

Highlights from TIMSS 2011

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Focus on Mathematics

Overview

What is TIMSS and which education systems participate in it?

How are U.S. students performing compared to their international peers in:

- ✤ 4th-grade mathematics?
- ✤ 8th-grade mathematics?

How are students performing in participating U.S. states?





What are...?



- Trends in International Mathematics and Science Study (TIMSS)
- 4th- and 8th-grade mathematics and science assessment
- Developed by the TIMSS & PIRLS International Study Center at Boston College, under contract to the International Association for the Evaluation of Educational Achievement (IEA)





Focus on Mathematics * In 1999, no grade 4 assessment.

TIMSS participating education systems (in either/both grades)



74 education systems

2011



Focus on Mathematics

Participating states

 9 states participated as separate entities to obtain scores in PIRLS or TIMSS or both

TIMSS grade 4	TIMSS grade 8
Florida North Carolina	Florida North Carolina Alabama California Colorado Connecticut Indiana Massachusetts Minnesota

- Each participated as part of the nation and on its own
- NCES funded participation at grade 8 of all states except Florida as part of a study to statistically link NAEP (National Assessment of Educational Progress) and TIMSS (Florida received other Education Department funding)



U.S. national sample size



4th grade

Schools: 369 Students: 12,569

8th grade

Schools: 501 Students: 10,477



U.S. state sample sizes

(public schools only)



4th grade

(FL, NC)

Schools: 46 - 77

Students:

1,792 - 2,661

8th grade

(AL, CA, CO, CT, FL, IN, MA, MN, NC)

Schools: 53 - 82

Students:

1,712 – 2,614



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TIMSS 2011 mathematics framework

	TIMSS mathematics	
Content dimensions	Grade 4 Number Geometric Shapes and Measures Data DisplayGrade 8 	
Cognitive dimensions	Knowing Applying Reasoning	





What is on the TIMSS mathematics assessment?







What is on the TIMSS mathematics assessment?

	Ingre	dients		
	Eggs	4		
	Flour	8 cups		
G	Milk	$\frac{1}{2}$ cup		
A D E	The above in make this re Complete th 3 people. Th	ngredients are ecipe for only 3 ne table below t ne number of eg	used to make a recipe for 6 people. Sam wants to people. to show what Sam needs to make the recipe for ggs he needs is shown.	
4	Ingredients		Percentage of 4th- graders answering	
	Eggs	2	- correctly:	
	Flour	<u> </u>	U.S.: 76%	
	Milk		Int'l Avg.: 65%	









What is on the TIMSS mathematics assessment?

There are 10 marbles in a bag: 5 red, and 5 blue. Sue draws a marble from the bag at random. The marble is red. She puts the marble back into the bag. What is the probability that the next marble she draws at random is red? \overrightarrow{A} . $\frac{1}{2}$ B. $\frac{4}{10}$ C. $\frac{1}{5}$ Percentage of 8thgraders answering correctly: U.S.: 66% Int'l Avg.: 45%



G

R

Α

D

Ε

8

10

D.



