score = 7.921577 + 1.242992 • Logit Scale Score

Equivalence Table of the Raw Score and the Transformed Scale Score for the TIMSS Advanced 2015 Students' Sense of School Belonging Scale, Physics

Raw Score	Transformed Scale Score	Cutpoint
0	2.83834	
1	4.17439	
2	4.80361	
3	5.23192	
4	5.56897	
5	5.85267	
6	6.10445	
7	6.33561	
8	6.55328	
9	6.76244	
10	6.96690	
11	7.16980	
12	7.37399	
13	7.58285	7.6
14	7.79734	
15	8.02192	
16	8.25960	
17	8.51313	
18	8.78559	
19	9.07945	
20	9.39640	
21	9.73823	
22	10.10871	
23	10.51544	10.5
24	10.97845	
25	11.53918	
26	12.31006	
27	13.80166	

SOURCE: IEA's Trends in International Mathematics and Science Study – TIMSS 2015

Cronbach's Alpha Reliability Coefficient and Principal Components Analysis of the Items in the TIMSS Advanced 2015 Students' Sense of School Belonging Scale, Physics

Country	Cronbach's Alpha Reliability Coefficient	Percent of Variance Explained	Component Loadings for Each Item									
			PSBP22A	PSBP22B	PSBP22C	PSBP22D	PSBP22E	PSBP22F	PSBP22G	PSBP22H	PSBP22I	
France	0.82	42	0.72	0.68	0.69	0.59	0.54	0.73	0.65	0.59	0.58	
Italy	0.83	43	0.73	0.73	0.76	0.51	0.64	0.79	0.68	0.51	0.48	
Lebanon	0.87	49	0.68	0.78	0.80	0.64	0.65	0.76	0.70	0.66	0.61	
Norway	0.83	44	0.70	0.69	0.79	0.65	0.56	0.71	0.64	0.62	0.56	
Portugal	0.83	43	0.74	0.68	0.74	0.55	0.56	0.78	0.67	0.60	0.57	
Russian Federation	0.89	54	0.79	0.74	0.79	0.70	0.66	0.81	0.72	0.67	0.70	
Slovenia	0.86	47	0.69	0.67	0.80	0.60	0.67	0.81	0.77	0.62	0.50	
Sweden	0.85	47	0.80	0.69	0.80	0.67	0.58	0.76	0.69	0.56	0.58	
United States	0.87	49	0.67	0.69	0.79	0.68	0.64	0.79	0.71	0.71	0.62	
International Avg.	0.85	47	0.73	0.70	0.77	0.62	0.61	0.77	0.69	0.62	0.58	

Relationship Between the TIMSS Advanced 2015 Students' Sense of School Belonging Scale, and TIMSS Advanced 2015 Physics Achievement

Country	Pearson's Correlation with Physics Achievement		Variance in Physics Achievement Accounted for by Difference Between Regions of the Scale (η^2)
	(r)	(r ²)	
France	0.25	0.06	0.05
Italy	0.06	0.00	0.01
Lebanon	0.02	0.00	0.00
Norway	0.16	0.03	0.03
Portugal	0.11	0.01	0.02
Russian Federation	0.07	0.01	0.00
Slovenia	0.22	0.05	0.05
Sweden	0.19	0.04	0.05
United States	0.09	0.01	0.01
International Median	0.11	0.01	0.02

SOURCE: IEA's Trends in International Mathematics and Science Study – TIMSS 2015

Students Value Physics Scale

The Students Value Physics (SVP) scale was created based on students' degree of agreement with the nine statements described below.

Items in the TIMSS Advanced 2015 Students Value Physics Scale

How much do you agree with these statements about the physics you are studying?	
	Agree a lot ↓ ○ ——— ○ ——— ○ ——— ○ Agree a little Disagree a little Disagree a lot
PSBP21A	1) Learning physics will help me get ahead in the world-----○ ——— ○ ——— ○ ——— ○
PSBP21B	2) It is important to do well in my physics class -----○ ——— ○ ——— ○ ——— ○
PSBP21C*	3) The physics I am studying is not useful for my future* -----○ ——— ○ ——— ○ ——— ○
PSBP21D	4) My parents are pleased that I am taking physics -----○ ——— ○ ——— ○ ——— ○
PSBP21E	5) Doing well in physics will help me get into the university of my choice ----○ ——— ○ ——— ○ ——— ○
PSBP21F*	6) Learning physics does not seem to be a worthwhile exercise*-----○ ——— ○ ——— ○ ——— ○
PSBP21G	7) My parents think that it is important that I do well in my physics class-----○ ——— ○ ——— ○ ——— ○
PSBP21H	8) I like telling people I am studying physics -----○ ——— ○ ——— ○ ——— ○
PSBP21I	9) Learning physics will give me more job opportunities -----○ ——— ○ ——— ○ ——— ○
*Reverse coded	

