

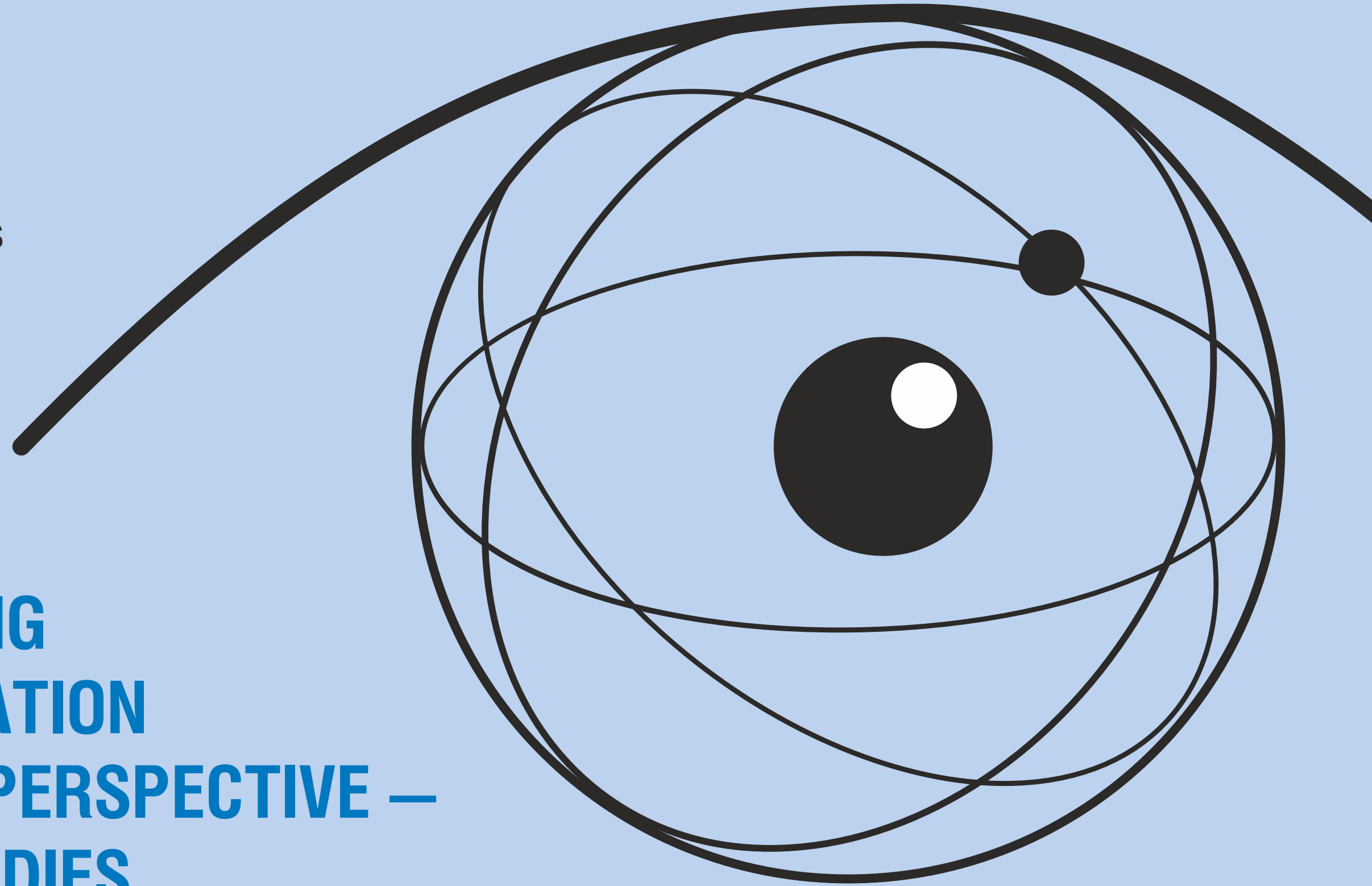
29<sup>th</sup> – 30<sup>th</sup>  
OF SEPTEMBER 2016  
INTERNATIONAL  
CONFERENCE



