TIMSS Advanced 2008 Project Completed!

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51st IEA General Assembly

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TIMSS Advanced 2008



TIMSS Advanced 2008 International Report Published

- International Report printed and distributed to NRCs
 - November 2009
- International press release
 - December 9, 2009
 - University of Oslo



TIMSS Advanced 2008



International Database and Technical Report

- Technical Report posted on web
 - December 9, 2009
- International Database and User Guide distributed to NRCs and posted on web
 - December 15, 2009





TIMSS Advanced 2008



International Release

Introduction





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TIMSS Advanced 2008 Assesses final-year students with special preparation in

- Advanced mathematics
- Physics

First administered as part of TIMSS in 1995, which included grades 3, 4, 7, 8, and final year

• Trends 1995 to 2008



Countries Participating

- Armenia
- Italy
- Iran
- Lebanon
- Netherlands

- Norway
- Philippines
- Russian Federation
- Slovenia
- Sweden

Also participated in 1995





Increasingly select population by final year

adiation

Left school

w

- Range of courses and choices
- Not all students study all subjects

Percentage enrolled in advanced courses varies

- Curricular choices available to students
- Students choosing to specialize
- Selectivity of country

Increasing differentiation

- Small percentages in advanced courses
- "Best and brightest"



TIMSS Advanced Results

- Extensive data on contexts for learning
- Achievement in relation to educational contexts, such as students' programs and learning experiences



Key Policy Issue – "Yield"

How many can be educated to high level?

- "Mathematics for all"
- Practical considerations
- Strategic planning



Assessed carefully defined populations

- Taking advanced courses in mathematics or physics
- Specialists in pre-university programs
- Programs lasting three to five years



TIMSS Advanced 2008 Frameworks

- Advanced mathematics
 - Algebra
 - Calculus
 - Geometry
- Physics
 - Mechanics
 - Electricity and magnetism
 - Heat and temperature
 - Atomic and nuclear physics







TIMSS & PIRLS International Study Center Lynch School of Education, Boston College

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Students surviving the pipeline

- Varies across countries
- Remained in school
- Studied mathematics and science
- Studying at high level all through school careers



TIMSS Advanced Coverage Index

Students Taking Advanced Courses

X 100

Entire Age Cohort





TIMSS Advanced 2008 Mathematics Coverage Index



TIMSS Advanced 2008



Achievement in Advanced Mathematics

Country	Average Scale Score	Advanced Mathematics Achievement Distribution				
Russian Federation	561 🛆		-		_	
Netherlands	552 🛆					
Lebanon	545 🛆			_		
TIMSS Adv. Scale Avg.	500					
Iran, Islamic Rep. of	497		_	-	-	
Slovenia	457 💌		_			
Italy	449 💌					
Norway	439 💌			-		
Armenia	433 💌			_		
Sweden	412 💌	-	-			
Philippines	355 💌			_		
	1(0 200	300 400	500 600	700	800
Country average significantly higher than TIMSS Advanced scale average		51	Percentiles o	f Performance		
Country average significantly lower than TIMSS Advanced scale average		95% Confidence Interval for Average (±2SE)				

TIMSS Advanced 2008





Advanced International Benchmark – 625

Students demonstrate their understanding of concepts, mastery of procedures, and mathematical reasoning skills in algebra, trigonometry, geometry, and differential and integral calculus to solve problems in complex contexts.

High International Benchmark – 550

Students can use their knowledge of mathematical concepts and procedures in algebra, calculus, and geometry and trigonometry to analyze and solve multistep problems set in routine and non-routine contexts.

Intermediate International Benchmark – 475

Students demonstrate knowledge of concepts and procedures in algebra, calculus, and geometry to solve routine problems.





