2012 Program for International Student Assessment (PISA) Results in Mathematics, Science, and Reading 15-year-old Students

PISA Overview

PISA is administered to 15-year-old students every three years in mathematics, science, and reading. PISA 2012 is the fifth administration since the program began in 2000 and the second, after the 2003 survey, to focus on mathematics. In 2012, reading and science were assessed as minor areas of focus. Approximately 60 countries covering roughly 90% of the world economy participated in this assessment of student preparation for the challenges of young adult life. Rather than focusing on the mastery and reproduction of a specific school curriculum, PISA focuses on assessing a students' ability to use their knowledge and skills to meet real-life challenges.

In 2012, PISA assessed approximately 510,000 students in 65 education systems, 34 of which make up the OECD countries and 31 being partner countries and economies. The OECD (Organization for Economic Cooperation and Development) is an international economic organization of 34 countries founded in 1961 to stimulate economic progress and world trade. It is a forum of countries committed to democracy and the market economy, providing a platform to compare policy experiences, seek answers to common problems, identify good practices and coordinate domestic and international policies of its members.

In the United States, over 6,000 randomly selected 15-year-old students from 161 schools participated in PISA 2012. Three states – Connecticut, Florida and Massachusetts – participated for the first time as international benchmarking systems (regions of countries) and received separate scores.

PISA 2012 was a paper-based assessment lasting a total of two hours for each student. Test items were a mixture of multiple-choice and constructed-response items. The items were organized in groups based on a passage describing a real-life situation. Different students had booklets of different combinations of test items. Students also answered a 30-minute background questionnaire, providing information about themselves, their homes, and their school and learning experiences. Similarly, school principals were given a questionnaire that covered the school system and the learning environment. PISA students are usually between 15 years, 3 months and 16 years, 2 months at the time of the assessment and have completed at least 6 years of formal schooling.

The average score scale for all three domains is 0-1000 and percentages are reported at 6 proficiency levels. The mean scores for PISA 2012 were set at 494 for mathematics, 501 for science, and 496 for reading. PISA also reports on the change between average scores over time and provides subgroup scores for International and U.S. specific variables.

United States and Florida PISA 2012 Results

The PISA mathematics average of 15-year-old students in the United States was lower than the OECD average. The averages in science and reading of the United States and the OECD were not significantly different. Florida's average was not significantly different from the United States and OECD in reading, not significantly different from the United States but below the OECD in science, and below the United States and the OECD in mathematics.

Mathematics Literacy

In the PISA Mathematics framework, mathematics literacy is defined as an individuals' capacity to formulate, employ, and interpret mathematics in a variety of contexts. Mathematical literacy includes reasoning mathematically and using mathematical concepts, procedures, facts, and tools to describe, explain, and predict phenomena. It assists individuals in recognizing the role that mathematics plays in the world and to make the well-founded judgments and decisions needed by constructive, engaged, and reflective citizens.

PISA seeks to measure not just the extent to which students can reproduce mathematical content knowledge, but also how well they can draw conclusions from what they know and apply those conclusions in both new and unfamiliar situations. This is a reflection of modern societies and workplaces which value success not by what people know, but by what people can do with what they know.

In the framework, mathematics is organized around four context categories that identify the broad areas of life: (1) personal, which is related to individuals' and families' daily lives; (2) societal, which is related to the community – local, national or global – in which an individual lives; (3) occupational, which is related to the world of work; and (4) scientific, which is related to the use of mathematics in science and technology.

PISA items reflect four categories of mathematical content: (1) quantity, (2) uncertainty and data, (3) change and relationships, and (4) space and shape. The student must formulate situations mathematically, employ mathematical concepts, facts, procedures, and reasoning, and interpret, apply, and evaluate mathematical outcomes and their reasonableness in the context of a real-world problem.

Mathematics Proficiency Levels

For PISA 2012, the range of difficulty of the tasks is represented by six levels of mathematics proficiency with Level 6 being the highest and Level 1 being the lowest.