USE OF THE  
EDUCATION  
QUALITY  
RESEARCH RESULTS:  
PROBLEMS AND PROSPECTS

# MATHEMATICS TEACHING IN THE RUSSIAN FEDERATION IN AN INTERNATIONAL PERSPECTIVE — RESULTS FROM IEA STUDIES

DIRK HASTEDT, EXECUTIVE DIRECTOR IEA





# THE IEA

## THE INTERNATIONAL ASSOCIATION FOR EVALUATION OF EDUCATIONAL ACHIEVEMENT



A non-profit research organization

**1958**

Founded in 1958

**>60**

More than 60 member countries

**>30**

Conducted more than 30 international studies on education

**>100**

Active in more than 100 countries

## CURRENT STUDIES

**TIMSS**

2015

**PIRLS**

2016

**ICILS**

2018

**ICCS**

2016



## THE IEA



**The IEA's studies help policymakers and educators determine how well educational systems are doing**



**The IEA aims at increasing our understanding of the policies and practices that foster educational progress**



**The emphasis is on comparing to learn rather than competing with each other**



**EA studies are a joint effort of participating countries**



**IEA does not give policy advice but encourages countries to analyze the data and to come up with their own conclusions**



# THE IEA TEDS-M STUDY DESIGN



**Researched the teacher education  
of future primary and secondary  
mathematics teachers**



**Conducted in 2007/2008 in 17 countries:**  
Botswana, Canada, Chile, Chinese Taipei, Georgia,  
Germany, Malaysia, Norway, Oman,  
Philippines, Poland, Russian  
Federation, Singapore,  
Spain, Switzerland  
(German-speaking  
cantons), Thailand,  
and United States



**At the end  
of pre-service training**



**Survey of teacher training  
institutions, teacher educators,  
and future mathematics teachers**



**On curriculum, programs, opportunities  
to learn, future teachers' knowledge  
and beliefs about mathematics  
and learning mathematics**



## THE IEA TEDS-M STUDY RESULTS

### FIRST RESULT: MATHEMATICS EDUCATION IS VERY DIFFERENT ACROSS COUNTRIES

is consecutive but there  
are also concurrent programs  
(theory and praxis)

is offered in general but  
also in specialists programs  
(math teaching vs. general teachers)

prepares teachers  
for different grade levels

## IS VERY DIFFICULT TO COMPARE ACROSS COUNTRIES

**ALL COMPARISONS SHOULD BE DONE VERY CAREFULLY!**

---

However...



## THE IEA TEDS-M STUDY

### SAMPLE ITEM FOR MATHEMATICS PEDAGOGY CONTENT KNOWLEDGE

[Jeremy] notices that when he enters  $0.2 \times 6$  into a calculator his answer is smaller than 6, and when he enters  $6 + 0.2$  he gets a number greater than 6. He is puzzled by this, and asks his teacher for a new calculator!

- (a) What is [Jeremy's] mostlikely misconception?
- (b) Draw a visual representation that the teacher could use to model  $0.2 \times 6$  to help [Jeremy] understand

WHY the answer is what it is?

**Note: \*International average percent correct:**

**208A** full credit (20%), partial credit (12%)

**208B** full credit (16%), partial credit (16%)



# THE IEA TEDS-M STUDY

## SAMPLE ITEM FOR MATHEMATICS PEDAGOGY CONTENT KNOWLEDGE

Some <lower-secondary school> students were asked to prove the following statement:  
When you multiply 3 consecutive natural numbers, the product is a multiple of 6. Below are three responses.

### [KATE'S] ANSWER

A multiple of 6 must have factors of 3 and 2.  
If you have three consecutive numbers, one will be a multiple of 3.  
Also, at least one number will be even and all even numbers are multiples of 2. If you multiply the three consecutive numbers together the answer must have at least one factor of 3 and one factor of 2.

### [LEON'S] ANSWER

$$\begin{aligned}1 \times 2 \times 3 &= 6 \\2 \times 3 \times 4 &= 24 = 6 \times 4 \\4 \times 5 \times 6 &= 120 = 6 \times 20 \\6 \times 7 \times 8 &= 336 = 6 \times 56\end{aligned}$$

### [MARIA'S] ANSWER

$n$  is any whole number

$$\begin{aligned}n \times (n+1) \times (n+2) &= (n^2+n) \times (n+2) \\&= n^3 + n^2 + 2n^2 + 2n\end{aligned}$$

Cancelling the  $n$ 's gives  $1 + 1 + 2 + 2 = 6$

Determine whether each proof is valid.