Strongly Value Physics Value Physics Do Not Value Physics

11.3 8.2

Item Parameters for the TIMSS Advanced 2015 Students Value Physics Scale, Physics

Item	delta	tau_1	tau_2	tau_3	Infit
PSBP21A	0.12198	-1.22089	-0.28221	1.50310	0.91
PSBP21B	-0.11136	-1.22137	-0.16984	1.39121	1.07
PSBP21C*	0.21349	-0.87936	-0.23886	1.11822	1.30
PSBP21D	-0.34054	-1.18074	-0.59829	1.77903	1.02
PSBP21E	0.03096	-0.41265	-0.17841	0.59106	0.97
PSBP21F*	-0.16915	-0.85167	-0.33674	1.18841	1.43
PSBP21G	-0.43055	-0.94318	-0.50789	1.45107	1.05
PSBP21H	0.64924	-1.21577	-0.07682	1.29259	1.16
PSBP21I	0.03593	-0.88494	-0.30990	1.19484	0.88

*Reverse coded

Scale Transformation Constants for the TIMSS Advanced 2015 Students Value Physics Scale, Physics

Scale Transformation Constants

$$A = 8.418724$$

$$B = 1.650896$$

$$\text{Transformed Scale Score} = 8.418724 + 1.650896 \cdot \text{Logit Scale Score}$$

Equivalence Table of the Raw Score and the Transformed Scale Score for the TIMSS Advanced 2015 Students Value Physics Scale, Physics

Raw Score	Transformed Scale Score	Cutpoint
0	1.91155	
1	3.71438	
2	4.57065	
3	5.15343	
4	5.60982	
5	5.99212	
6	6.32606	
7	6.63211	
8	6.91547	
9	7.18258	
10	7.43842	
11	7.68700	
12	7.93169	
13	8.17550	8.2
14	8.42143	
15	8.67212	
16	8.93095	
17	9.20112	
18	9.48621	
19	9.78912	
20	10.11722	
21	10.47668	
22	10.87750	
23	11.33535	11.3
24	11.87577	
25	12.55759	
26	13.52803	
27	15.46562	

SOURCE: IEA's Trends in International Mathematics and Science Study – TIMSS 2015

Cronbach's Alpha Reliability Coefficient and Principal Components Analysis of the Items in the TIMSS Advanced 2015 Students Value Physics Scale, Physics

Country	Cronbach's Alpha Reliability Coefficient	Percent of Variance Explained	Component Loadings for Each Item									
			PSBP21A	PSBP21B	PSBP21C*	PSBP21D	PSBP21E	PSBP21F*	PSBP21G	PSBP21H	PSBP21I	PSBP21J
France	0.83	43	0.70	0.57	0.69	0.58	0.75	0.67	0.52	0.61	0.77	
Italy	0.85	46	0.79	0.73	0.58	0.61	0.70	0.68	0.57	0.63	0.77	
Lebanon	0.73	36	0.58	0.70	0.31	0.66	0.69	0.20	0.67	0.59	0.74	
Norway	0.77	37	0.75	0.70	0.49	0.63	0.65	0.69	0.46	0.46	0.56	
Portugal	0.83	43	0.76	0.67	0.63	0.63	0.64	0.65	0.60	0.57	0.73	
Russian Federation	0.86	51	0.76	0.79	0.42	0.80	0.82	0.43	0.79	0.61	0.83	
Slovenia	0.63	29	0.68	0.44	0.20	0.67	0.45	-0.02	0.67	0.57	0.73	
Sweden	0.79	38	0.75	0.57	0.66	0.59	0.62	0.67	0.49	0.48	0.66	
United States	0.85	45	0.78	0.69	0.64	0.69	0.67	0.62	0.52	0.62	0.79	
International Avg.	0.79	41	0.73	0.65	0.51	0.65	0.67	0.51	0.59	0.57	0.73	

*Reverse coded

Relationship Between the TIMSS Advanced 2015 Students Value Physics Scale, and TIMSS Advanced 2015 Physics Achievement