- Level 6 students can conceptualize, generalize, and utilize information based on their investigations and modeling of complex problem situations, and can use their knowledge in relatively non-standard contexts (lower score limit 669; OECD average 3%)
- Level 5 students can develop and work with models for complex situations, identifying constraints and specifying assumptions (lower score limit 607; OECD average 13%)
- Level 4 students can work effectively with explicit models for complex concrete situations that may involve constraints or call for making assumptions (lower score limit 545; OECD average 31%)
- Level 3 students can execute clearly described procedures, including those that require sequential decisions (lower score limit 482; OECD average 55%)
- Level 2 students can interpret and recognize situations in contexts that require no more than direct inference (lower score limit 420; OECD average 77%)
- Level 1 students can answer questions involving familiar contexts where all relevant information is present and the questions are clearly defined (lower score limit 358; OECD average 92%)

2012 PISA Performance in Mathematics

Strengths and weaknesses of U.S. students

Strengths

- Reading data directly from tables
- Simple handling of data from tables and diagrams
- Handling directly manageable formulae

Weaknesses

- Taking real-world situations and translating them into mathematical terms
- Interpreting mathematical aspects in real-world problems
- Reasoning in geometric context

2012 PISA Performance in Mathematics, continued

- In the United States, 9 percent of 15-year-old students scored at level 5 and above, which was lower than the OECD average of 13 percent. Twenty-seven education systems had significantly higher percentages of students scoring at level 5 and above than the United States, and 22 education systems had significantly lower percentages.
- Twenty-six percent of the students in the United States scored below level 2, which was higher than the OECD average (23 percent) and that of 29 education systems. Twenty-six education systems had a significantly higher percentage of students scoring below level 2 than the United States.
- In Florida, 6 percent of students scored at level 5 and above while 30 percent scored below level 2. The percentage of Florida students scoring at level 5 and above was significantly lower than the percentages of the United States and the OECD; the percentage of Massachusetts and Connecticut students scoring at level 5 and above was significantly higher than the United States and not significantly different from the OECD.
- The average score for students in the United States (481) was higher than in 26 education systems and lower than the OECD average (494) and that of 29 education systems.
- Florida's average score (467) was lower than the averages of the United States and the OECD. Massachusetts' average was significantly higher than the average scores of the United States and the OECD. The average score in Connecticut was significantly higher than the United States' and not significantly different from the OECD's.

2012 PISA Mathematics

Exhibit 1: Proficiency Levels

	Education System	Proficiency Levels: Below Level 2	Proficiency Levels: Level 5 and above
Top 4	Shanghai-CHN	4%^	55%*
Top 4	Singapore	8%^	40%*
Top 4	Chinese Taipei	13%^	37%*
Top 4	Hong Kong- CHN	9%^	34%*
OECD Avg		23%^	13%*
United States		*26%*	*9%*
Bottom 4	Jordan	69%*	<1%^
Bottom 4	Colombia	74%*	0^
Bottom 4	Indonesia	76%*	<1%^
Bottom 4	Argentina	66%*	0^

Exhibit 2: Proficiency Levels

United States Education System	Proficiency Levels: Below Level 2	Proficiency Levels: Level 5 and Above
Massachusetts	18%^	19%*
Connecticut	21%^	16%*
OECD Avg	23%^	13%*
United States	*26%*	*9%*
Florida	30%*	6%^

Significantly higher than U.S. in 2012 Mathematics*
Significantly lower than U.S. in 2012 Mathematics^

