

NSTA's Mission is to promote excellence and innovation in science teaching and learning for all



NSTA Web Seminar Facts

- Live interactive learning at your desktop since 2004
- Tonight's program is the 290th NSTA Web Seminar
- 12,000 participants to date

NAEP 101: Learning More about the NAEP 2009 Science Results



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January 25, 2011



Presentation Outline



- NAEP Overview
- Science 2009 Results
 - Assessment Overview
 - Grade 4
 - Grade 8
 - Grade 12
- NAEP Resources



Poll Question



Did you attend the web presentation about
the release earlier today?

✓ Yes

✗ No



NAEP Overview

What is NAEP?



- Largest nationally representative assessment
- Provides a common measure of student achievement across the country
- First administered in 1969
- Reports results for:
 - Nation – since 1969
 - States – since 1990
 - Selected urban districts – since 2002

Scale Scores



- Indicate what students know and can do
- Reported on a scale that varies with assessment subjects
 - 0-300 or 0-500 scale
- Scores are presented for the assessment year, and over time (when possible)

Achievement Levels



- Developed by the National Assessment Governing Board
- Set standards for what students should know and be able to do
- Achievement levels:
 - **Basic:** partial mastery of fundamental knowledge and skills
 - **Proficient:** competency over challenging subject matter
 - **Advanced:** superior academic performance

Contextual Questionnaires



- Provide context for reporting student performance
 - **Student factors**
 - Demographic characteristics, classroom experiences, and educational support
 - **Teacher factors**
 - Credentials, educational background, teacher certification, instructional practices
 - **School factors**
 - Whether school receives Title I funding, type of school, percentage of students absent



Let's pause for questions
from the audience





Science 2009 Results

What is the NAEP Science Assessment?



- Administered January through March 2009
 - 156,500 fourth-graders
 - 151,100 eighth-graders
 - 11,100 twelfth-graders
- Results available for
 - Nation at grades 4, 8, and 12
 - 46 states and Department of Defense schools at grades 4 and 8
- Performance reported as
 - Average scale scores (0–300 scale)
 - Achievement levels (*Basic, Proficient, Advanced*)

NAEP Science Assessment Overview



- Assessment based on a new science framework
 - Four science practices describe how students use their scientific knowledge
 - Increased focus on conceptual understanding of science principles
 - Shift in emphasis in content areas at grades 8 and 12

NAEP Science Assessment Overview



Students assessed in three science content areas

	Grade 4	Grade 8	Grade 12
Physical Science	$33\frac{1}{3}\%$	30%	$37\frac{1}{2}\%$
Life Science	$33\frac{1}{3}\%$	30%	$37\frac{1}{2}\%$
Earth and Space Sciences	$33\frac{1}{3}\%$	40%	25%



Let's pause for questions
from the audience





Science 2009

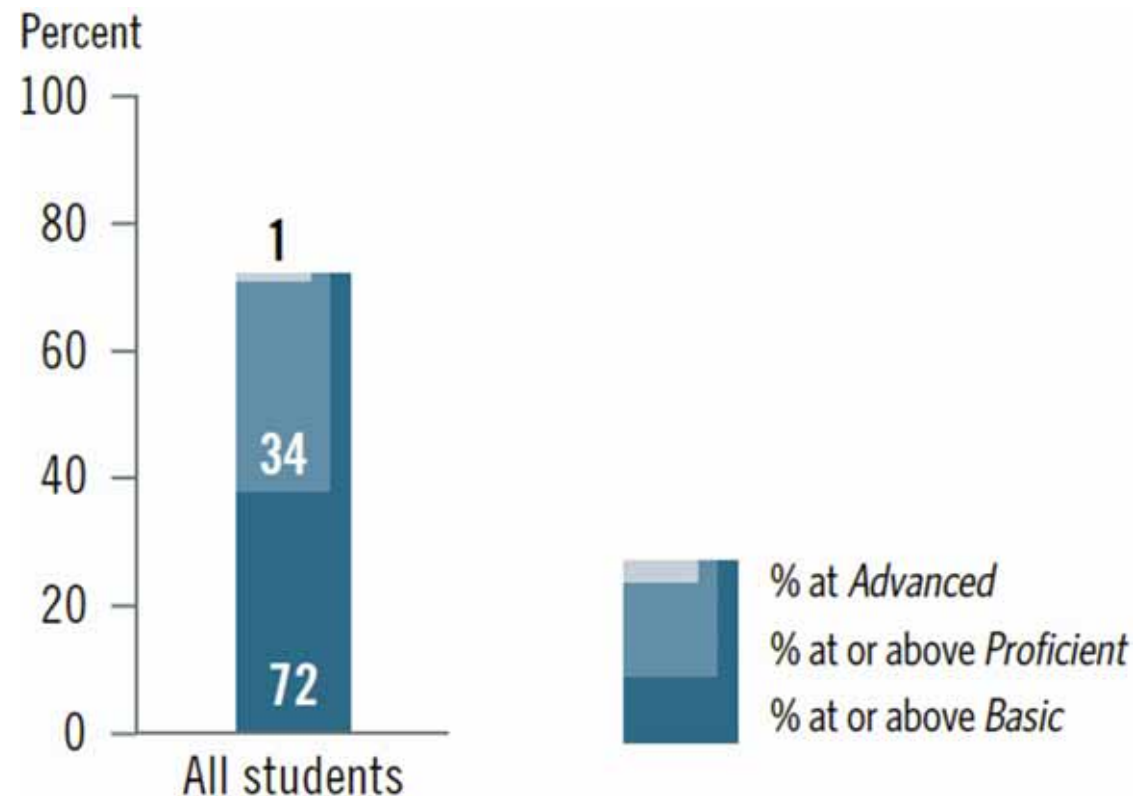
NATIONAL ASSESSMENT OF EDUCATIONAL PROGRESS AT

Grade 4

Grade 4 Results

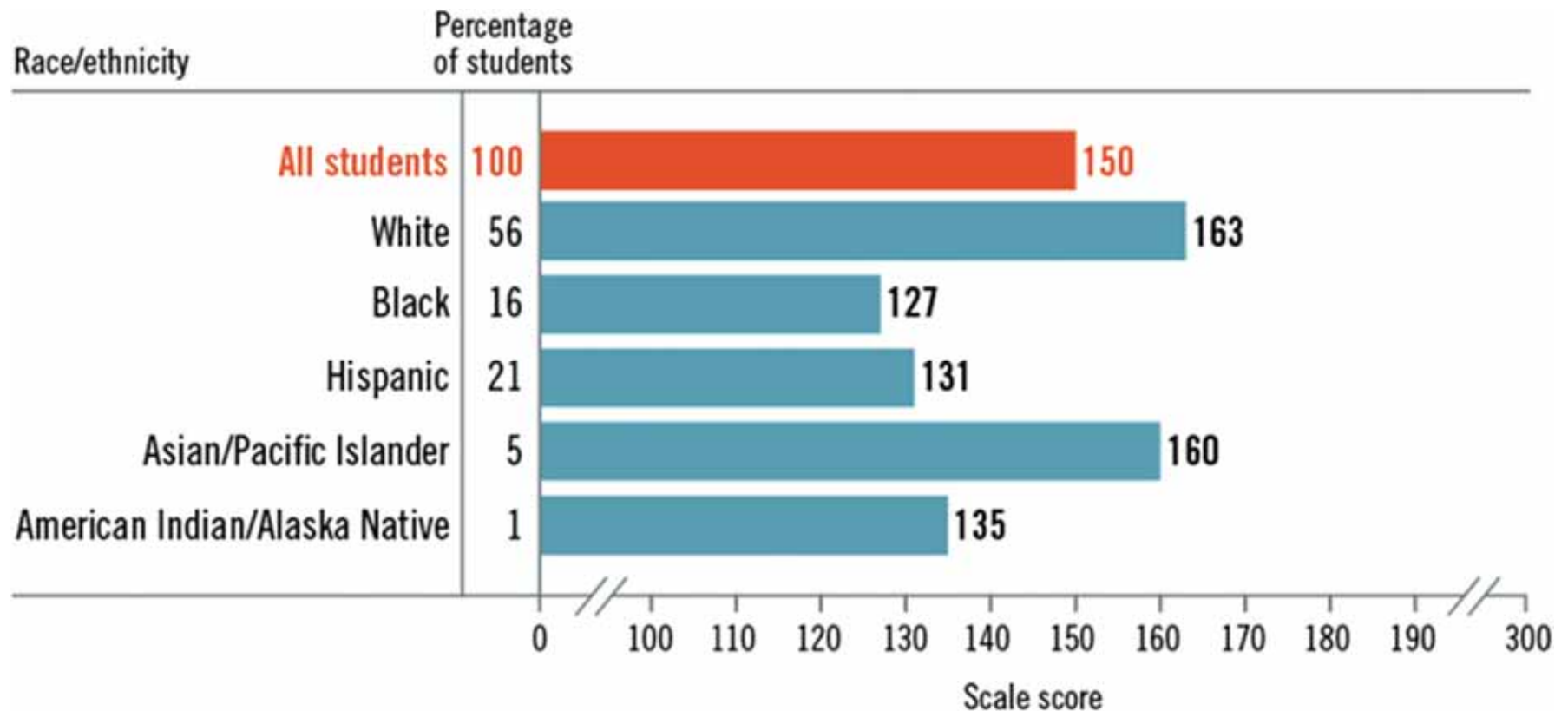


- Thirty-four percent of fourth-graders perform at or above *Proficient*
- Seventy-two percent perform at or above *Basic*