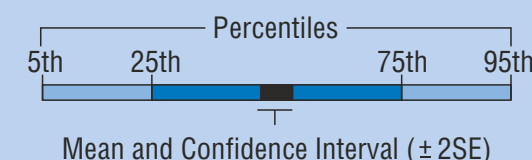
Check one box in each row

	Valid	Not valid
A. [Kate's] proof	<input type="checkbox"/>	<input type="checkbox"/>
B. [Leon's] proof	<input type="checkbox"/>	<input type="checkbox"/>
C. [Maria's] proof	<input type="checkbox"/>	<input type="checkbox"/>



# THE IEA TEDS-M STUDY

## FUTURE PRIMARY TEACHERS' MATHEMATICS CONTENT AND PEDAGOGY CONTENT KNOWLEDGE



Program-Group	Country	Scaled Score: Mean (SE)	Mathematics Content					Scaled Score: Mean (SE)	Mathematics Pedagogy Content Knowledge				
			200	300	400	500	600		700	800	200	300	400
<b>GROUP 1.</b> Lower Primary (to Grade 4 Maximum)	Georgia	345 (4)	[Bar chart showing distribution]					345 (5)	[Bar chart showing distribution]				
	Germany	501 (3)	[Bar chart showing distribution]					491 (5)	[Bar chart showing distribution]				
	Poland <sup>a</sup>	456 (2)	[Bar chart showing distribution]					452 (2)	[Bar chart showing distribution]				
	<b>Russian Federation<sup>b</sup></b>	<b>536 (10)</b>	[Bar chart showing distribution]					<b>512 (8)</b>	[Bar chart showing distribution]				
	Switzerland <sup>c</sup>	512 (6)	[Bar chart showing distribution]					519 (6)	[Bar chart showing distribution]				
<b>GROUP 2.</b> Primary (to Grade 6 Maximum)	Chinese Taipei	623 (4)	[Bar chart showing distribution]					592 (2)	[Bar chart showing distribution]				
	Philippines	440 (8)	[Bar chart showing distribution]					457 (10)	[Bar chart showing distribution]				
	Singapore	586 (4)	[Bar chart showing distribution]					588 (4)	[Bar chart showing distribution]				
	Spain	481 (3)	[Bar chart showing distribution]					492 (2)	[Bar chart showing distribution]				
	Switzerland	548 (2)	[Bar chart showing distribution]					539 (2)	[Bar chart showing distribution]				
	United States <sup>f,d</sup>	518 (5)	[Bar chart showing distribution]					544 (3)	[Bar chart showing distribution]				
<b>GROUP 3.</b> Primary and Secondary Generalists (to Grade 10 Maximum)	Botswana <sup>e</sup>	441 (6)	[Bar chart showing distribution]					448 (9)	[Bar chart showing distribution]				
	Chile <sup>f</sup>	413 (2)	[Bar chart showing distribution]					425 (4)	[Bar chart showing distribution]				
	Norway (ALU) <sup>g</sup>	509 (4)	[Bar chart showing distribution]					539 (3)	[Bar chart showing distribution]				
	Norway (ALU+) <sup>g</sup>	553 (6)	[Bar chart showing distribution]					564 (6)	[Bar chart showing distribution]				
	Germany	555 (8)	[Bar chart showing distribution]					552 (7)	[Bar chart showing distribution]				
<b>GROUP 4.</b> Primary Mathematics Specialists	Malaysia	488 (2)	[Bar chart showing distribution]					503 (3)	[Bar chart showing distribution]				
	Poland <sup>a</sup>	614 (5)	[Bar chart showing distribution]					575 (4)	[Bar chart showing distribution]				
	Singapore	600 (8)	[Bar chart showing distribution]					604 (7)	[Bar chart showing distribution]				
	Thailand	528 (2)	[Bar chart showing distribution]					506 (2)	[Bar chart showing distribution]				
	United States <sup>f,d</sup>	520 (7)	[Bar chart showing distribution]					545 (6)	[Bar chart showing distribution]				