Exhibit 3: Average scores

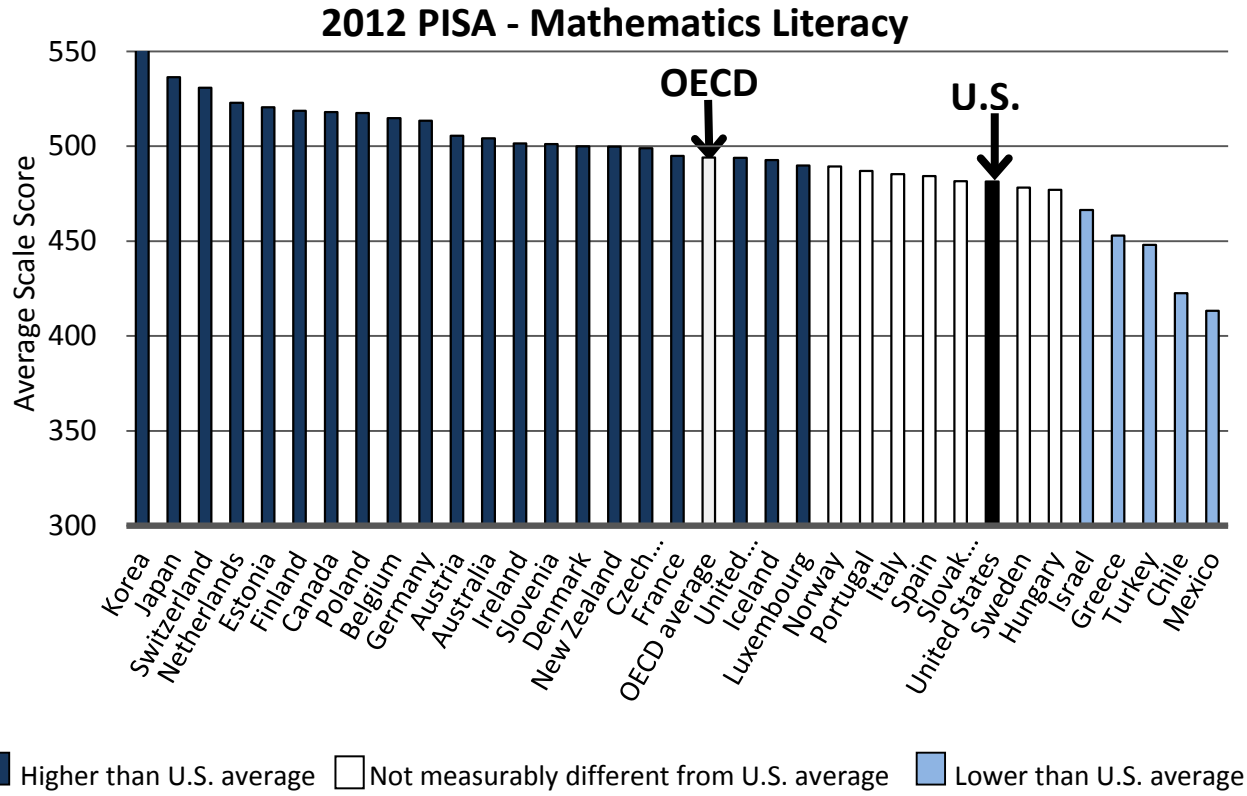
	Education System	Average Score
Top 4	Shanghai-CHN	613*
Top 4	Singapore	573*
Top 4	Hong Kong-CHN	561*
Top 4	Chinese Taipei	560*
OECD Mean		494*
United States		*481*
Bottom 4	Colombia	376^
Bottom 4	Qatar	376^
Bottom 4	Indonesia	375^
Bottom 4	Peru	368^

Exhibit 4: Average Scores

United States Education System	Average Score
Massachusetts	514*
Connecticut	506*
OECD Mean	494*
United States	*481*
Florida	467^

Significantly higher than U.S. in 2012 Mathematics*
Significantly lower than U.S. in 2012 Mathematics^

Of 34 OECD Countries, the United States Ranks 27th in Mathematics Literacy



Source: National Center for Education Statistics, 2013, http://nces.ed.gov/surveys/pisa/pisa2012/pisa2012highlights_3a.asp

1st Korea 554; 2nd Japan 536; 3rd Switzerland 531; 4th Netherlands 523; 5th Estonia 521; 6th Finland 519; 7th Canada 518; 8th Poland 518; 9th Belgium 515; 10th Germany 514; 11th Austria 506; 12th Australia 504; 13th Ireland 501; 14th Slovenia 501; 15th Denmark 500; 16th New Zealand 500; 17th Czech Republic 499; 18th France 495; OECD average 494; 19th United Kingdom 494; 20th Iceland 493; 21st Luxembourg 490; 22nd Norway 489; 23rd Portugal 487; 24th Italy 485; 25th Spain 484; 26th Slovak Republic 482; 27th United States 481; 28th Sweden 478; 29th Hungary 477; 30th Israel 466; 31st Greece 453; 32nd Turkey 448; 33rd Chile 423; 34th Mexico 413

Science Literacy

Science was the focus of the PISA 2006 survey and a minor domain in 2009 and 2012. Science will be the focus of the PISA 2015 survey.

In the PISA Science framework, scientific literacy is defined as:

- an individual's scientific knowledge, and use of that knowledge, to identify questions, acquire new knowledge, explain scientific phenomena, and draw evidence-based conclusions about science-related issues
- understanding of the characteristic features of science as a form of human knowledge and enquiry
- awareness of how science and technology shape our material, intellectual, and cultural environments
- willingness to engage in science-related issues, and with the ideas of science, as a reflective citizen

Science Proficiency Levels

For PISA 2012, the range of difficulty of the tasks is represented by six levels of science proficiency with Level 6 being the highest and Level 1 being the lowest.