U.S. average score (541) the TIMSS scale aver

UNITED STATES 541

Denmark 537

Germany 528

Hungary 515

Quebec-CAN 533

Ontario-CAN 518

Kazakhstan 501

Czech Republic 511

Alberta-CAN; Slovak Republic 507

core (541) higher than Japan 585			605 Korea, Rep. of 600 591 Chinese Taipei-CHN	
cale average (50)0)	North Carolina-U Finland; Florida-U United Stat Denma Quebec-C/ Germa	SA 554 SA 545 es 541 ark 537 AN 533 ny 528	562 Northern Ireland-GBR 549 Belgium (Flemish)-BEL 542 England-GBR; Russian Federation 540 Netherlands 534 Lithuania 532 Portugal 527 Ireland
542 England-GBR; Russian Fed 540 Netherlands 534 Lithuania 532 Portugal 527 Ireland	leration	Ontario-C4 Hunga Czech Repub Alberta-CAN; Slovak Repub Kazakhst. Norw New Zeala Pola Dubai-U, Chi	NN 518 ry 515 ilic511 ilic507 an 501 ay 495 nd 486 nd 481 AE 468 ile 462	516 Australia; Serbia 513 Slovenia 508 Austria; Italy 504 Sweden 500 496 Malta 490 Croatia 482 Romania; Spain 469 Turkey 463 Azerbaijan 458 Thailand
516 Australia; Serbia 513 Slovenia 508 Austria; Italy		Armen Bahra Iran, Islamic Rep. Qat	in 436 of 431 ar 413	450 Georgia 434 United Arab Emirates 417 Abu Dhabi-UAE 410 Saudi Arabia
504 Sweden 500		Oma	an 385	- 400
		Kuwa	ait 342	359 Tunisia 335 Morocco
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Yemen 248



U.S. average score (541) lower than in 8 education systems





Yemen 248

15

Lower than U.S.

Singapore 606

Japan 585

Hong Kong-CHN 602

North Carolina-USA 554

Finland: Florida-USA 545

United States 541

605 Korea, Rep. of

591 Chinese Taipei-CHN

562 Northern Ireland-GBR

549 Belgium (Flemish)-BEL

540 Netherlands

542 England-GBR; Russian Federation

600





U.S. average score (541) higher than in 42 education systems

Singapore 606 Hong Kong-CHN 602 600

Japan 585

591 Chinese Taipei-CHN

562 Northern Ireland-GBR

Quebec-CAN 533	534 Lithuania 532 Portugal	Finland; Florida-USA 545 United States 541 Denmark 537 Quebec-CAN 533 Germany 528	549 Belgium (Flemish)-BEL 542 England-GBR; Russian Federation 540 Netherlands 534 Lithuania 532 Portugal 527 Ireland
Germany 528	527 Ireland	Ontario-CAN 518 Hungary 515 Czech Republic 511 Alberta-CAN; Slovak Republic 507 Kazakhstan 501	516 Australia; Serbia 513 Slovenia 508 Austria; Italy 504 Sweden 500 Sweden
Ontario-CAN 518 Hungary 515 Czech Republic 511	516 Australia; Serbia 513 Slovenia	Norway 495 New Zealand 486 Poland 481	495 Maita 490 Croatia 482 Romania; Spain
Alberta-CAN; Slovak Republic 507	508 Austria; Italy	Dubai-UAE 468 Chile 462	469 Turkey 463 Azerbaijan
Kazakhstan 501	504 Sweden 500	Armenia 452	458 Thailand 450 Georgia
Norway 495	496 Malta	Bahrain 436 Iran, Islamic Rep. of 431	434 United Arab Emirates
New Zealand 486 Poland 481	490 Croatia 482 Romania; Spain	Qatar 413	417 Abu Dhabi-UAE 410 Saudi Arabia • 400
		Oman 385	
Dubai-UAE 468	469 Turkey		
Chile 462	463 Azerbaijan		359 Tunisia
	458 Ihailand	Kuwait 342	335 Morocco



17

300

■ Higher than U.S.

Not measurably different than U.S.

Lower than U.S.











Average mathematics scores of 4th-grade students increased from 2007 to 2011 in 12 education systems, including the U.S.



*p < .05. Change in average scores is significant. NOTE: Education systems ordered according to average mathematics score in 2011.



Average mathematics scores of 8th-grade students increased from 2007 to 2011 in 10 education systems





*p < .05. Change in average scores is significant.

NOTE: Education systems ordered according to average mathematics score in 2011.



Average mathematics scores of 8th-grade students decreased from 2007 to 2011 in 6 education systems





*p < .05. Change in average scores is significant. NOTE: Education systems ordered according to average mathematics score in 2011.



TIMSS international mathematics benchmarks

	Grade 4	Grade 8
Advanced (625)	Students can apply their understanding and knowledge in a variety of relatively complex situations and explain their reasoning.	Students can reason with information, draw conclusions, make generalizations, and solve linear equations.
High (550)	Students can apply their knowledge and understanding to solve problems.	Students can apply their understanding and knowledge in a variety of relatively complex situations.
Intermediate (475)	Students can apply basic mathematical knowledge in straightforward situations.	Students can apply basic mathematical knowledge in straightforward situations.
Low (400)	Students have some basic mathematical knowledge.	Students have some knowledge of whole numbers and decimals, operations, and basic graphs.