Country	Pearson's Correlation with Physics Achievement		Variance in Physics Achievement Accounted for by Difference Between Regions of the Scale (η^2)
	(r)	(r ²)	
France	0.38	0.14	0.10
Italy	0.28	0.08	0.07
Lebanon	0.19	0.04	0.03
Norway	0.28	0.08	0.08
Portugal	0.30	0.09	0.08
Russian Federation	0.31	0.10	0.10
Slovenia	0.22	0.05	0.03
Sweden	0.26	0.07	0.06
United States	0.33	0.11	0.10
International Median	0.28	0.08	0.08

SOURCE: IEA's Trends in International Mathematics and Science Study – TIMSS 2015

Students' Views on Engaging Teaching in Physics Lessons Scale

The Students' Views on Engaging Teaching in Physics Lessons (EPL) scale was created based on students' degree of agreement with the fourteen statements described below.

Items in the TIMSS Advanced 2015 Students' Views on Engaging Teaching in Physics Lessons Scale

How much do you agree with these statements about your <u>physics</u> lessons?	
	<div>Agree a lot</div> <div>Agree a little</div> <div>Disagree a little</div> <div>Disagree a lot</div>
PSBP18A	1) The teacher clearly communicates the purpose of each physics lesson -----○-----○-----○-----○
PSBP18B	2) I know what my teacher expects me to do -----○-----○-----○-----○
PSBP18C	3) My teacher is easy to understand -----○-----○-----○-----○
PSBP18D	4) I am interested in what my teacher says -----○-----○-----○-----○
PSBP18E	5) My teacher gives me interesting things to do -----○-----○-----○-----○
PSBP18F	6) My teacher asks me thought provoking questions -----○-----○-----○-----○
PSBP18G	7) My teacher has clear answers to my questions-----○-----○-----○-----○
PSBP18H	8) My teacher links new content to what I already know -----○-----○-----○-----○
PSBP18I	9) My teacher is good at explaining physics -----○-----○-----○-----○
PSBP18J	10) My teacher provides the opportunity for me to show what I have learned -----○-----○-----○-----○
PSBP18K	11) My teacher encourages me to keep working on physics problems until I solve them -----○-----○-----○-----○
PSBP18L	12) My teacher provides helpful feedback on my schoolwork (including homework) -----○-----○-----○-----○
PSBP18M	13) My teacher uses a variety of teaching methods, tasks, and activities to help us learn -----○-----○-----○-----○
PSBP18N	14) My teacher believes that I can learn difficult physics material -----○-----○-----○-----○

Very Engaging Teaching Engaging Teaching Less than Engaging Teaching

10.6 8.2

Item Parameters for the TIMSS Advanced 2015 Students' Views on Engaging Teaching in Physics Lessons Scale, Physics

Item	delta	tau_1	tau_2	tau_3	Infit
PSBP18A	-0.14831	-1.38275	-0.35811	1.74086	0.87
PSBP18B	-0.43649	-1.60005	-0.45229	2.05234	1.13
PSBP18C	0.13061	-1.48920	-0.24496	1.73416	0.83
PSBP18D	-0.05456	-1.45103	-0.42519	1.87622	1.16
PSBP18E	0.63636	-1.76934	-0.24144	2.01078	1.02
PSBP18F	0.13739	-1.39531	-0.27005	1.66536	1.13
PSBP18G	0.14795	-1.29217	-0.29296	1.58513	0.95
PSBP18H	-0.32221	-1.50071	-0.42276	1.92347	1.00
PSBP18I	-0.19384	-1.15279	-0.30087	1.45366	0.79
PSBP18J	-0.27918	-1.98442	-0.36623	2.35065	1.06
PSBP18K	-0.01635	-1.57874	-0.18354	1.76228	1.16
PSBP18L	0.36382	-1.67707	-0.16971	1.84678	1.10
PSBP18M	0.21519	-1.60597	-0.15229	1.75826	1.13
PSBP18N	-0.18038	-1.41620	-0.42459	1.84079	1.34

Scale Transformation Constants for the TIMSS Advanced 2015 Students' Views on Engaging Teaching in Physics Lessons Scale, Physics

Scale Transformation Constants

A = 8.247393

B = 1.153149

Transformed Scale Score = 8.247393 + 1.153149 • Logit Scale Score

**Equivalence Table of the Raw Score and the Transformed Scale Score
for the TIMSS Advanced 2015 Students' Views on Engaging Teaching in
Physics Lessons Scale, Physics**