- Level 6 students can consistently identify, explain, and apply scientific knowledge and knowledge about science in a variety of complex life situations (lower score limit 708; OECD average 1%)
- Level 5 students can identify the scientific components of many complex life situations, apply both scientific concepts and knowledge about science to these situations, and can compare, select, and evaluate appropriate scientific evidence for responding to life situations (lower score limit 633; OECD average 66%)
- Level 4 students can work effectively with situations and issues that may involve explicit phenomena requiring them to make inferences about the role of science or technology (lower score limit 559; OECD average 29%)
- Level 3 students can identify clearly described scientific issues in a range of contexts (lower score limit 484; OECD average 58%)
- Level 2 students have adequate scientific knowledge to provide possible explanations in familiar contexts or draw conclusions based on simple investigations (lower score limit 409; OECD average 82%)
- Level 1 students have such limited scientific knowledge that it can only be applied to a few, familiar situations (lower score limit 335; OECD average 95%)

2012 PISA Performance in Science

- In the United States, 7 percent of 15-year-old students scored at proficiency level 5 or above, which was not significantly different from the OECD average of 8 percent. Seventeen education systems had significantly higher percentages of students scoring at level 5 and above than the United States, and 27 education systems had a significantly lower percentage.
- Both the United States and the OECD had an average of 18 percent of their 15-year old students scoring below level 2. Twenty-one education systems had a significantly lower percentage of students scoring at or below level 2 than the United States, and 29 education systems had a significantly higher percentage of students scoring at or below level 2 than the United States.
- In Florida, 5 percent of students scored at level 5 and above while 21 percent scored below level 2. The percentage of Florida students scoring at level 5 and above was not significantly different from the United States, while Massachusetts and Connecticut had a significantly higher percentage of students scored at level 5 and above than the United States and the OECD.
- The average score for students in the United States (497) was higher than in 29 education systems and lower than in 22 education systems. The United States' average was not significantly different from the OECD average of 501.
- Florida's average score (485) was not significantly different from the United States average but lower than the OECD average. Massachusetts and Connecticut had average scores that were significantly higher than the United States' and OECD averages.

2012 PISA Science

Exhibit 5: Proficiency Levels

Education System		Proficiency Levels	
		Below Level 2	Levels 5 and above
Top 4	Shanghai-CHN	3%^	27%*
	Singapore	10%^	23%*
	Japan	8%^	18%*
	Finland	8%^	17%*
OECD Avg		18%‡	8%‡
United States		*18%*	*7%*
Bottom 4	Colombia	56%*	<1%^
	Tunisia	55%*	<1%^
	Peru	68%*	1%^
	Indonesia	67%*	<1%^

Exhibit 6: Proficiency Levels

United States Education System	Proficiency Levels	
	Below Level 2	Levels 5 and Above
Massachusetts	11%^	14%*
Connecticut	13%^	13%*
OECD Avg	18%‡	8%‡
United States	*18%*	*7%*
Florida	21%*	5%‡

Significantly higher than U.S. in 2012 Science*
Not significantly different from U.S. in 2012 Science‡
Significantly lower than U.S. in 2012 Science^

