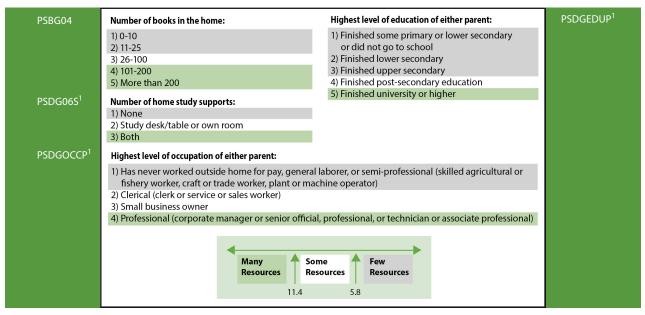


# Appendix 15B: TIMSS Advanced 2015 Context Questionnaire Scales, Physics

## 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



<sup>1</sup> 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	Transformed Scale Score = 7.525439 + 2.234962 • Logit Scale Score
B = 2.234962	- Hallstofffied State Stole — 1.323435 + 2.234702 • Loyit State Stole

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

Transformed Scale Score	Cutpoint
1.31964	
3.68097	
4.88859	
5.77587	5.8
6.50614	
7.14369	
7.71485	
8.25370	
8.77829	
9.31522	
9.89707	
10.57858	
11.48758	11.4
13.18946	
	\$\text{Scale Score}\$  1.31964  3.68097  4.88859  5.77587  6.50614  7.14369  7.71485  8.25370  8.77829  9.31522  9.89707  10.57858  11.48758

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	Compo	/	. ,	for Each I	
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

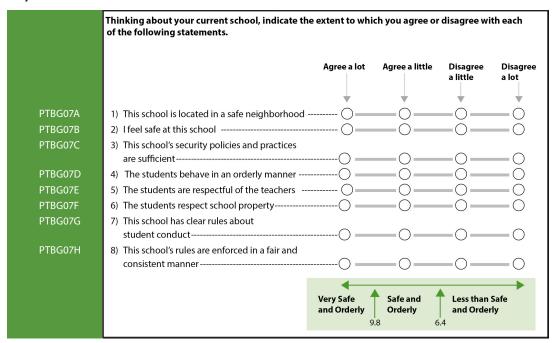
	Pearson's Correlation w	Variance in Physics Achievement Accounted for	
Country	(r)	(r²)	by Difference Between Regions of the Scale (η²)
France	0.33	0.11	0.07
Italy	0.14	0.02	0.01
Lebanon	0.19	0.04	0.02
Norway	0.26	0.07	0.05
Portugal	0.31	0.09	0.07
Russian Federation	0.15	0.02	0.01
Slovenia	0.21	0.04	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



# 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, Physics<sup>1</sup>



<sup>1</sup> 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

ltem	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	Transformed Scale Score = 8.10253 + 0.992158 • Logit Scale Score
B = 0.992158	ilalisiotitied stale stole — 6. 10255 + 0.572136 • Logit stale stole

### 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	







# 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	P/860.	W. (2000)	· '/	. /	· ,	for Each	/	2/08/11
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

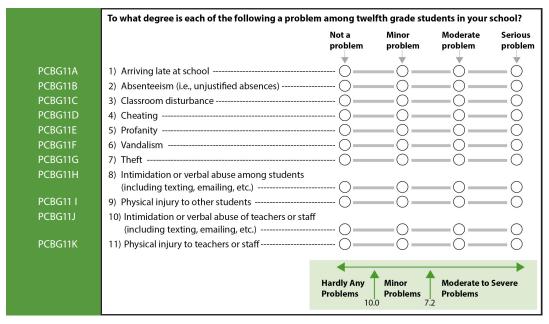
	Pearson's Correlation w	Pearson's Correlation with Physics Achievement		
Country	(r)	(r²)	by Difference Between Regions of the Scale (η²)	
France	0.08	0.01	0.01	
Italy	0.03	0.00	0.00	
Lebanon	0.07	0.00	0.01	
Norway	0.11	0.01	0.02	
Portugal	0.04	0.00	0.01	
Russian Federation	0.03	0.00	0.00	
Slovenia	0.19	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	