Percentages of U.S. 4th-graders reaching TIMSS mathematics benchmarks were higher than international medians in 2011

Percent at or above



NOTE: All U.S. percentages are significantly higher than the corresponding TIMSS international median at the .05 level of statistical significance.





Seven systems had higher percentages of 4thgrade students reaching *Advanced* than the U.S.



NOTE: Education systems with lower percentages of students reaching the *Advanced* benchmark than the percentage of U.S. students reaching the *Advanced* benchmark are not included in figure.



Percentages of U.S. 8th-graders reaching TIMSS mathematics benchmarks were higher than international medians in 2011

Percent at or above



NOTE: All U.S. percentages are significantly higher than the corresponding TIMSS international median at the .05 level of statistical significance.



Eleven systems had higher percentages of 8thgraders reaching *Advanced* than the U.S.





NOTE: Education systems with lower percentages of students reaching the *Advanced* benchmark than the percentage of U.S. students reaching the *Advanced* benchmark are not included in figure.



60

Summary of change in average U.S. scores over time



Korea, Rep. of 613 Chinese Taipei-CHN 609	611 Singapore	
	- 600	Higher than U.S.
		Not measurably different than U.S.
	586 Hong Kong-CHN	Lower than U.S.
Japan 570		
	561 Massachusetts-USA	
Minnesota-USA 545		
North Carolina-USA 537	539 Russian Federation	
	532 Quebec-CAN	
Indiana-USA 522	518 Colorado-USA: Connecticut-USA	
Israel 516 Florida-USA 513 United States 509	514 Finland 512 Ontario-CAN	
Alberta-CAN; Australia; Hungary, Slovenia 505	507 England-GBR	
Italy 498	- 500	
	493 California-USA	
New Zealand 488 Sweden 484	487 Kazakhstan	
Dubai-UAE 478	479 Ukraine	
Armenia 467	466 Alabama-USA	
Romania 458	456 United Arab Emirates	
Turkey 452	449 Abu Dhabi-UAE; Lebanon	
Malavsia 440		
Thailand 427	431 Georgia 426 Macedonia Rep. of	
Tunisia 425		
Iran, Islamic Rep. of 415	416 Chile	
Bahrain 409 Palestinian Nat'l Auth, 404	410 Qatar 406 Jordan	
	- 400	
	394 Saudi Arabia	
Indonesia 386		
	380 Syrian Arab Republic	
Morocco 371	366 Oman	

Singapore 606 Hong Kong-CHN 602	605 Korea, Rep. of	
	600	Higher than U.S.
12020 595	591 Chinese Taipei-CHN	
Japan 585		Not measurably different
		than 0.5.
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Germany 528	532 Portugal 527 Ireland	
Ontario-CAN 518		
Hungary 515 Czech Benublic 511	516 Australia; Serbia 513 Slovenia	
Alberta-CAN; Slovak Republic 507	508 Austria; Italy 504 Sweden	
Kazakhstan 501	• 500	
Norway 495	496 Malta 490 Croatia	
New Zealand 486	493 Bernenia: Casia	
Poland 481	462 Komania, Spain	
Dubai-UAE 468	469 Turkey	
Chile 462	463 Azerbaijan	
	458 Thailand	
Armenia 452	450 Georgia	
Bahrain 436 Iran, Islamic Bon, of 431	434 United Arab Emirates	
iran, islamic kep. of 451		
	417 Abu Dhabi-UAE	
Qatar 413	410 Saudi Arabia	
	400	
Oman 385		
	359 Tunisia	
Kuwait 342		
	335 Morocco	
	- 300	
Yemen 248		

For more information



TIMSS at NCES: <u>http://nces.ed.gov/timss/</u> International Data Explorer: <u>http://nces.ed.gov/timss/idetimss/</u>

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