Exhibit 7: Average scores

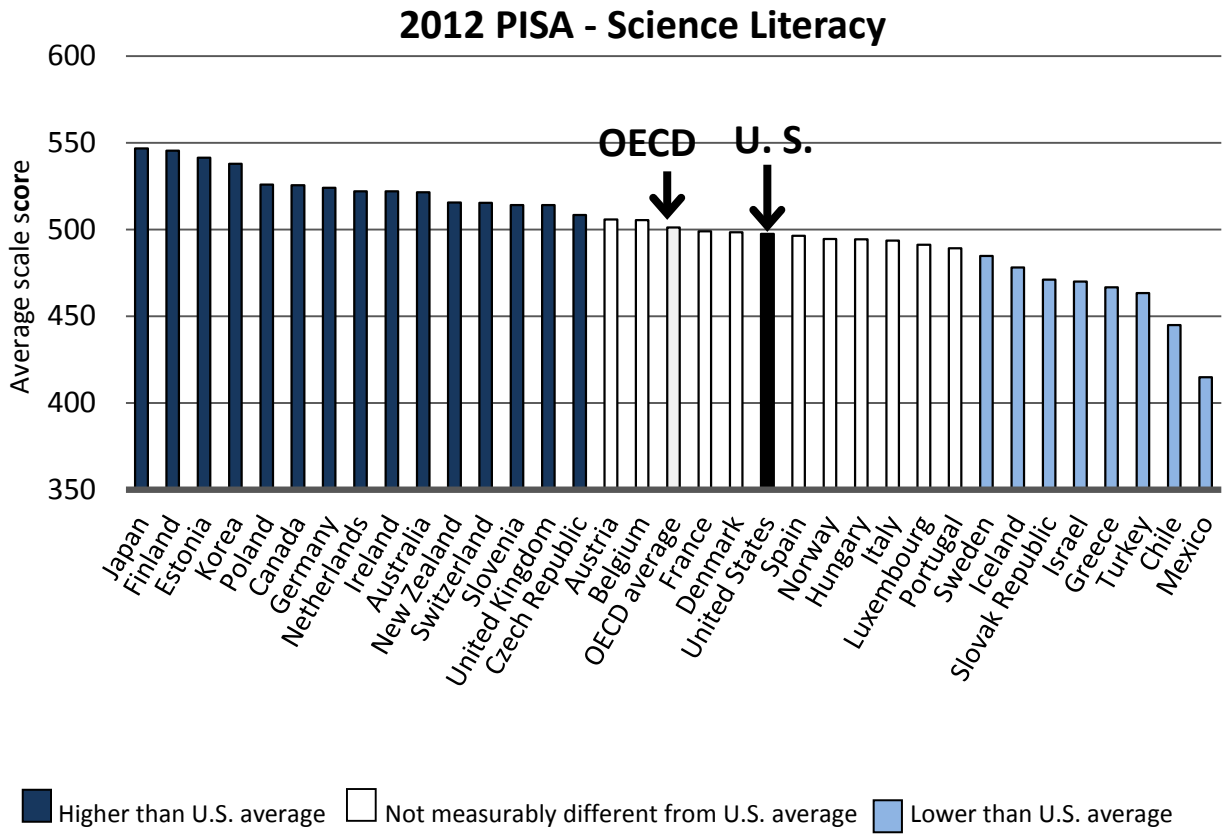
Education System		Average Score
Top 4	Shanghai-CHN	580*
	Hong Kong-CHN	555*
	Singapore	551*
	Japan	547*
OECD Mean		501‡
United States		*497*
Bottom 4	Albania	397^
	Qatar	384^
	Indonesia	382^
	Peru	373^

Exhibit 8: Average Scores

United States Education System	Average Score
Massachusetts	527*
Connecticut	524*
OECD Mean	501‡
United States	*497*
Florida	485^

Significantly higher than U.S. in 2012 Science*
Not significantly different from U.S. in 2012 Science‡
Significantly lower than U.S. in 2012 Science^

Of 34 OECD Countries, the United States Ranks 20th in Science Literacy



Source: National Center for Education Statistics, 2013, http://nces.ed.gov/surveys/pisa/pisa2012/pisa2012highlights_3a.asp

1st Japan 547; 2nd Finland 545; 3rd Estonia 541; 4th Korea 538; 5th Poland 526; 6th Canada 525; 7th Germany 524; 8th Netherlands 522; 9th Ireland 522; 10th Australia 521; 11th New Zealand 516; 12th Switzerland 515; 13th Slovenia 514; 14th United Kingdom 514; 15th Czech Republic 508; 16th Austria 506; 17th Belgium 505; OECD average 501; 18th France 499; 19th Denmark 498; 20th United States 497; 21st Spain 496; 22nd Norway 495; 23rd Hungary 494; 24th Italy 494; 25th Luxembourg 491; 26th Portugal 489; 27th Sweden 485; 28th Iceland 478; 29th Slovak Republic 471; 30th Israel 470; 31st Greece 467; 32nd Turkey 463; 33rd Chile 445; 34th Mexico 415

Reading Literacy

Reading was the focus of the PISA 2000 and 2009 surveys and a minor domain in 2003, 2006, and 2012. Reading will be the focus of the PISA 2017 survey.