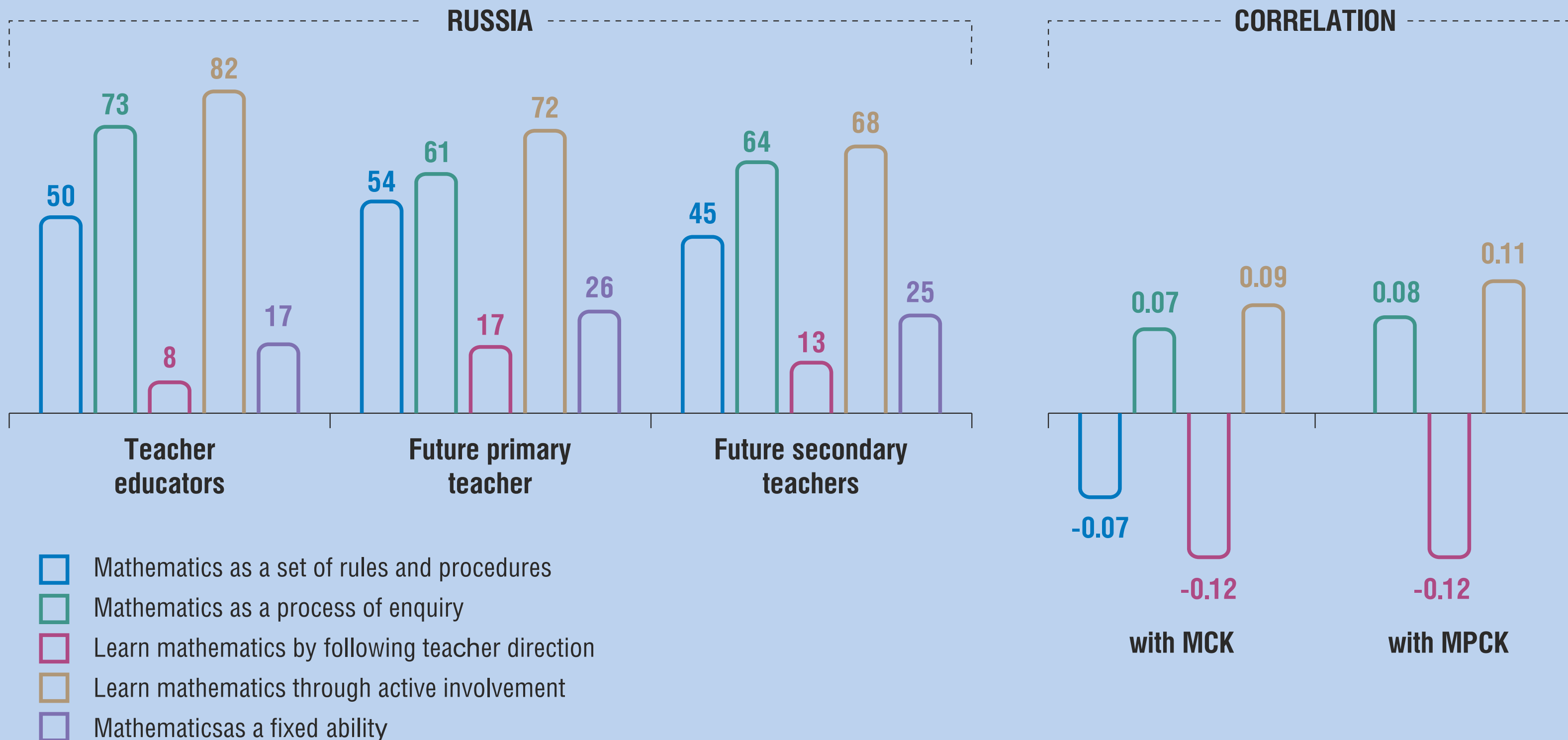






# THE IEA TEDS-M STUDY

## BELIEFS ABOUT MATHEMATICS AND MATHEMATICS LEARNING





## THE IEA TEDS-M STUDY

**Results in the Russian Federation are  
in line with the findings in other countries**

---

**In all countries, beliefs of future teachers are quite  
in line with the beliefs of teacher educators**

---

**This might indicate that changing these might be a long process starting  
with the teacher educators and the teacher-preparation programs**