Grade 4 Results

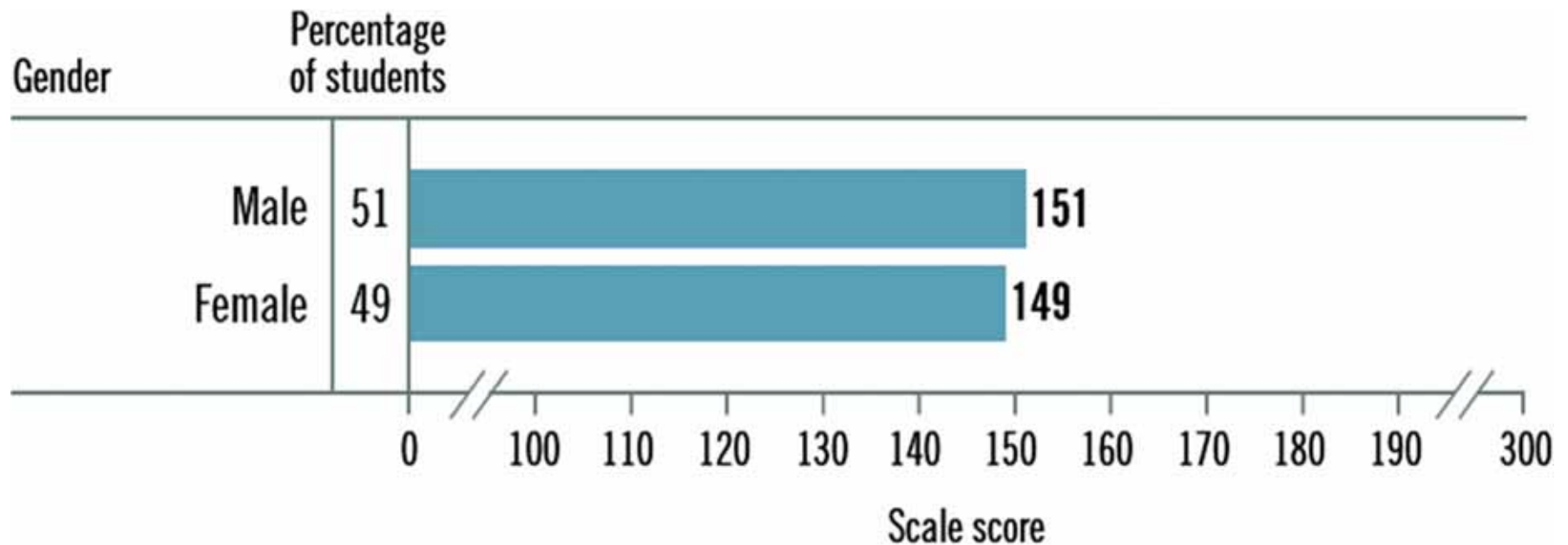
White students score higher than other racial/ethnic groups



NOTE: Detail may not sum to totals because results are not shown for students whose race/ethnicity was unclassified.

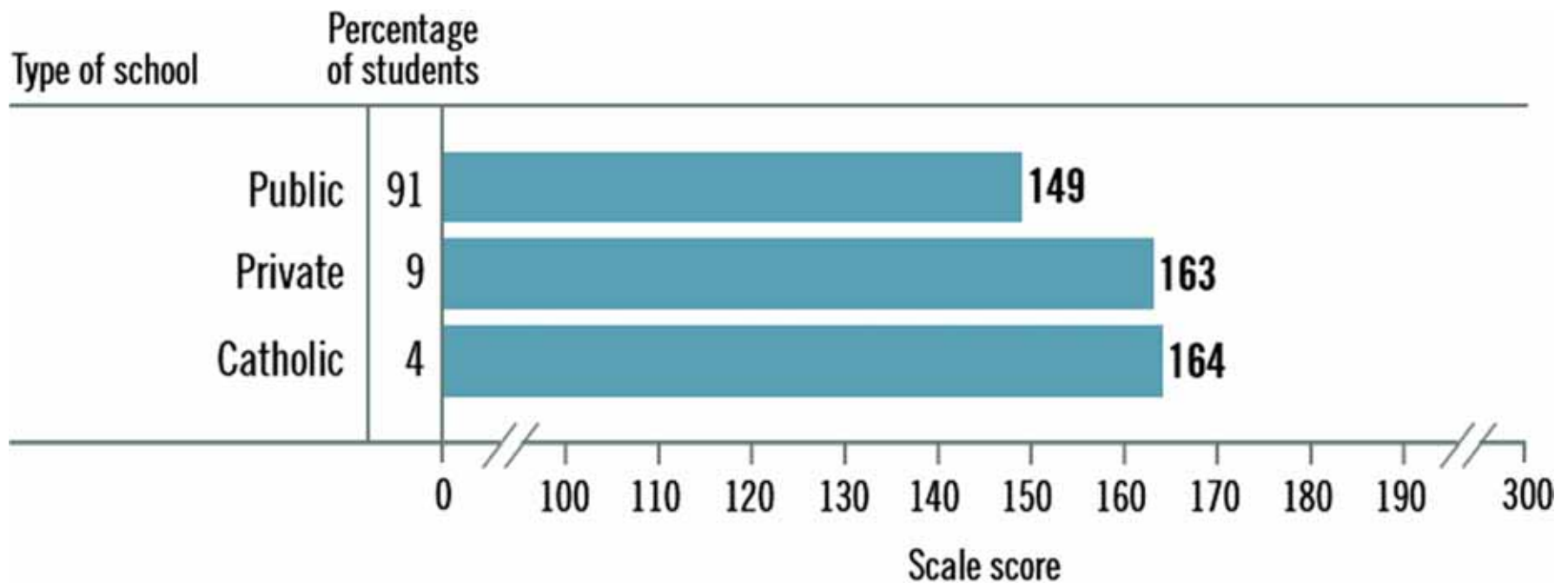
Grade 4 Results

Male students score higher than female students



Grade 4 Results

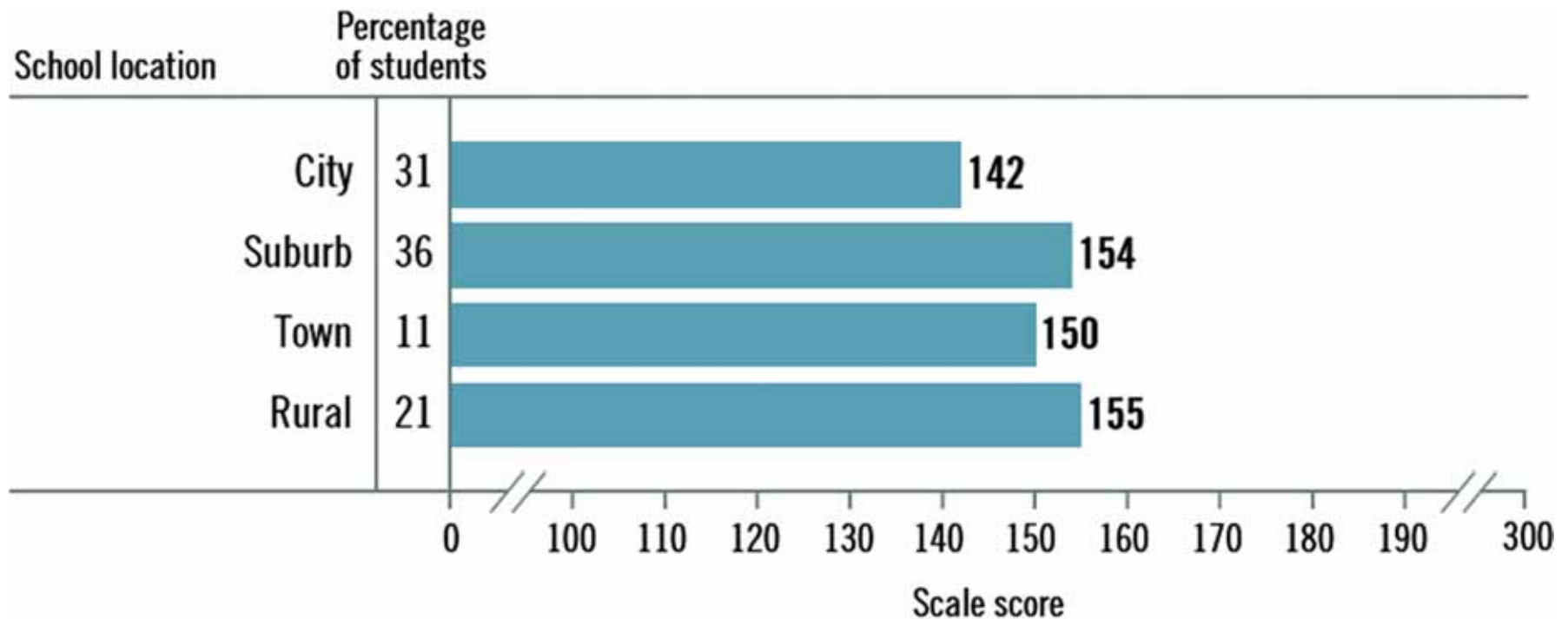
Private school students outperform public school students



NOTE: Private schools include Catholic, other religious, and nonsectarian private schools.

Grade 4 Results

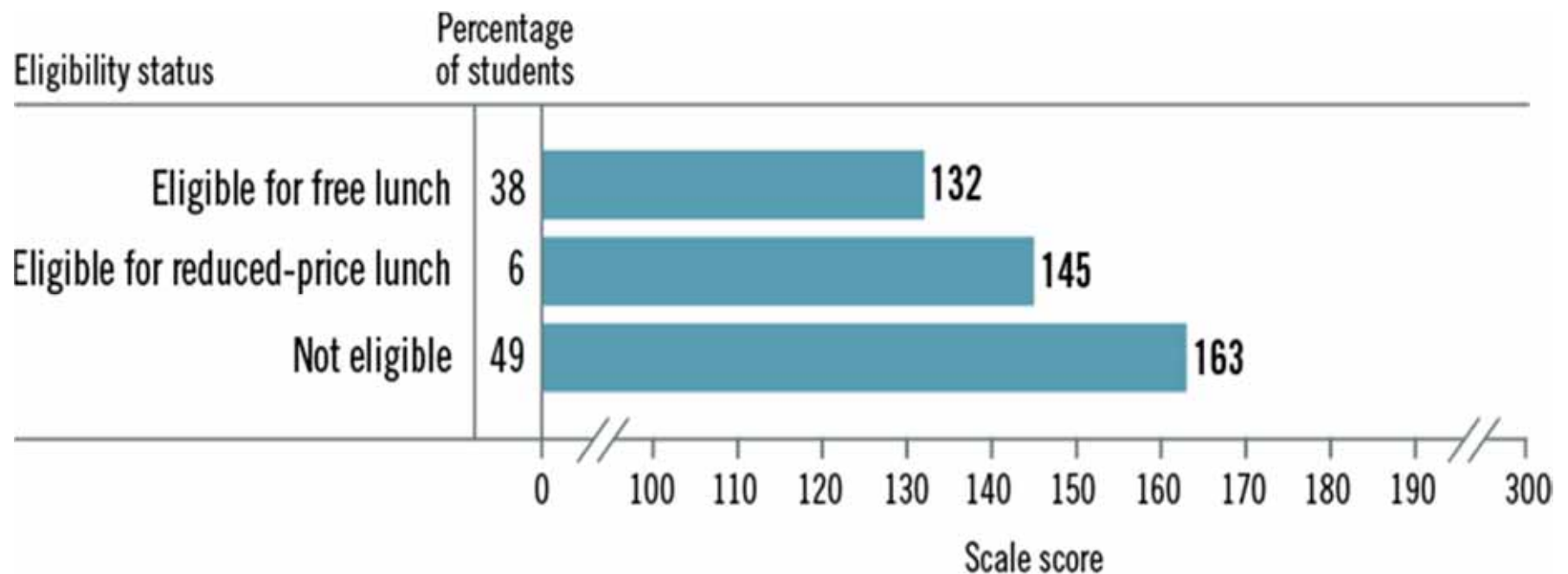
Students in city schools score lower than students in other locations



NOTE: Detail may not sum to totals because of rounding.