In the PISA Reading framework, reading literacy is defined as the ability of students to use written information in real-life situations; as understanding, using, reflecting on, and engaging with written texts, in order to

- achieve one's goals
- develop one's knowledge and potential
- participate in society

Reading Proficiency Levels

For PISA 2012, the range of difficulty of the tasks is represented by seven levels of reading proficiency with Level 6 being the highest and Level 1b being the lowest.

- Level 6 students are presented with tasks that typically require the reader to make multiple inferences, comparisons, and contrasts that are both detailed and precise (lower score limit 698; OECD average 1%).
- Level 5 students are presented with tasks that involve retrieving information that require the reader to locate and organize several pieces of embedded information, inferring which information in the text is relevant (lower score limit 626; OECD average 8%)
- Level 4 students are presented with tasks that involve retrieving information that require the reader to locate and organize several pieces of embedded information (lower score limit 553; OECD average 30%)
- Level 3 students are presented with tasks that require the reader to locate, and in some cases recognize the relationship between, several pieces of information that must meet multiple conditions (lower score limit 480; OECD average 59%)
- Level 2 students are presented with some tasks that require the reader to locate one or more pieces of information, which may need to be inferred and may need to meet several conditions (lower score limit 407; OECD average 82%)
- Level 1a students are presented with tasks that require the reader to locate one or more pieces of explicitly stated information, to recognize the main theme or author's purpose in a text about a familiar topic, or to make a simple connection between information in the text and common, everyday knowledge (lower score limit 335; OECD average 94%)
- Level 1b students are presented with tasks that require the reader to locate a single piece of explicitly stated information in a prominent position in a short, syntactically simple text with a familiar context and text type, such as a narrative or a simple list (lower score limit 262; OECD average 99%)

Performance in Reading

- In the United States, 8 percent of 15-year-old students scored at proficiency level 5 or above, which was not significantly different from the OECD average of 8 percent. Fourteen education systems had significantly higher percentages of students scoring at level 5 and above than the United States, and 33 had significantly lower percentages.
- Seventeen percent of the United States' 15-year-old students scored below level 2, which was not significantly different from the OECD average of 18 percent. Fourteen education systems had significantly lower percentages of students scoring at below level 2 than the United States, and 33 had significantly higher percentages.
- In Florida, 6 percent of students scored at level 5 and above while 17 percent scored below level 2. The percentage of Florida students scoring at level 5 and above was significantly lower than that of the United States, while Massachusetts and Connecticut had a significantly higher percentage of students scoring at Level 5 and above than did the United States.
- The average score for students in the United States (498) was higher than in 34 education systems and lower than in 19 education systems. The United States' average was not significantly different from the OECD's average of 496.
- Florida's average score (492) was not significantly different from the United States' or OECD's averages. Massachusetts and Connecticut both had average scores significantly higher than the average scores of the United States and the OECD.

2012 PISA Reading

Exhibit 9: Proficiency Levels

	Education System	Proficiency Levels: Below Level 2	Proficiency Levels: Levels 5 and above
Top 4	Shanghai-CHN	3%^	25%*
	Singapore	10%^	21%*
	Japan	10%^	18%*
	Hong Kong-CHN	7%^	17%*
OECD Avg		18%‡	8%‡
United States		*17%*	*8%*
Bottom 4	Jordan	51%*	<1%^
	Malaysia	53%*	<1%^
	Indonesia	55%*	<1%^
	Kazakhstan	57%*	<1%^

Exhibit 10: Proficiency Levels

United States Education System	Proficiency Levels: Below Level 2	Proficiency Levels: Levels 5 and Above
Massachusetts	11%^	16%*
Connecticut	13%^	15%*
OECD Avg	18%‡	8%‡
United States	*17%*	*8%*
Florida	17%‡	6%‡

Significantly higher than U.S. in 2012 Reading*
Not significantly different from U.S. in 2012 Reading‡
Significantly lower than U.S. in 2012 Reading^