# 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





#### 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	ildisionileu scale scole — 7.705435 + 0.553134 • Logit scale scole

# 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  7.2
0	3.54143	
1	4.62379	
	5.12325	
2	5.12325	
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	
33	13./3430	





## 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	Pak.	# / SB / SB		/	mponer	/	٠ /	. ,	1		PB6114
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

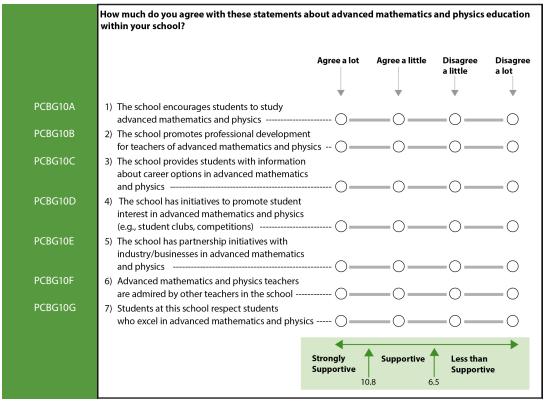
	Pearson's Correlation w	Variance in Physics  Achievement Accounted for		
Country	(r)	( <b>r</b> ²)	by Difference Between  Regions of the Scale (ŋ²)	
France	0.12	0.01	0.00	
France		0.01	0.00	
Italy	0.23	0.05	0.03	
Lebanon	0.07	0.00	0.00	
Norway	0.07	0.00	0.01	
Portugal	0.05	0.00	0.00	
Russian Federation	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	



# 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, Physics<sup>1</sup>



<sup>1</sup> 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	Transformed Scale Score = 8.69507 + 1.384086 • Logit Scale Score
B = 1.384086	Halistotined scale scole — 0.05207 ± 1.304000 * Logit scale scole

**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	TIMSS 2015
0	3.03255		_
1	4.78821		· Pr
2	5.74762		– str
3	6.48485	6.5	- Sub-
4	7.12106		Sci.
5	7.70041		and
6	8.24387		tics —
7	8.76353		— ema
8	9.27161		athe
9	9.78476		— <u>¤</u>
10	10.31709		<u>ti</u> o
11	10.89611	10.8	
12	11.57031		Inte
13	12.46547		S Trends in International Mathematics and Science Study
14	14.14715		end
			— F







# 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	, P. G. F. J. G. F. J	/	٠ /	. /	ngs for	/	/	901
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

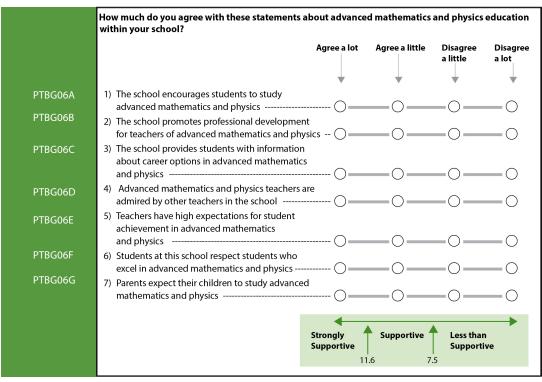
	Pearson's Correlation wi	Pearson's Correlation with Physics Achievement				
Country	(r)	(r²)	Achievement Accounted for by Difference Between Regions of the Scale (η²)			
France	0.03	0.00	0.00			
Italy	0.05	0.00	0.01			
Lebanon	0.04	0.00	0.01			
Norway	0.07	0.01	0.00			
Portugal	-0.02	0.00	0.00			
Russian 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			



# 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, Physics<sup>1</sup>



<sup>1</sup> 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	-0.23350 -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

reacties version scale, r mysics	
Scale Transformation Constants	
A = 9.52146	Transformed Scale Score = 9.52146 + 1.382519 • Logit Scale Score
B = 1.382519	Halistotineu scale scole – 7.32140 + 1.362317 • Loyit scale scole

# 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	





## 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	Page	/	٠ /	nt Loadi	٠ /	/	, ,	
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