---

**The correlations are in line with  
theories and other research**

---

**It might be useful to support the concept of active learning even more and advise  
teachers and their educators that mathematics is not a set of rules and procedures**

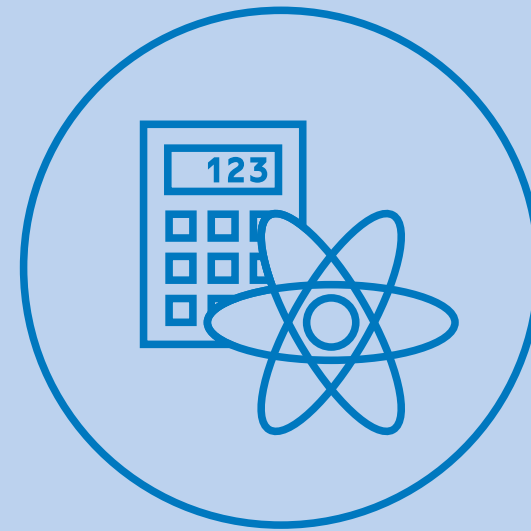
---



## THE IEA TIMSS



**Trends in International  
Mathematics and  
Science Study**



**Assesses the mathematics  
and science achievement  
and competencies of grade 4,  
grade 8, and grade 12 students  
(grade-based assessment)**



**Is conducted every four  
years since 1995 in up  
to 70 countries**



**Follows up on some of the results  
from the TIMSS 2011 assessment  
(results from TIMSS 2015 will be  
released November 29th this year)**