Exhibit 11: Average Scores

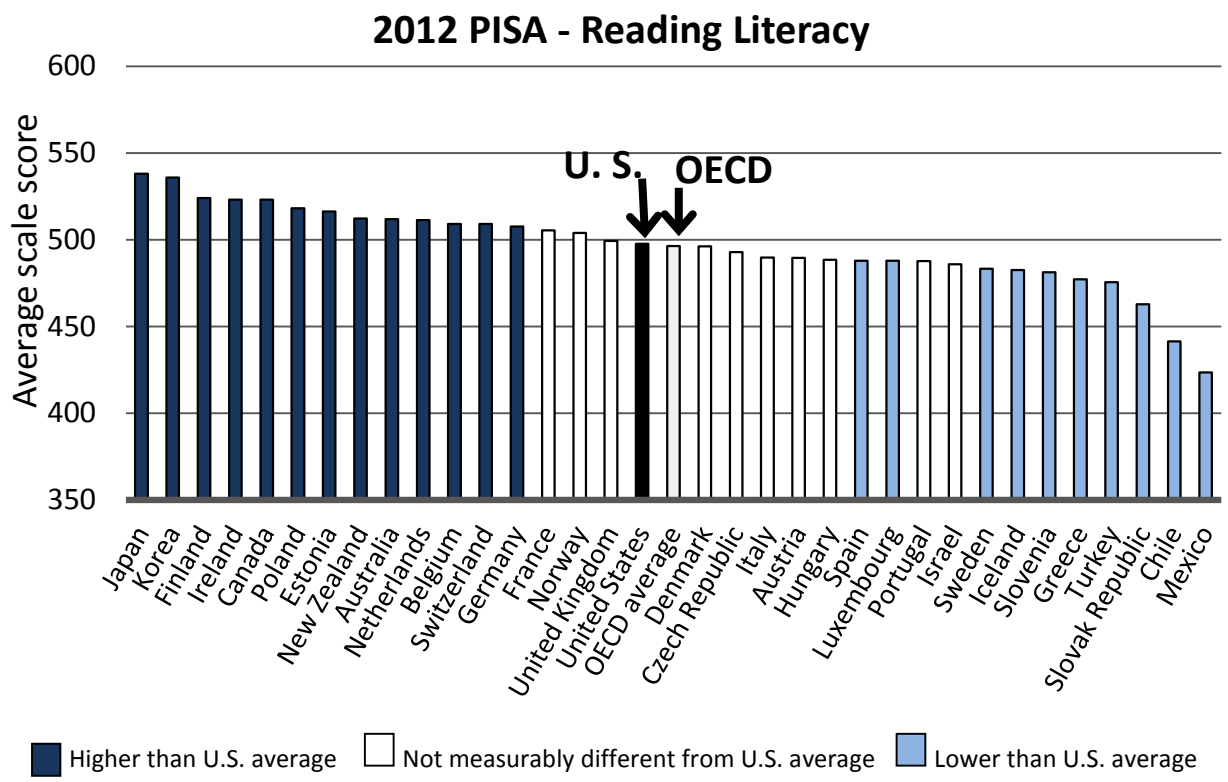
	Education System	Average Score
Top 4	Shanghai-CHN	570*
	Hong Kong-CHN	545*
	Singapore	542*
	Japan	538*
United States		*498*
OECD Mean		496‡
Bottom 4	Albania	394^
	Kazakhstan	393^
	Qatar	388^
	Peru	384^

Exhibit 12: Average Scores

United States Education System	Average Score
Massachusetts	527*
Connecticut	521*
United States	*498*
OECD Mean	496‡
Florida	492‡

Significantly higher than U.S. in 2012 Reading*
Not significantly different from U.S. in 2012 Reading‡
Significantly lower than U.S. in 2012 Reading^

Of 34 OECD Countries, the United States Ranks 17th in Reading Literacy



Source: National Center for Education Statistics, 2013, http://nces.ed.gov/surveys/pisa/pisa2012/pisa2012highlights_3a.asp

1st Japan 538; 2nd Korea 536; 3rd Finland 524; 4th Ireland 523; 5th Canada 523; 6th Poland 518; 7th Estonia 516; 8th New Zealand 512; 9th Australia 512; 10th Netherlands 511; 11th Belgium 509; 12th Switzerland 509; 13th Germany 508; 14th France 505; 15th Norway 504; 16th United Kingdom 499; 17th United States 498; OECD average 496; 18th Denmark 496; 19th Czech Republic 493; 20th Italy 490; 21st Austria 490; 22nd Hungary 488; 25th Portugal 488; 26th Israel 486; 23rd Spain 488; 24th Luxembourg 488; 27th Sweden 483; 28th Iceland 483; 29th Slovenia 481; 30th Greece 477; 31st Turkey 475; 32nd Slovak Republic 463; 33rd Chile 441; 34th Mexico 424