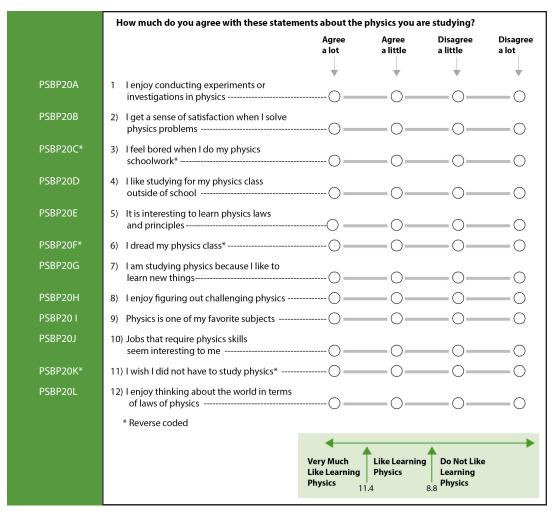
	Pearson's Correlation w	Pearson's Correlation with Physics Achievement				
Country	(r)	(r²)	by Difference Between Regions of the Scale (η²)			
France	0.05	0.00	0.00			
Italy	-0.01	0.00	0.00			
Lebanon	-0.03	0.00	0.00			
Norway	0.02	0.00	0.00			
Portugal	0.01	0.00	0.01			
Russian Federation	0.08	0.01	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			



## 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





#### 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

<sup>\*</sup> Reverse coded

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

Scale Transformation Constants	
A = 8.81822	- Transformed Scale Score = 8.81822 + 1.464843 • Logit Scale Score
B = 1.464843	ilalisionillea scale scole — 0.01022 + 1.404045 • Lugit scale scole





# 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	





## 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	P.S.P.	# /s# /s#	# / Sec.		· /	. /	oadings	/	1	186), (48	1867 (d)	**************************************
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

<sup>\*</sup> Reverse coded

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

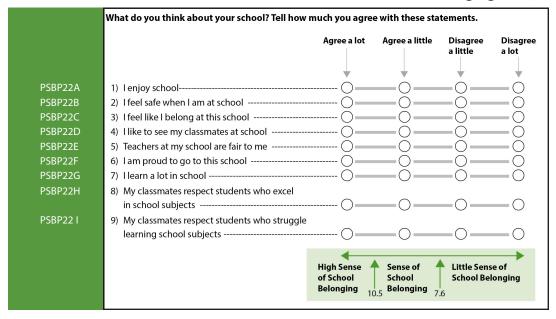
	Pearson's Correlation w	Pearson's Correlation with Physics Achievement				
Country	(r)	( <b>r</b> ²)	Achievement Accounted for by Difference Between Regions of the Scale (η²)			
France	0.46	0.22	0.18			
Italy	0.39	0.15	0.13			
Lebanon	0.22	0.05	0.04			
Norway	0.50	0.25	0.22			
Portugal	0.43	0.18	0.17			
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			



## 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





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

ltem	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		E A 'S
A = 7.921577	Transformed Scale Score = 7.921577 + 1.242992 • Logit Scale Score	
B = 1.242992	Halisiotitied Scale Scote — 1.521577 + 1.242552 • Logit Scale Scote	5

# 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	





# Cronbach's Alpha Reliability Coefficient and Principal Components Analysis of the Items in the TIMSS Advanced 2015 Students' Sense of School Belonging Scale, Physics SOURCE: IEA's Trends in International Mathematics and Science Study – TIMSS 2015

							9 -	,	,-			
Country	Cronbach's Alpha Reliability Coefficient	Percent of Variance Explained	1869	\$\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\	' /	• /	nt Loadi	٠ /	/	/		
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

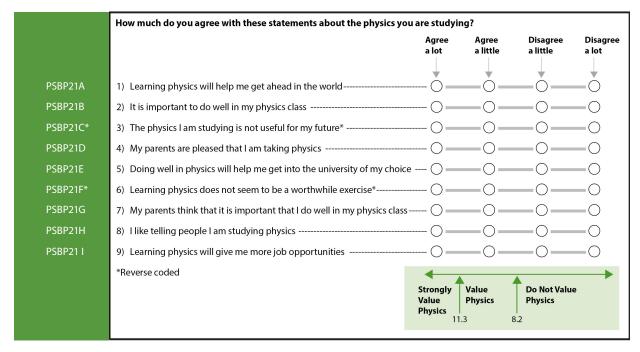
	Pearson's Correlation v	Pearson's Correlation with Physics Achievement				
Country	(r)	(r²)	by Difference Between Regions of the Scale (η²)			
France	0.25	0.06	0.05			
Italy	0.06	0.00	0.01			
Lebanon	0.02	0.00	0.00			
Norway	0.16	0.03	0.03			
Portugal	0.11	0.01	0.02			
Russian Federation	0.07	0.01	0.00			
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			