Grade 4 Results

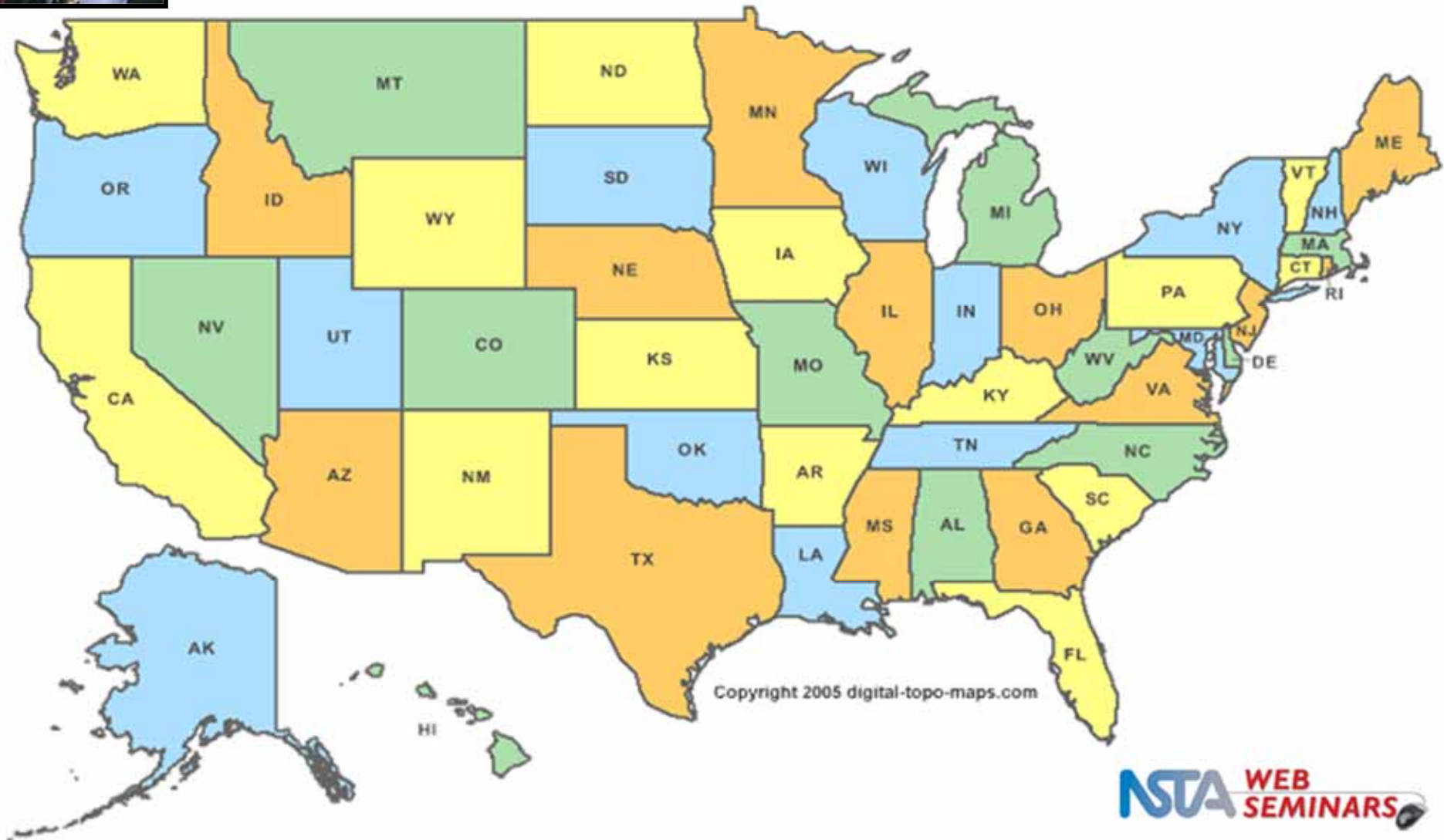
Student performance varies by family income



NOTE: Detail may not sum to totals because results are not shown for the "information not available" category.

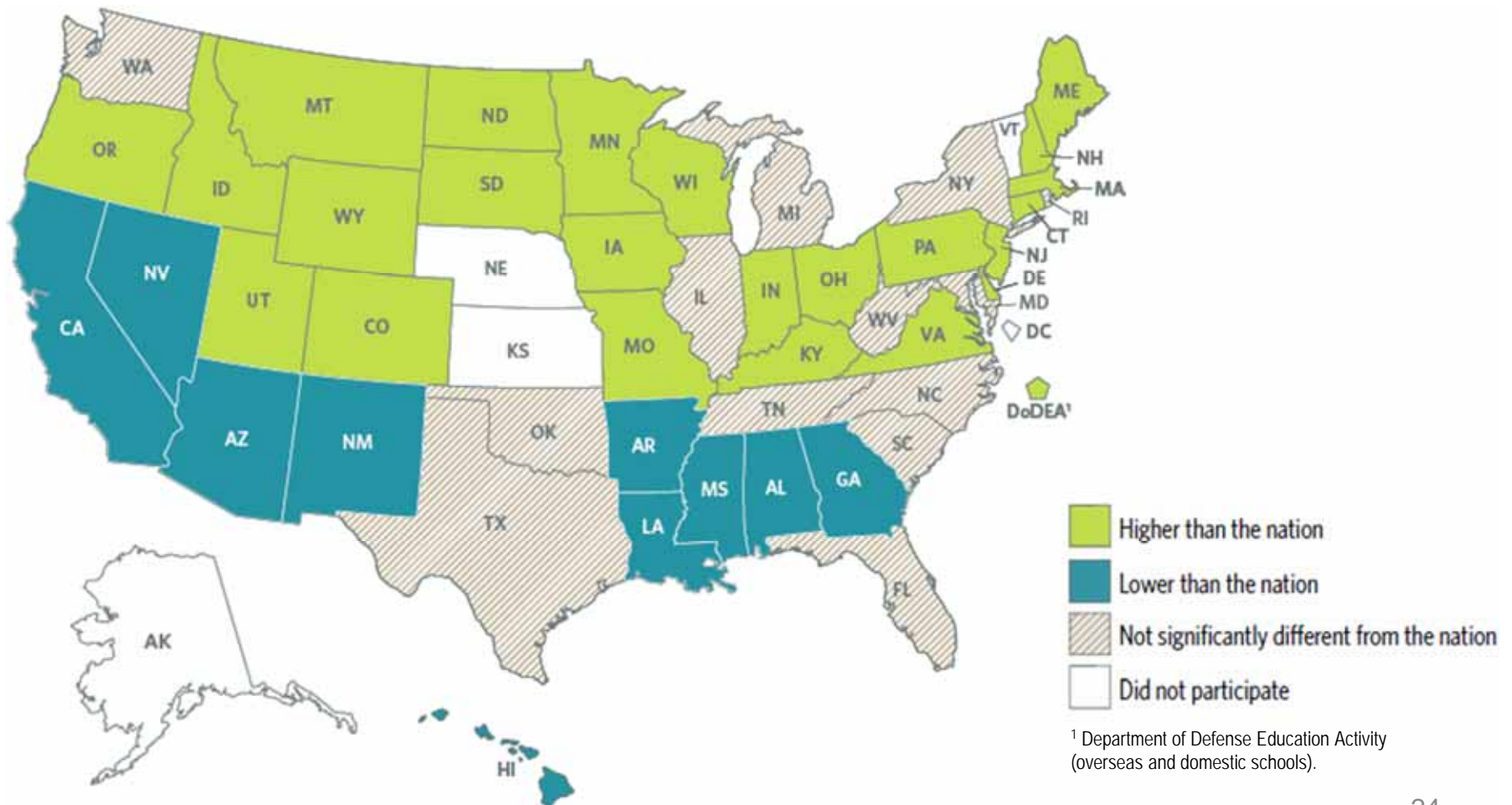


Which states do you think scored higher than the national average?



Grade 4 Results

Scores in 24 states higher than the national average

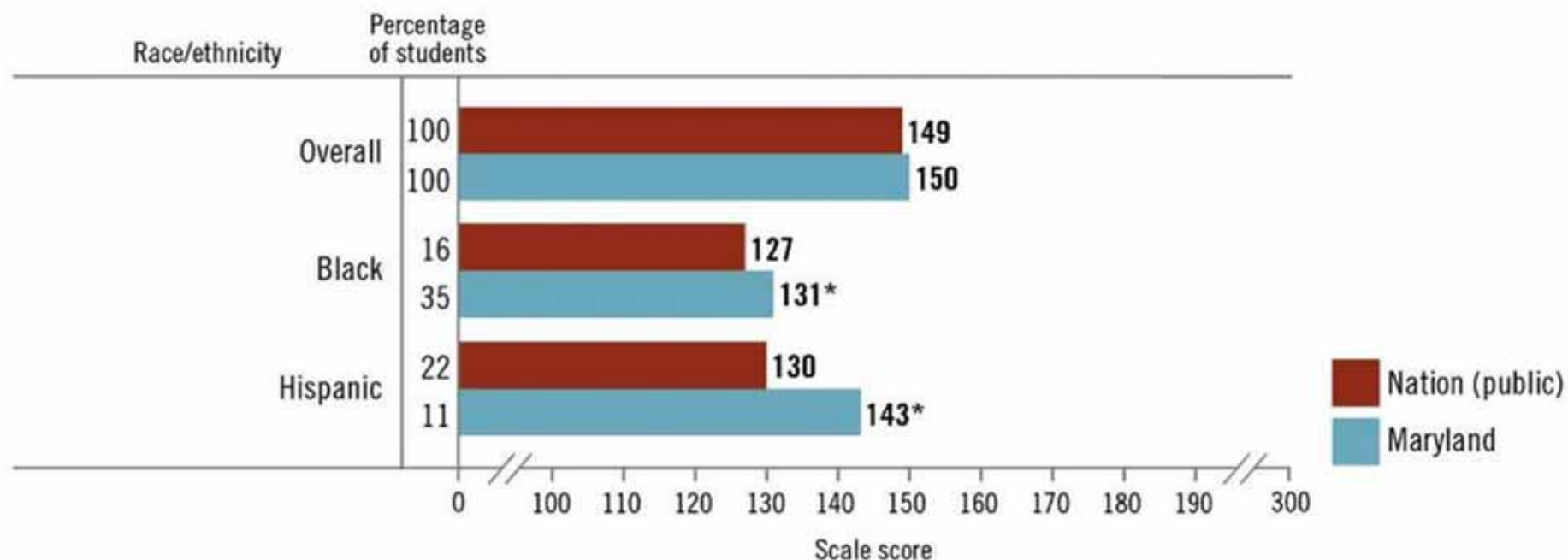


Grade 4 State Demographics and Performance



Maryland: Black and Hispanic fourth-graders score above their peers

Percentage of students and average scores in NAEP science for public school students at grade 4 in the nation and Maryland, by selected racial/ethnic groups: 2009