# THE IEA TIMSS 2011 RESULTS

## GRADE 8 STUDENTS' MATHEMATICS TEACHERS EDUCATION

RUSSIA

Major in Mathematics and Mathematics Education

63%

Percentage

543

Math Achievement

Major in Mathematics but no Major in Mathematics Education

35%

Percentage

529

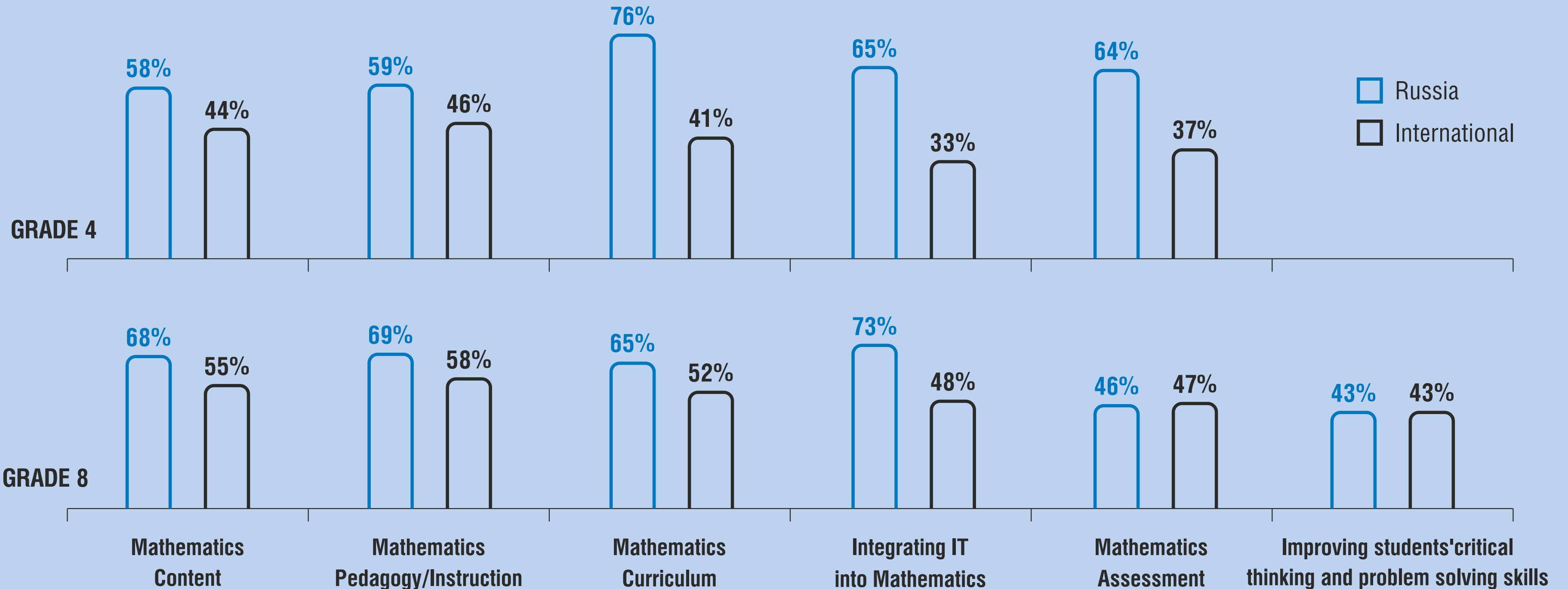
Math Achievement

\*percentage of students taught by teachers with this experience

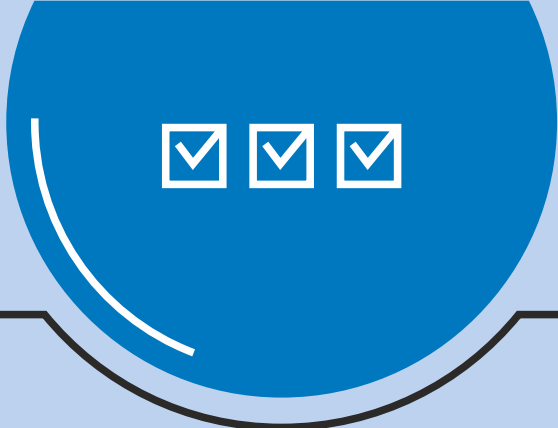


# THE IEA TIMSS 2011 RESULTS

## MATHEMATICS TEACHERS' PARTICIPATION IN PROFESSIONAL DEVELOPMENT IN THE LAST 2 YEARS



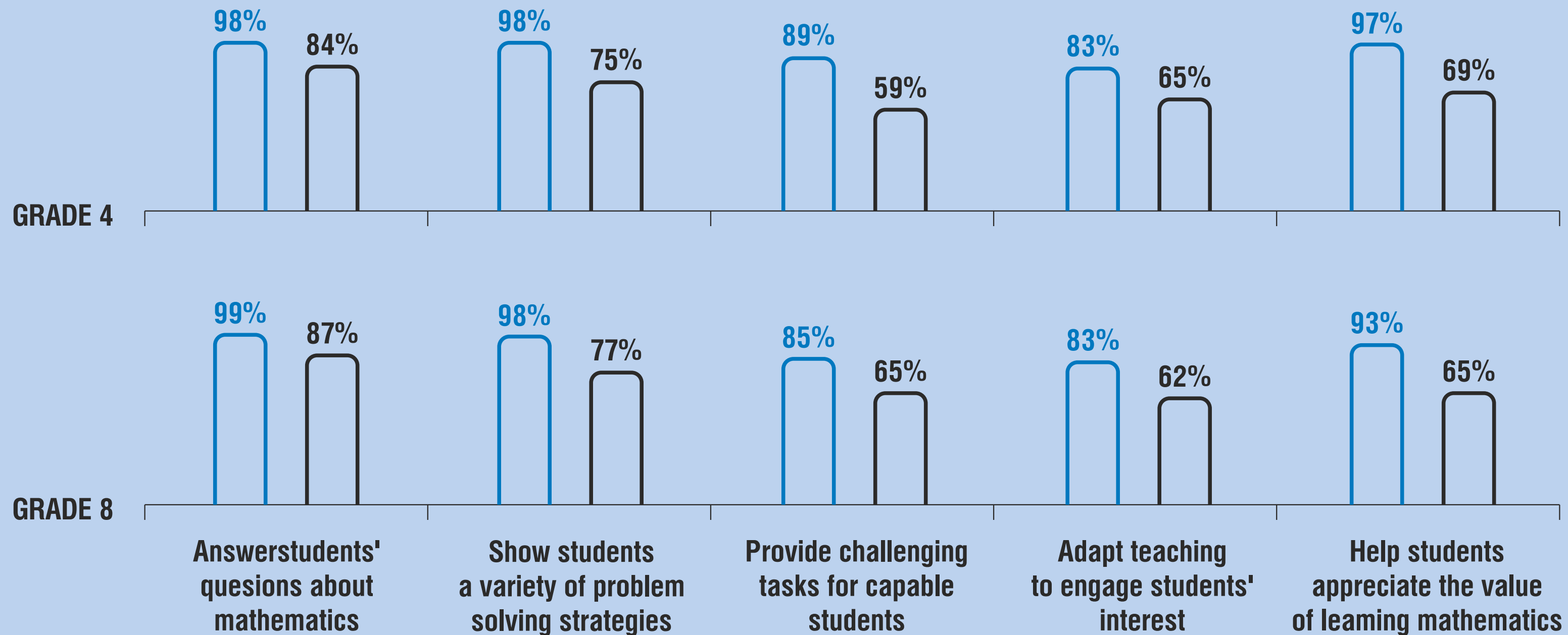
\*percentage of students taught by teachers with this experience