Advanced Mathematics Results by Gender

Country	Perce Stud	ent of ents	Average Achievement						
country	Females	Males	Females Males Scored Higher Scored Higher						
Netherlands	23	77							
Italy	34	66							
Norway	38	62							
Armenia	52	48							
Lebanon	29	71							
Sweden	40	60							
Russian Federation	45	55							
Slovenia	60	40							
Iran, Islamic Rep. of	44	56							
Philippines	63	37							
		10	00 80 60 40 20 0 20 40 60 80 10						
			Difference statistically significant Difference not statistically significant						

TIMSS Advanced 2008



Trends in Achievement in Advanced Mathematics

Countries	Difference in Average Achievement in Advanced Mathematics					TIMSS Advanced Mathematics Coverage Index				
	1995 Higher				2008 Higher			2008	1995	
Russian Federation					12				1.4%	2.0%
Slovenia			-20						40.5%	75.4%
Italy			-34						19.7%	20.2%
Sweden -	-89								12.8%	16.2%
1	00 80) 60	40 2	20 0	20	40	60 80	0 10	00	
		Dif	ference ference	statisti not sta	cally signtisticall	gnificai ly signi	nt ficant			

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TIMSS Advanced 2008 Physics Coverage Index







Achievement in Physics

Country	Average Scale Score	Physics Achievement Distribution						
Netherlands	582 🛆						-	
Slovenia	535 🛆							
Norway	534 🛆						_	
Russian Federation	521 🛆			_		-	_	•
TIMSS Adv. Scale Avg.	500							
Sweden	497			_				
Armenia	495			_			_	
Iran, Islamic Rep. of	460 💌		-		-	-	_	
Lebanon	444 💌			-		_		
Italy	422 💌		-		-	_		
	1	00 20	00 30	 00 4	00 5	00 6	00 70	00 800
• Country average significantly higher than TIMSS Advanced scale average		Percentiles of Performance						
Country average significantly lower		5th 25th 75th 95th						
than TIMSS Advanced scale average		95% Confidence Interval for Average (±2SE)						

TIMSS Advanced 2008





Advanced International Benchmark – 625

Students can combine and apply concepts and laws of physics in solving complex problems in a variety of situations.

High International Benchmark – 550

Students can apply basic laws of physics in solving problems in a variety of situations.

Intermediate International Benchmark – 475

Students demonstrate knowledge of the physics underlying a range of phenomena pertinent to everyday life.





Physics Results by Gender

TIMSS Advanced

2008

Country	Perce Stud	ent of ents	Average Achievement						
country	Females	Males	Females Males Scored Higher Scored Higher						
Slovenia	27	73							
Armenia	53	47							
Sweden	35	65							
Lebanon	29	71							
Netherlands	19	81							
Norway	29	71							
Italy	40	60							
Iran, Islamic Rep. of	44	56							
Russian Federation	45	55							
		1(00 80 60 40 20 0 20 40 60 80 100						
	Difference statistically significant								

Difference not statistically significant



Trends in Achievement in Physics

Countries	Difference in Physics Achievement	TIMSS Physics Coverage Index			
	1995 Higher 2008 Higher	2008 1995			
Slovenia	3	7.5% 38.6%			
Russian Federation	-24	2.6% 1.5%			
Norway	-47	6.8% 8.4%			
Sweden	-81	11.0% 16.3%			
1	00 80 60 40 20 0 20 40 60 80	100			
	Difference statistically significant				
	Difference not statistically significant				





Dwindling supply of teachers able to teach advanced content





Students' Areas of Continuing Education

Country	Advanced Mathematics – Intended Area with Most Students	Physics – Intended Area with Most Students
Armenia	26%	22%
Iran	82	82
Italy	20	R 26
Lebanon	66	65
Netherlands	41	4 0
Norway	3 2	4 1
Philippines	R 23	_
Russian Federation	2 5	2 3
Slovenia	() 34	‡ 36
Sweden	‡ 22	‡ 29
	usiness R Health Science	Social Science
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Percent of Students by Teachers' Aged 50 years or Older



TIMSS Advanced 2008



Potential teacher shortages

- Dwindling of supply of highly educated teachers
- Existing teachers nearing retirement



Compelling necessity

- More students into mathematics and science courses
- More mathematics and science students into teachers



Areas of concern from TIMSS Advanced 2008

- Disappointing achievement in advanced mathematics and physics
- Declines in yield fewer students and lower achievement
- Lack sufficient people with sufficient skills to teach advanced mathematics and physics in the future





TIMSS Advanced 2008



Next Opportunity for TIMSS Advanced:

TIMSS in 2015 – Assessing mathematics and science in primary through high school grades

- 12th grade advanced mathematics and physics
- 8th grade mathematics and science
- 4th grade mathematics and science





MSS & PIR

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