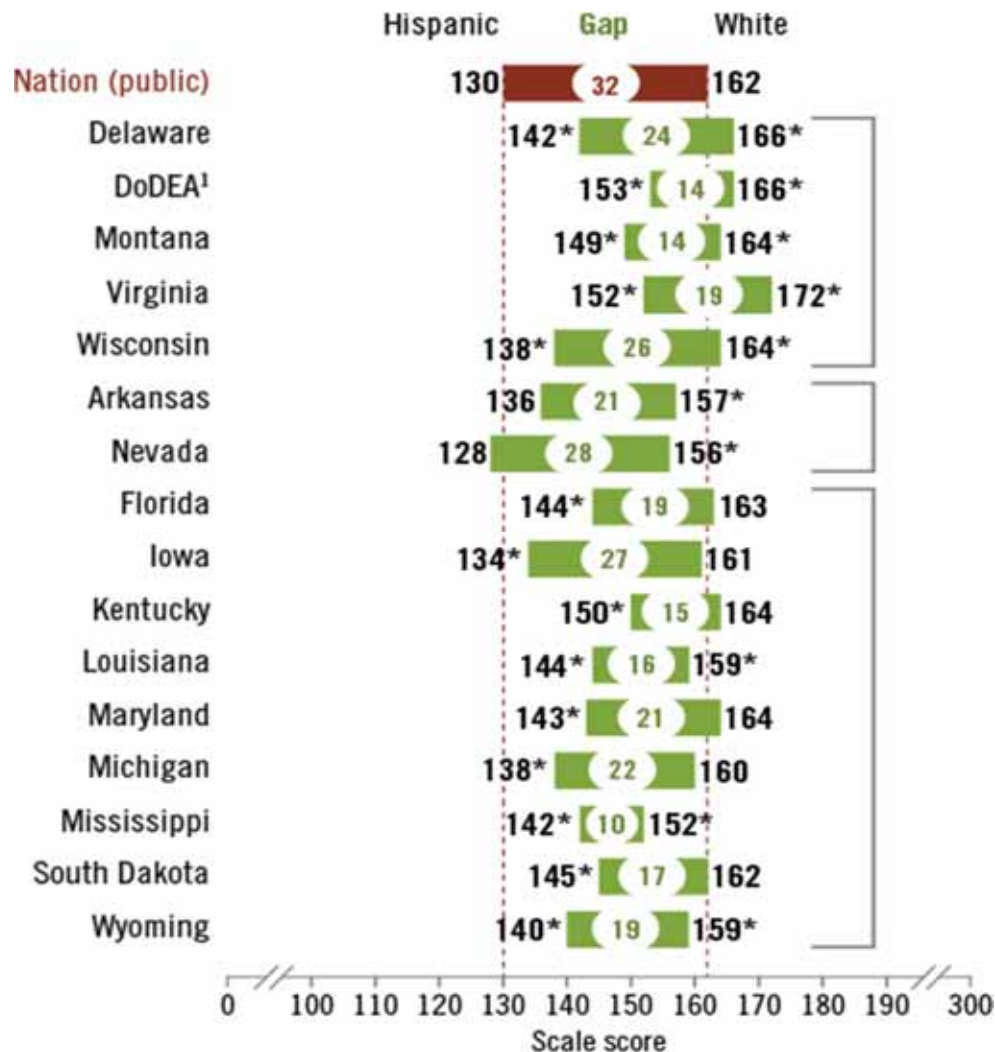


* Significantly different ($p < .05$) from the nation.

NOTE: Black includes African American, and Hispanic includes Latino. Race categories exclude Hispanic

White-Hispanic State Gaps

State gaps smaller than the nation



Both White students and Hispanic students scored higher

Hispanic students scored comparably and White students scored lower

Hispanic students scored higher

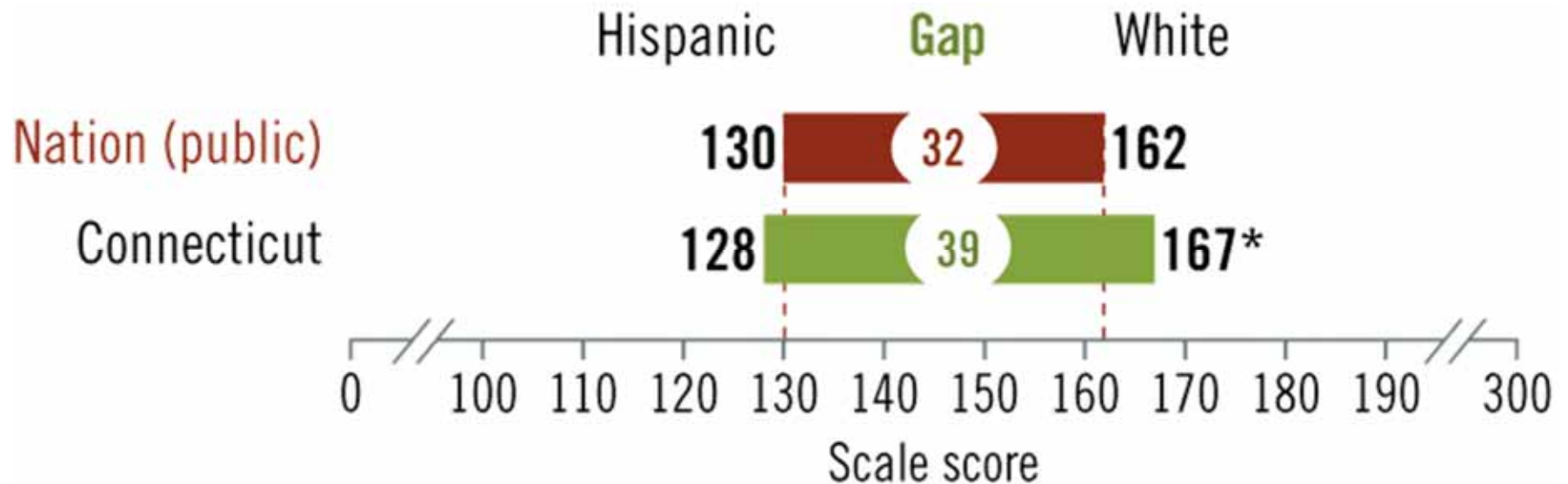
* The score is significantly different ($p < .05$) from the nation.

¹ Department of Defense Education Activity (overseas and domestic schools).

NOTE: The score difference between White and Hispanic students in Mississippi is not significantly different.

White-Hispanic State Gaps

State gaps larger than the nation



* The score is significantly different ($p < .05$) from the nation.

Grade 4 Results



Skills demonstrated by students performing at different levels

	Scale score	Content area	Question description
Advanced	300		
	//		
	264	Physical science	Determine the source of sound during an investigation about the pitch of sounds
	264	Life science	Explain differences between related individuals
	233	Earth and space sciences	Draw a conclusion about differences in air temperatures based on data
Proficient	224		
	222	Life science	Describe the different stages of the life cycle of an organism
	190	Earth and space sciences	Relate the calendar to amount of daylight
	169	Physical science	Explain an example of heat (thermal energy) transfer
Basic	167		
	161	Earth and space sciences	Explain the choice of material based on protection of the environment
	146	Life science	Explain the benefit of an adaptation for an organism
	138	Physical science	Recognize an example of a change of state
Below Basic	131		
	128	Life science	Identify the organism with a change in habitat from young to adult
	118	Physical science	Identify the data on a chart
	113	Earth and space sciences	Recognize a renewable source of energy
	//		
	0		

Grade 4 Results



Skills demonstrated by students performing at different levels

264 Physical science Determine the source of sound during an investigation about the pitch of sounds

169 Physical science Explain an example of heat (thermal energy) transfer

138 Physical science Recognize an example of a change of state

118 Physical science Identify the data on a chart

You try it!



Sample Question: Physical Science

A thermometer shows that the outside air temperature is colder than the temperature at which water turns to ice. However, ice on the sidewalk melts.

What probably caused this?

- A) The air heating the sidewalk
- B) The sidewalk reflecting sunlight into the air
- C) The wind causing ice on the sidewalk to melt
- D) The sunlight making the sidewalk warmer than the air.

Grade 4 Results



Sample Question: Physical Science

A thermometer shows that the outside air temperature is colder than the temperature at which water turns to ice. However, ice on the sidewalk melts.

What probably caused this?