Raw Score	Transformed Scale Score	Cutpoint
0	2.56831	
1	3.87485	
2	4.50403	
3	4.93321	
4	5.26459	
5	5.53959	
6	5.77697	
7	5.98812	
8	6.18044	
9	6.35812	
10	6.52518	
11	6.68393	
12	6.83632	
13	6.98389	
14	7.12790	
15	7.26945	
16	7.40948	
17	7.54955	
18	7.68865	
19	7.82857	
20	7.96996	
21	8.11342	8.2
22	8.25966	
23	8.40883	
24	8.56179	
25	8.71883	
26	8.88033	
27	9.04665	
28	9.21823	
29	9.39540	
30	9.57861	
31	9.76853	
32	9.96608	
33	10.17267	
34	10.39036	
35	10.62218	10.6
36	10.87268	
37	11.14749	
38	11.45962	
39	11.82813	
40	12.29340	
41	12.95657	
42	14.29669	

SOURCE: IEA's Trends in International Mathematics and Science Study – TIMSS 2015

Cronbach's Alpha Reliability Coefficient and Principal Components Analysis of the Items in the TIMSS Advanced 2015 Students' Views on Engaging Teaching in Physics Lessons Scale, Physics

Country	Cronbach's Alpha Reliability Coefficient	Percent of Variance Explained	Component Loadings for Each Item													
			PSBP18A	PSBP18B	PSBP18C	PSBP18D	PSBP18E	PSBP18F	PSBP18G	PSBP18H	PSBP18I	PSBP18J	PSBP18K	PSBP18L	PSBP18M	PSBP18N
France	0.92	49	0.76	0.68	0.79	0.62	0.68	0.65	0.77	0.69	0.82	0.63	0.66	0.67	0.69	0.66
Italy	0.93	52	0.82	0.57	0.82	0.54	0.65	0.74	0.79	0.72	0.84	0.72	0.73	0.77	0.74	0.53
Lebanon	0.93	54	0.80	0.60	0.79	0.74	0.74	0.71	0.79	0.76	0.81	0.74	0.73	0.66	0.76	0.64
Norway	0.91	46	0.72	0.71	0.79	0.60	0.71	0.53	0.72	0.72	0.77	0.68	0.53	0.70	0.61	0.58
Portugal	0.94	55	0.82	0.67	0.83	0.64	0.76	0.65	0.81	0.76	0.84	0.72	0.75	0.71	0.73	0.60
Russian Federation	0.92	51	0.78	0.64	0.77	0.78	0.77	0.58	0.77	0.63	0.81	0.63	0.67	0.79	0.73	0.58
Slovenia	0.92	51	0.78	0.75	0.78	0.61	0.72	0.72	0.72	0.75	0.81	0.64	0.64	0.69	0.68	0.62
Sweden	0.92	50	0.75	0.65	0.82	0.66	0.75	0.70	0.75	0.74	0.83	0.66	0.66	0.69	0.65	0.58
United States	0.94	55	0.81	0.73	0.81	0.71	0.75	0.74	0.79	0.77	0.83	0.71	0.65	0.76	0.73	0.60
International Avg.	0.93	51	0.78	0.67	0.80	0.65	0.73	0.67	0.77	0.73	0.82	0.68	0.67	0.72	0.70	0.60

Relationship Between the TIMSS Advanced 2015 Students' Views on Engaging Teaching in Physics Lessons Scale, and TIMSS Advanced 2015 Physics Achievement

Country	Pearson's Correlation with Physics Achievement		Variance in Physics Achievement Accounted for by Difference Between Regions of the Scale (η^2)
	(r)	(r ²)	
France	0.24	0.06	0.05
Italy	0.12	0.01	0.01
Lebanon	0.08	0.01	0.02
Norway	0.25	0.06	0.06
Portugal	0.04	0.00	0.00
Russian Federation	0.20	0.04	0.04
Slovenia	0.31	0.10	0.10
Sweden	0.24	0.06	0.06
United States	0.16	0.03	0.04
International Median	0.20	0.04	0.04

SOURCE: IEA's Trends in International Mathematics and Science Study – TIMSS 2015

Teacher Job Satisfaction Scale, Physics

The Teacher Job Satisfaction (TJS) scale was created based on how often teachers responded positively to the seven statements described below.