## 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





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

ltem	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	-0.23886 1.11822	
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

<sup>\*</sup>Reverse coded

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

Scale Transformation Constants	
A = 8.418724	Transformed Scala Scara — 9 A1977A + 1 A50006 - Legit Scala Scara
B = 1.650896	Transformed Scale Score = 8.418724 + 1.650896 • 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	Cutpoint
	Scale Score	
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	





## 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	280.	# / (88)	. /	٠,	. /	ings for	,	1	11 / 18 / 18 / 18 / 18 / 18 / 18 / 18 /	#,
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	

<sup>\*</sup>Reverse coded

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

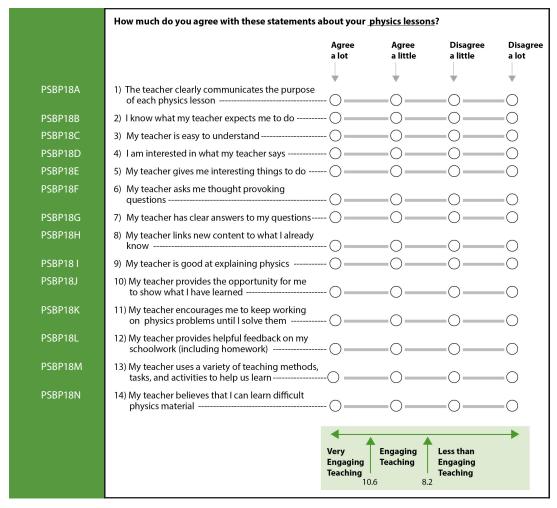
	Pearson's Correlation w	Pearson's Correlation with Physics Achievement				
Country	(r)	(r²)	by Difference Between Regions of the Scale (n²)			
France	0.38	0.14	0.10			
Italy	0.28	0.08	0.07			
Lebanon	0.19	0.04	0.03			
Norway	0.28	0.08	0.08			
Portugal	0.30	0.09	0.08			
Russian Federation	0.31	0.10	0.10			
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			



# 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





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

ltem	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	Transformed Scale Scare — 9 247202 + 1 152140 + Legit Scale Scare
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	Cutnoint
Kaw Score	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	





## 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	P.Sp.,	\$ \\ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \	88 / 188		8 / SB / 1884	į	oonent l	į	· /	/	/	* /SBP.		1 /886 MB/M
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

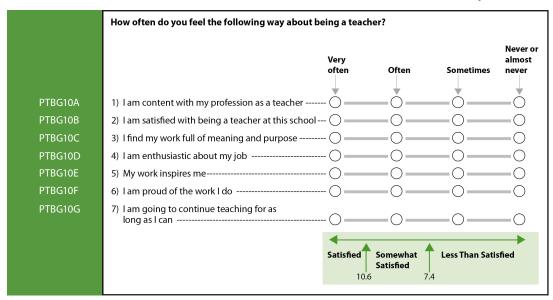
	Pearson's Correlation wi	Pearson's Correlation with Physics Achievement				
Country	(r)	(r²)	Achievement Accounted for by Difference Between  Regions of the Scale (η²)			
France	0.24	0.06	0.05			
Italy	0.12	0.01	0.01			
Lebanon	0.08	0.01	0.02			
Norway	0.25	0.06	0.06			
Portugal	0.04	0.00	0.00			
Russian 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			



## 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



<sup>1</sup> 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	Hallstottilea scale scole = 5.030432 + 0.057351 • Logit scale scole

#### **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	





#### 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	Plages	/	٠ /	nt Loadi	٠ /	/	1	Spir
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 w	Variance in Physics  Achievement Accounted for	
	(r)	(r) (r²)	
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