- (A) The air heating the sidewalk
- (B) The sidewalk reflecting sunlight into the air
- (C) The wind causing the ice on the sidewalk to melt
- (D) The sunlight making the sidewalk warmer than the air

- 64% of fourth-graders were able to explain an example of heat transfer

Percentage correct				
Overall	Below Basic	At Basic	At Proficient	At Advanced
64%	44%	65%	80%	91%



GE Foundation





Let's pause for questions
from the audience





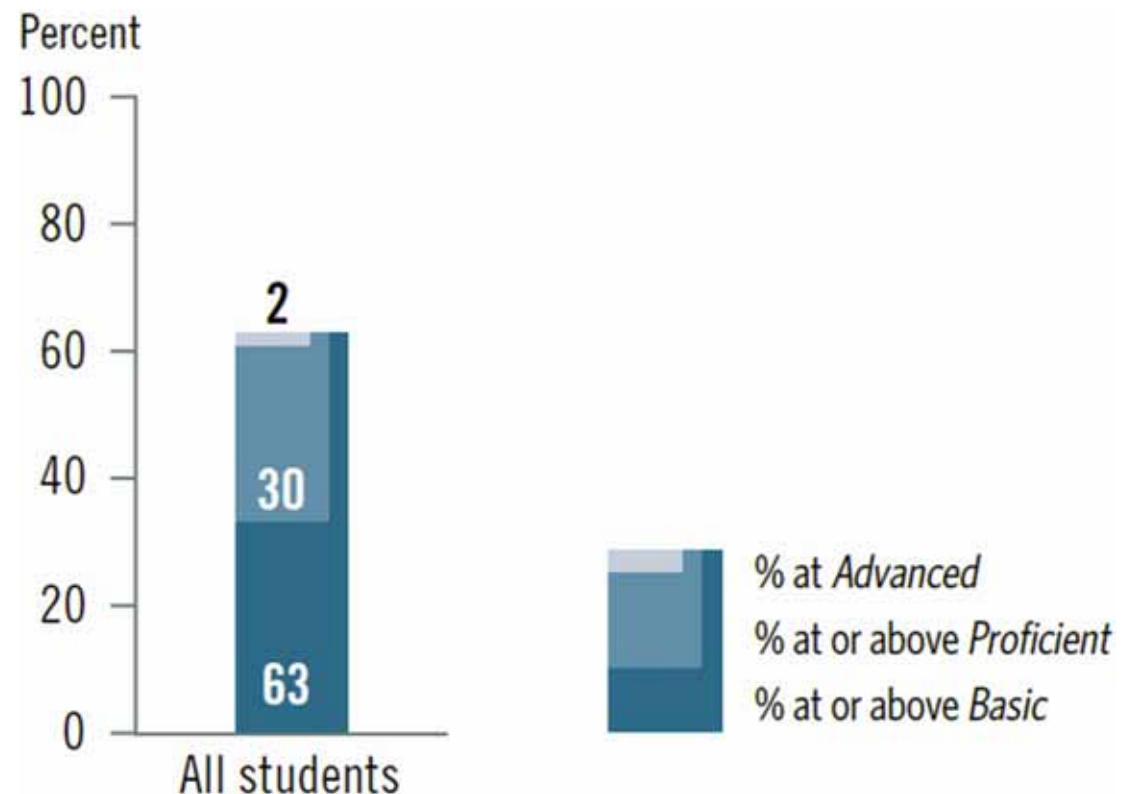
Science 2009

NATIONAL ASSESSMENT OF EDUCATIONAL PROGRESS AT

Grade 8

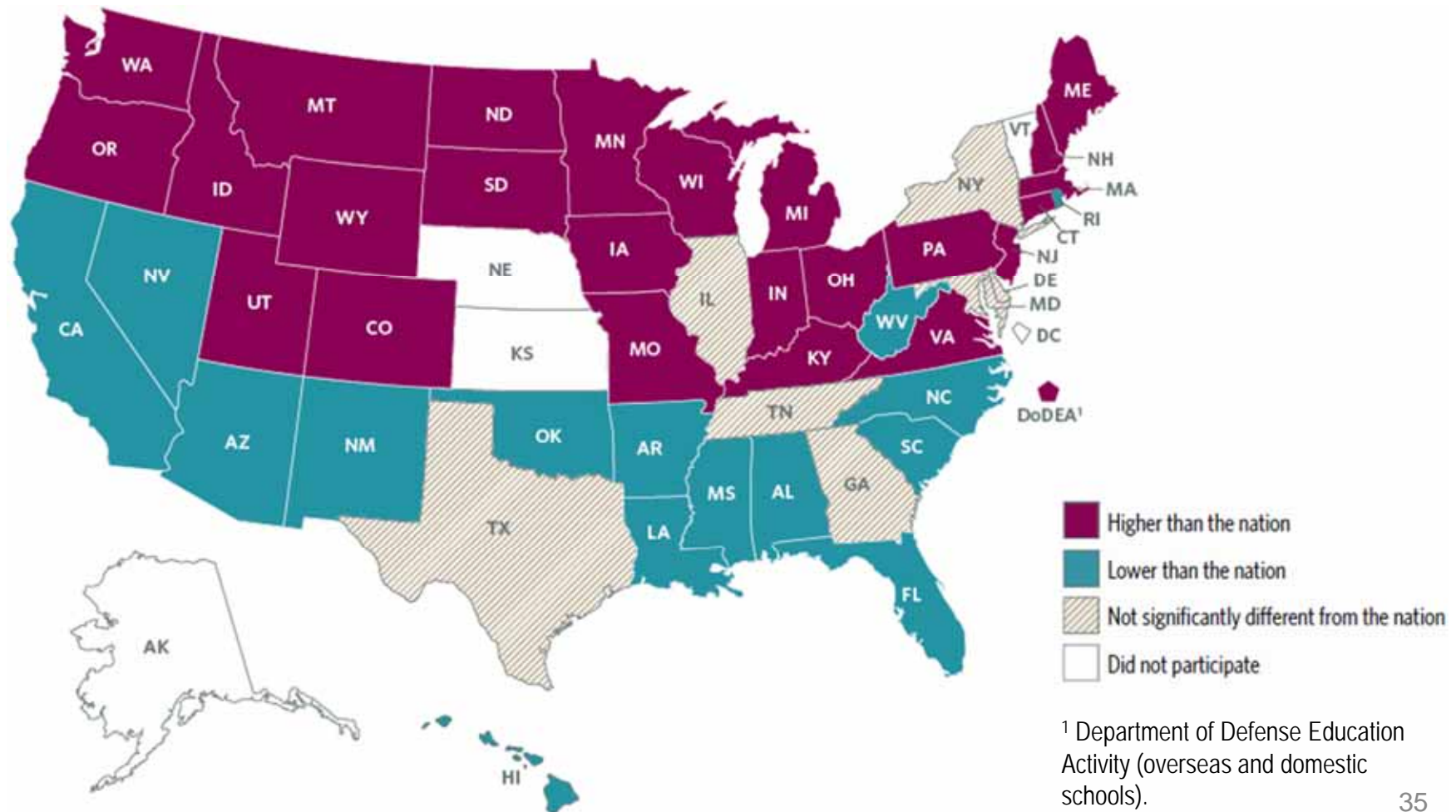
Grade 8 Results

- Thirty percent of eighth-graders perform at or above *Proficient*
- Sixty-three percent perform at or above *Basic*