# THE IEA TIMSS 2011 RESULTS

## PERCENTAGES OF STUDENTS WHOSE TEACHERS FEEL VERY CONFIDENT TO...

Russia  
International



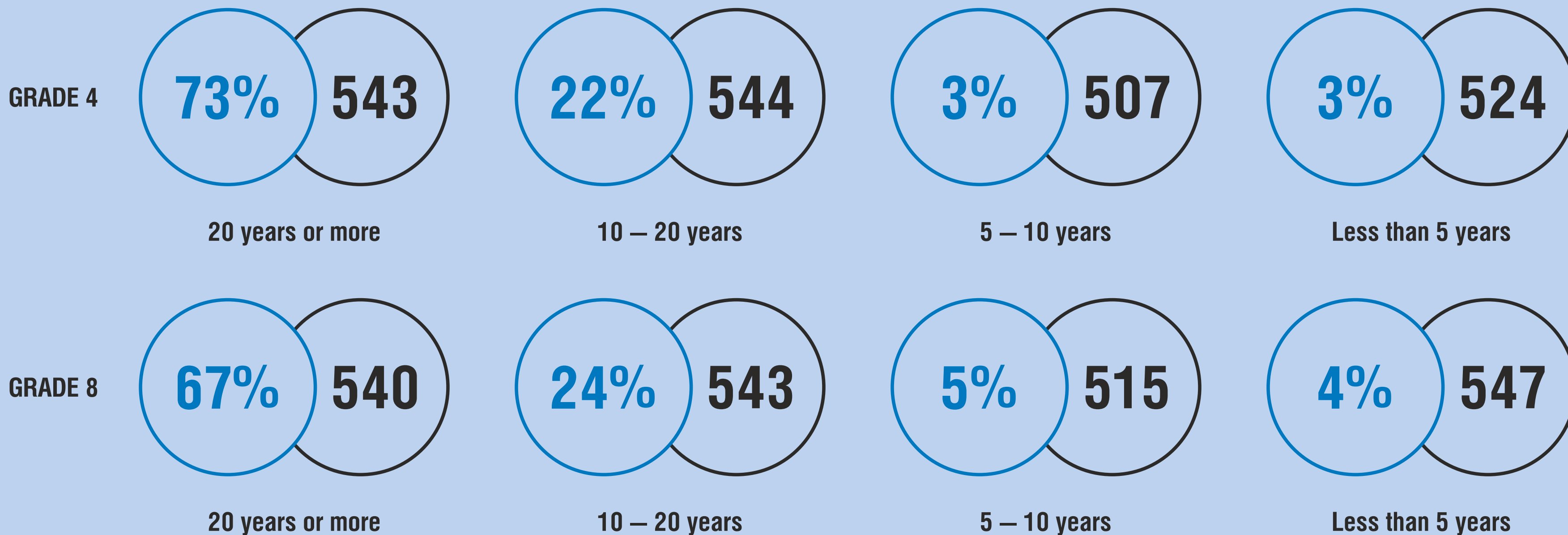
Russian mathematics teachers' self confidence 3rd highest in both grades



# THE IEA TIMSS 2011 RESULTS

## MATHEMATICS TEACHERS' EXPERIENCE IN RUSSIA

Percentage\*  
Stud math ach



\*percentage of students taught by teachers with this experience



**THANK YOU FOR YOUR ATTENTION!**

---

2016