Items in the TIMSS Advanced 2015 Teacher Job Satisfaction Scale, Physics¹

How often do you feel the following way about being a teacher?	
	Very often Often Sometimes Never or almost never
PTBG10A	1) I am content with my profession as a teacher ----- ○ ——— ○ ——— ○ ——— ○
PTBG10B	2) I am satisfied with being a teacher at this school --- ○ ——— ○ ——— ○ ——— ○
PTBG10C	3) I find my work full of meaning and purpose ----- ○ ——— ○ ——— ○ ——— ○
PTBG10D	4) I am enthusiastic about my job ----- ○ ——— ○ ——— ○ ——— ○
PTBG10E	5) My work inspires me----- ○ ——— ○ ——— ○ ——— ○
PTBG10F	6) I am proud of the work I do ----- ○ ——— ○ ——— ○ ——— ○
PTBG10G	7) I am going to continue teaching for as long as I can ----- ○ ——— ○ ——— ○

Satisfied Somewhat Satisfied Less Than Satisfied

10.6 7.4

¹ For the purpose of scaling, categories in which there were very few respondents were combined. The categories "Sometimes" and "Never or almost never" were combined for all variables. The scale statistics that are reported herein reflect analysis of the items following collapsing.

Item Parameters for the TIMSS Advanced 2015 Teacher Job Satisfaction Scale, Physics

Item	delta	tau_1	tau_2	Infit
PTBG10A	0.15383	-1.80976	1.80976	1.02
PTBG10B	-0.38606	-1.52386	1.52386	1.29
PTBG10C	-0.60185	-1.68715	1.68715	0.93
PTBG10D	0.30247	-1.45516	1.45516	0.87
PTBG10E	0.45983	-1.54534	1.54534	0.86
PTBG10F	-0.15541	-1.45758	1.45758	1.03
PTBG10G	0.22719	-1.16800	1.16800	1.47

Scale Transformation Constants for the TIMSS Advanced 2015 Teacher Job Satisfaction Scale, Physics

Scale Transformation Constants	
A = 9.030432	Transformed Scale Score = 9.030432 + 0.897591 • Logit Scale Score
B = 0.897591	

Equivalence Table of the Raw Score and the Transformed Scale Score for the TIMSS Advanced 2015 Teacher Job Satisfaction Scale, Physics

Raw Score	Transformed Scale Score	Cutpoint
0	5.13977	
1	6.27326	
2	6.89329	
3	7.37441	7.4
4	7.80316	
5	8.21352	
6	8.62591	
7	9.04442	
8	9.46026	
9	9.86512	
10	10.26699	
11	10.68423	10.6
12	11.15621	
13	11.76054	
14	12.88244	

SOURCE: IEA's Trends in International Mathematics and Science Study – TIMSS 2015

Cronbach's Alpha Reliability Coefficient and Principal Components Analysis of the Items in the TIMSS Advanced 2015 Teacher Job Satisfaction Scale, Physics

Country	Cronbach's Alpha Reliability Coefficient	Percent of Variance Explained	Component Loadings for Each Item							
			PTBG10A	PTBG10B	PTBG10C	PTBG10D	PTBG10E	PTBG10F	PTBG10G	
France	0.91	66	0.83	0.70	0.85	0.84	0.86	0.84	0.74	
Italy	0.90	63	0.84	0.70	0.72	0.89	0.86	0.84	0.67	
Lebanon	0.91	65	0.77	0.74	0.81	0.85	0.81	0.83	0.82	
Norway	0.90	63	0.83	0.76	0.80	0.84	0.90	0.75	0.66	
Portugal	0.84	52	0.80	0.70	0.77	0.78	0.71	0.57	0.68	
Russian Federation	0.90	64	0.84	0.81	0.77	0.83	0.85	0.81	0.68	
Slovenia	0.89	61	0.79	0.62	0.82	0.84	0.91	0.81	0.63	
Sweden	0.88	59	0.80	0.68	0.72	0.85	0.84	0.79	0.67	
United States	0.92	69	0.84	0.77	0.83	0.88	0.87	0.84	0.77	
International Avg.	0.89	62	0.81	0.72	0.79	0.85	0.85	0.79	0.70	

Relationship Between the TIMSS Advanced 2015 Teacher Job Satisfaction Scale, and TIMSS Advanced 2015 Physics Achievement

Country	Pearson's Correlation with Physics Achievement		Variance in Physics Achievement Accounted for by Difference Between Regions of the Scale (η^2)
	(r)	(r ²)	
France	0.02	0.00	0.00
Italy	-0.09	0.01	0.02
Lebanon	-0.02	0.00	0.01
Norway	0.01	0.00	0.00
Portugal	0.02	0.00	0.01
Russian Federation	0.07	0.00	0.00
Slovenia	0.20	0.04	0.06
Sweden	0.03	0.00	0.00
United States	0.11	0.01	0.03
International Median	0.02	0.00	0.01

SOURCE: IEA's Trends in International Mathematics and Science Study – TIMSS 2015