Grade 8 Results

Scores in 25 states higher than the national average

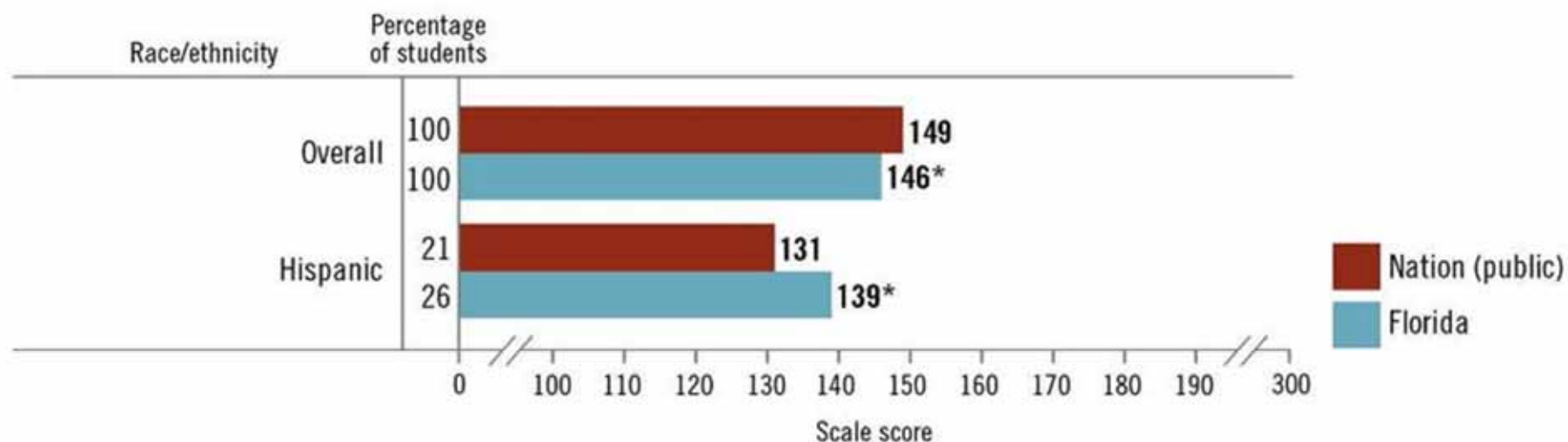


Grade 8 State Demographics and Performance



Florida: Hispanic eighth-graders score above their peers

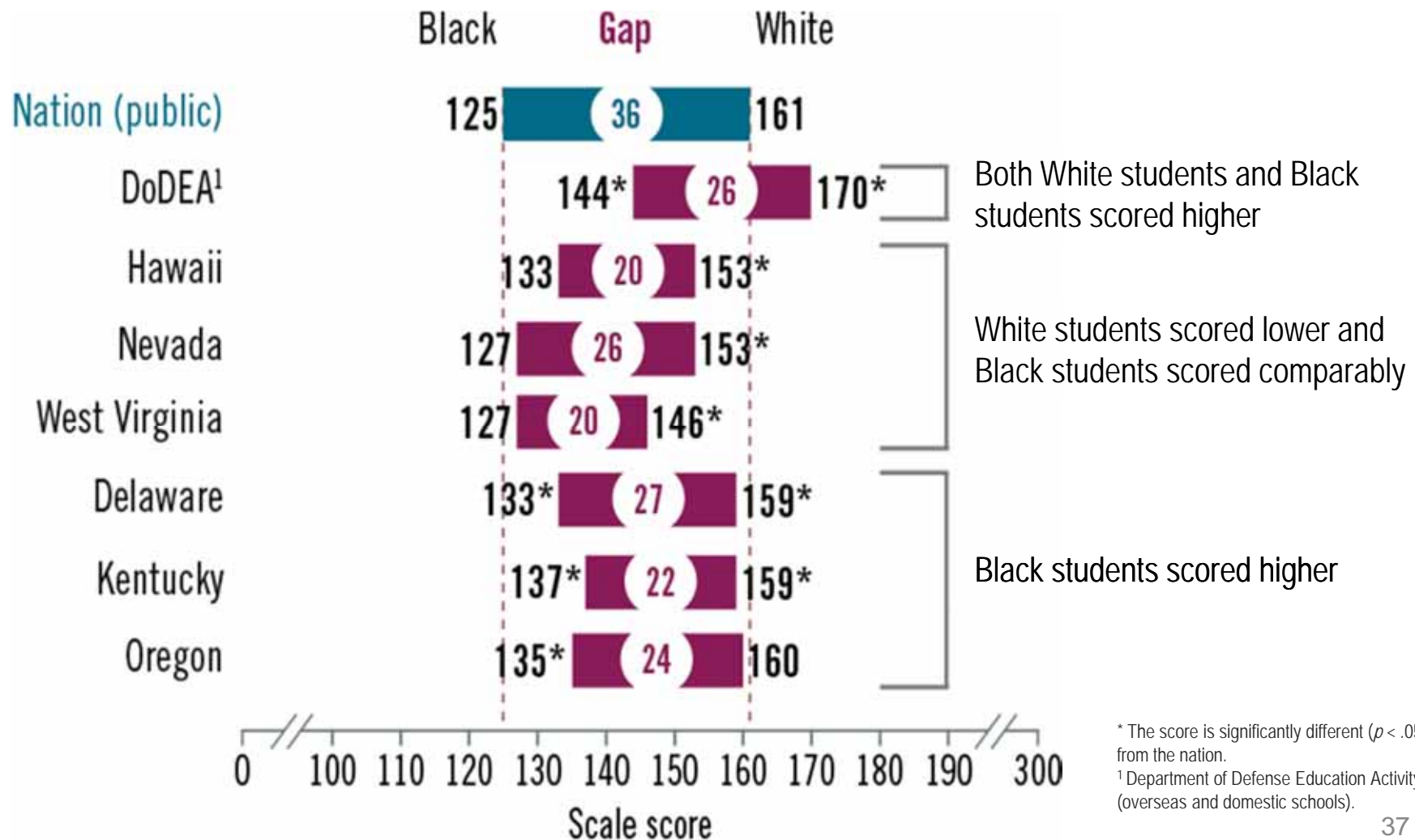
Percentage of students and average scores in NAEP science for public school students at grade 8 in the nation and Florida, by selected racial/ethnic groups: 2009



* Significantly different ($p < .05$) from the nation.
NOTE: Hispanic includes Latino.

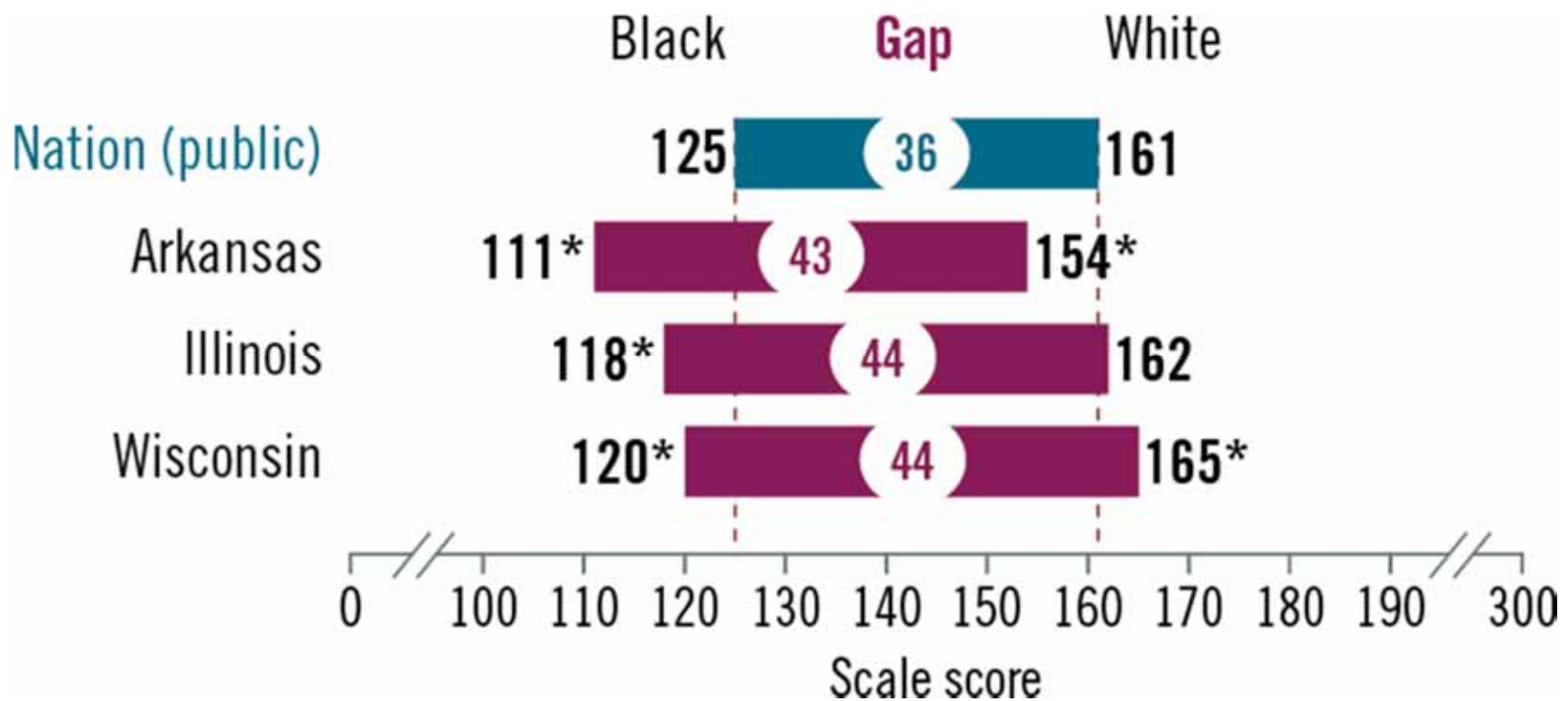
White-Black State Gaps

State gaps smaller than the nation



White-Black State Gaps

State gaps larger than the nation



Grade 8 Results



Skills demonstrated by students performing at different levels

	Scale score	Content area	Question description
Advanced	300		
	//		
	266	Physical science	Describe the evidence for chemical change
	246	Life science	Form a conclusion based on data about the behavior of an organism
	223	Earth and space sciences	Predict the Sun's position in the sky
	215		
Proficient	201	Earth and space sciences	List soils in order of permeability
	194	Physical science	Determine a controlled variable of a chemistry investigation
	186	Life science	Recognize that plants produce their own food
	170		
Basic	163	Life science	Recognize the role of decomposers
	152	Physical science	Critique and improve an investigation about forces
	148	Earth and space sciences	Identify the mechanism of a weather pattern
	141		
Below Basic	140	Earth and space sciences	Identify sequence of formation of Earth features
	130	Life science	Predict the effect of an environmental change on an organism
	119	Physical science	Describe part of a valid experiment to compare heating rates of different materials
	//		
	0		

Grade 8 Results



Skills demonstrated by students performing at different levels

223 Earth and space sciences Predict the Sun's position in the sky

201 Earth and space sciences List soils in order of permeability

148 Earth and space sciences Identify the mechanism of a weather pattern

140 Earth and space sciences Identify sequence of formation of Earth features



You try it!



Sample Question: Earth and Space Sciences

Three funnels were filled with equal volumes of pebbles, fine sand, and coarse sand, as shown in the diagram below. The same amount of water was poured into each funnel.



Which correctly lists the order in which the water passed through the funnels, from fastest to slowest?

- (A) Pebbles, fine sand, coarse sand
- (B) Pebbles, coarse sand, fine sand
- (C) Fine sand, coarse sand, pebbles
- (D) Coarse sand, pebbles, fine sand

Grade 8 Results

Sample Question: Earth and Space Sciences

Three funnels were filled with equal volumes of pebbles, fine sand, and coarse sand, as shown in the diagram below. The same amount of water was poured into each funnel.



Which correctly lists the order in which the water passed through the funnels, from fastest to slowest?

- (A) Pebbles, fine sand, coarse sand
- (B) Pebbles, coarse sand, fine sand
- (C) Fine sand, coarse sand, pebbles
- (D) Coarse sand, pebbles, fine sand

- 45% of eighth-graders were able to identify the correct order of soils according to the rate that water flowed through them

Percentage correct				
Overall	Below Basic	At Basic	At Proficient	At Advanced
45%	31%	41%	63%	88%



Let's pause for questions
from the audience





Science 2009

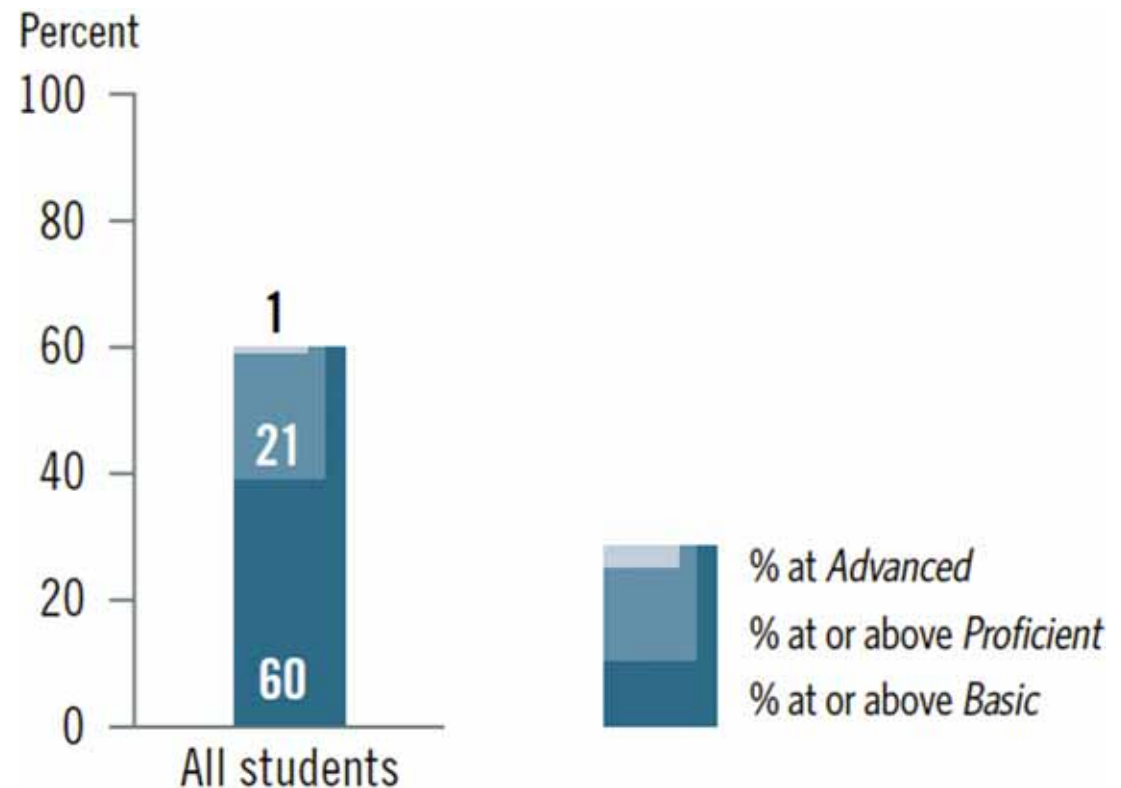
NATIONAL ASSESSMENT OF EDUCATIONAL PROGRESS AT

Grade 12



Grade 12 Results

- Twenty-one percent of twelfth-graders perform at or above *Proficient*
- Sixty percent perform at or above *Basic*



Grade 12 Results



Skills demonstrated by students performing at different levels

	Scale score	Content area	Question description
Advanced	300		
	//		
	269	Life science	Critique a conclusion about photosynthesis based on observations
	244	Physical science	Recognize a nuclear fission reaction
	232	Earth and space sciences	Compare methods for determining the age of the Earth
	222		
Proficient	212	Earth and space sciences	Identify a characteristic that distinguishes stars from planets
	198	Physical science	Relate motion to conversion of kinetic energy to potential energy
	186	Life science	Evaluate two methods to help control an invasive species
	179		
Basic	177	Physical science	Recognize atomic particles in an ion
	155	Earth and space sciences	Indicate a geologic event that explains a rock formation
	143	Life science	Determine relationships between species based on an evolutionary tree
	142		
Below Basic	135	Earth and space sciences	Design and evaluate a trade-off of a method to obtain drinking water
	128	Life science	Draw a conclusion about population growth based on data
	120	Physical science	Relate differences in chemical properties to differences in chemical bonds
	//		
	0		

Grade 12 Results



Skills demonstrated by students performing at different levels

269 Life science Critique a conclusion about photosynthesis based on observations

186 Life science Evaluate two methods to help control an invasive species

143 Life science Determine relationships between species based on an evolutionary tree

128 Life science Draw a conclusion about population growth based on data



Grade 12 Results

Sample Question: Life Science

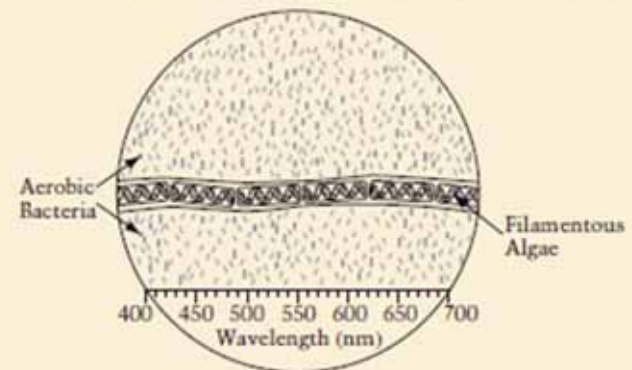
An experiment was conducted to determine which wavelengths of visible light are most effective for photosynthesis. The units shown here are in nanometers (nm).

Two organisms were used: filamentous algae, which are capable of photosynthesis, and some aerobic bacteria, which are not capable of photosynthesis.

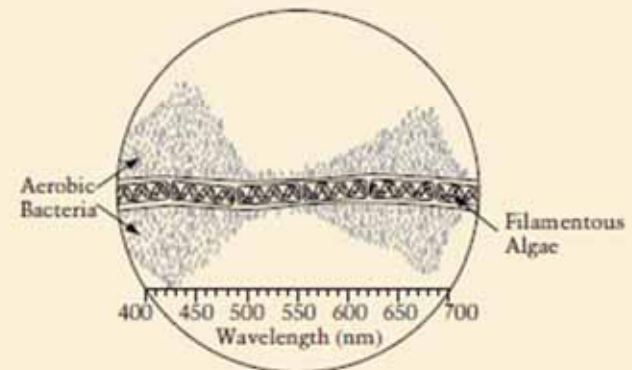
Both organisms were suspended in a water droplet and placed on a microscope slide. The slide was exposed to light that was passed through a crystal prism. (The prism was used to separate visible light into its wavelengths.)

The diagram on the right illustrates what was seen on the microscope slide before and one hour after exposure to light that was passed through the prism.

BEFORE EXPOSURE TO LIGHT PASSED THROUGH PRISM



AFTER EXPOSURE TO LIGHT PASSED THROUGH PRISM

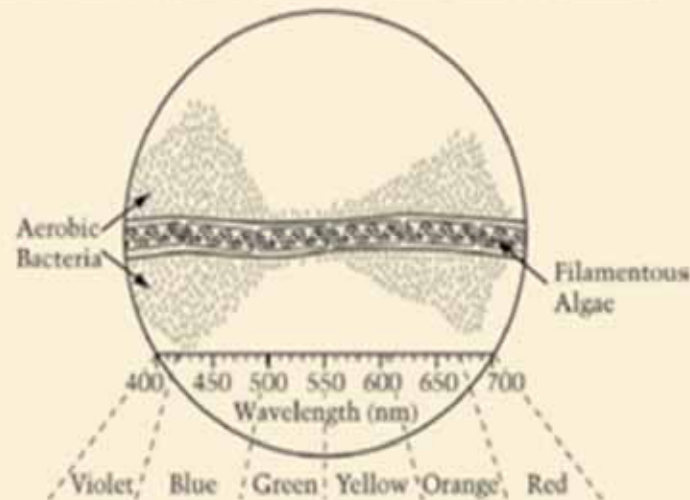


You try it!



The diagram below illustrates what was seen on the microscope slide one hour after exposure to light that was passed through a prism. The colors associated with the wavelengths of light are also indicated.

AFTER EXPOSURE TO LIGHT PASSED THROUGH PRISM



Based on the results of the experiment, a student concludes that the scientist used algae that was green.

Do you agree with the student's conclusion?

(A) Yes

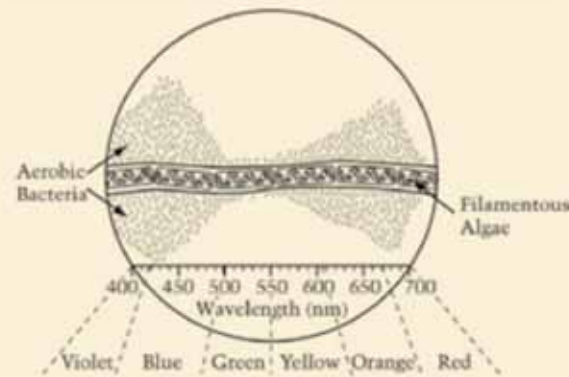
(B) No

Refer to the results from the experiment to support your answer.

Grade 12 Results

The diagram below illustrates what was seen on the microscope slide one hour after exposure to light that was passed through a prism. The colors associated with the wavelengths of light are also indicated.

AFTER EXPOSURE TO LIGHT PASSED THROUGH PRISM



Based on the results of the experiment, a student concludes that the scientist used algae that was green.

Do you agree with the student's conclusion?

- ☒ A Yes
☐ B No

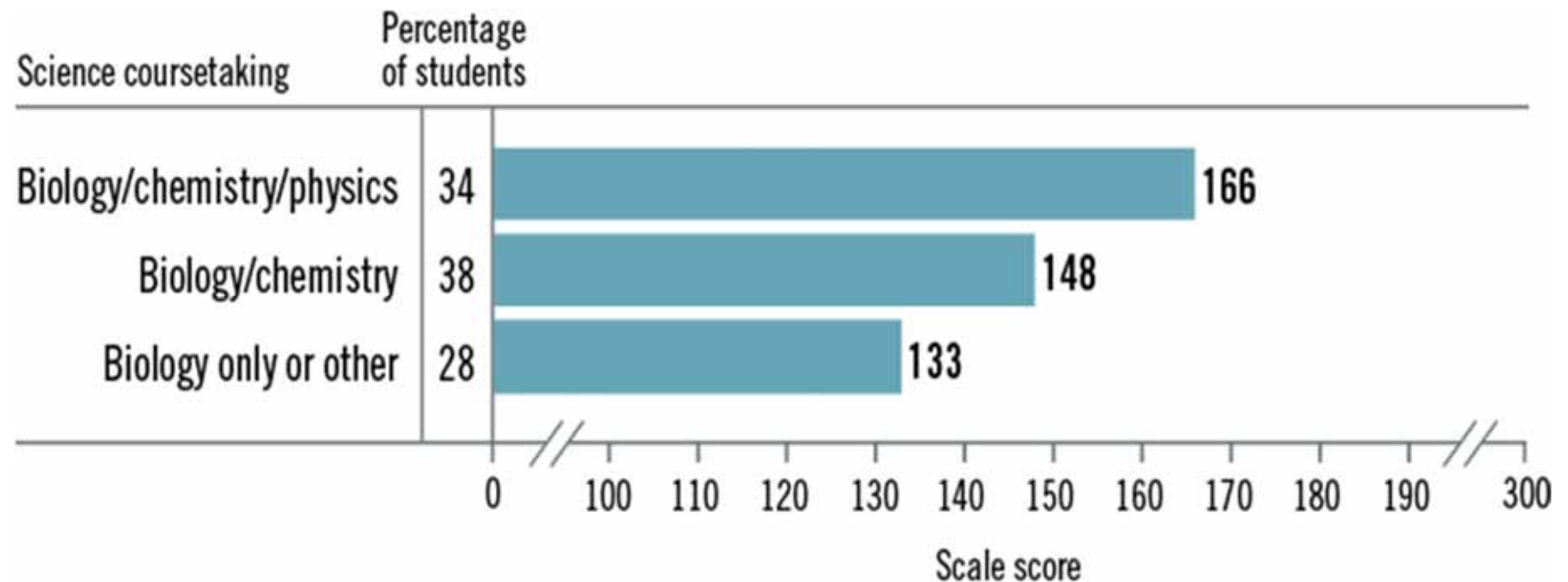
Refer to the results from the experiment to support your answer.

If the algae was green, then it would have reflected the green light rather than absorbing it for photosynthesis. It is obvious that the algae didn't conduct any photosynthesis at the green light given the small amount of bacteria located in that spectrum. Therefore the algae must have been green.

Complete	1%
Essential	3%
Partial	19%
Unsatisfactory/ Incorrect	71%
Omitted	6%

Grade 12 Results

About one-third of students report taking biology, chemistry, and physics





Let's pause for questions
from the audience





NAEP Resources

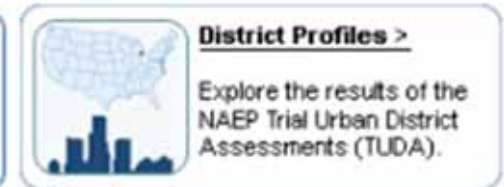
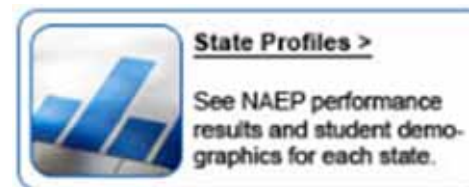
NAEP Data Tools



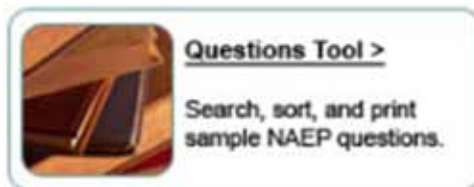
- NAEP Data Explorer



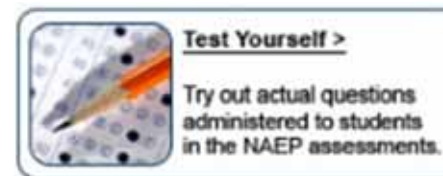
- State & District Profiles



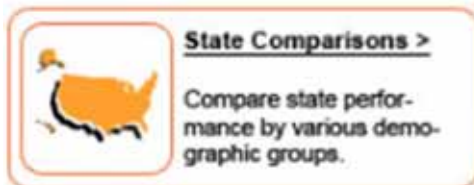
- NAEP Questions Tool



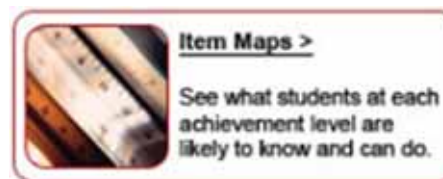
- Test Yourself



- State Comparisons



- NAEP Item Maps



NAEP Data Explorer



Table | Sig Test 1 X | Chart 1 X | **Sig Test 2 X**

Chart | **Significance Test** | Gap Analysis

To see how one value compares with the others, read across the row for that value. The displayed symbols indicate whether that value is significantly higher, significantly lower, or not significantly different than the value associated with that column. In some cases the significance test may have not been possible for statistical reasons.

Science, grade 8, overall science scale
 Difference in Average scale scores Between variables
 for Race/ethnicity (from school records) [SDRACE]
 2009, National

	White	Black	Hispanic
White		> Diff = 36 P-value = 0.0000 Family size = 3	> Diff = 30 P-value = 0.0000 Family size = 3
Black	< Diff = -36 P-value = 0.0000 Family size = 3		< Diff = -6 P-value = 0.0000 Family size = 3
Hispanic	< Diff = -30 P-value = 0.0000 Family size = 3	> Diff = 6 P-value = 0.0000 Family size = 3	

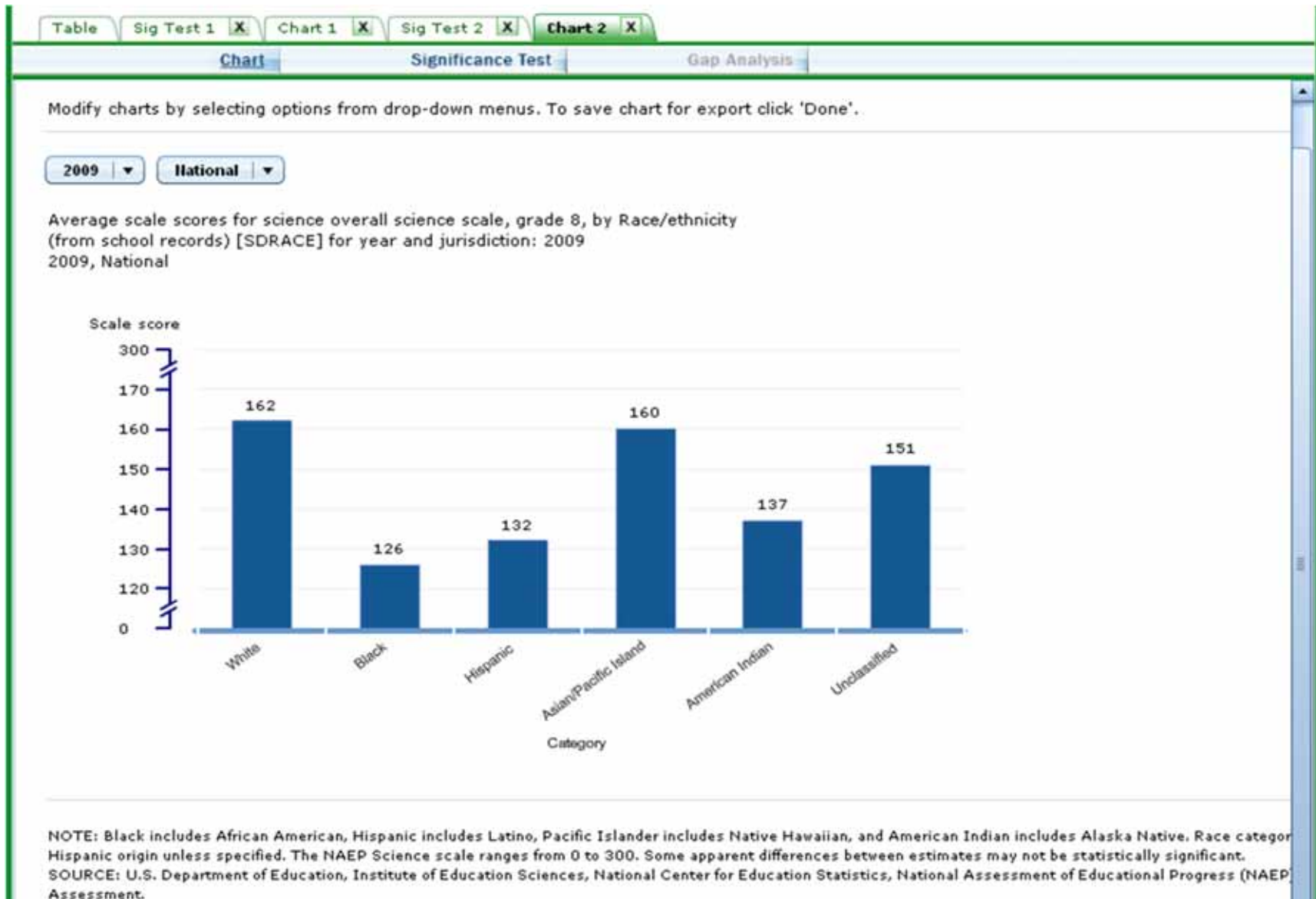
LEGEND:

<	Significantly lower.
>	Significantly higher.
x	No significant difference.

NOTE: All comparisons are independent tests with an alpha level of 0.05 adjusted for multiple pairwise comparisons according to the False Discovery Rate procedure. For comparisons between two jurisdictions, a dependent test is performed for cases where one jurisdiction is contained in the other. For more detailed information about the procedures and family sizes please see the Help document. Black includes African American, Hispanic includes Latino, Pacific Islander includes Native Hawaiian, and American Indian includes Alaska Native. Race categories exclude Hispanic origin unless specified.

SOURCE: U.S. Department of Education, Institute of Education Sciences, National Center for Education Statistics, National Assessment of Educational Progress (NAEP), 2009 Science Assessment.

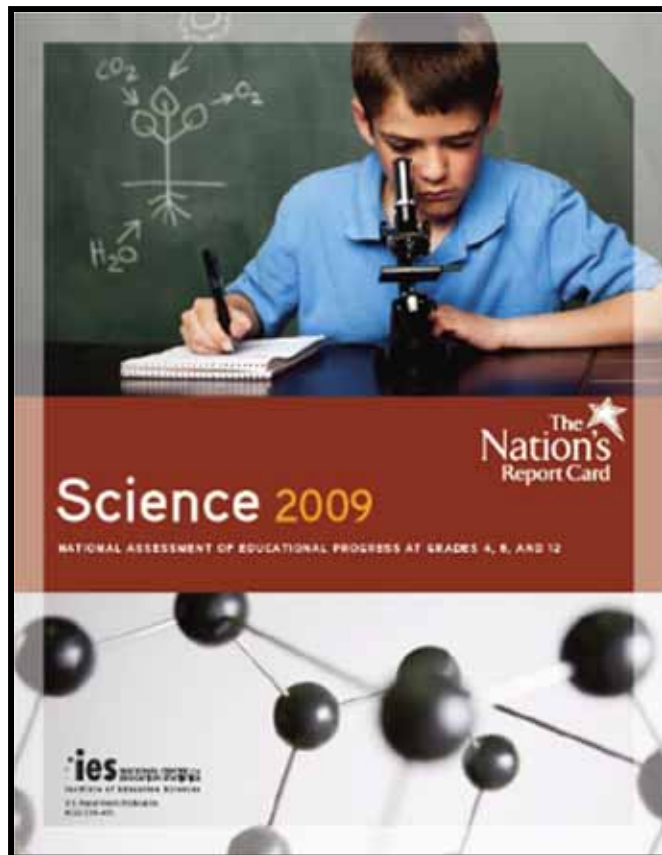
NAEP Data Explorer



Desktop Share Demonstration



For More Information...



<http://nationsreportcard.gov>

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Let's pause for questions
from the audience





NSTA Response

Comments by Dr. Francis Eberle

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