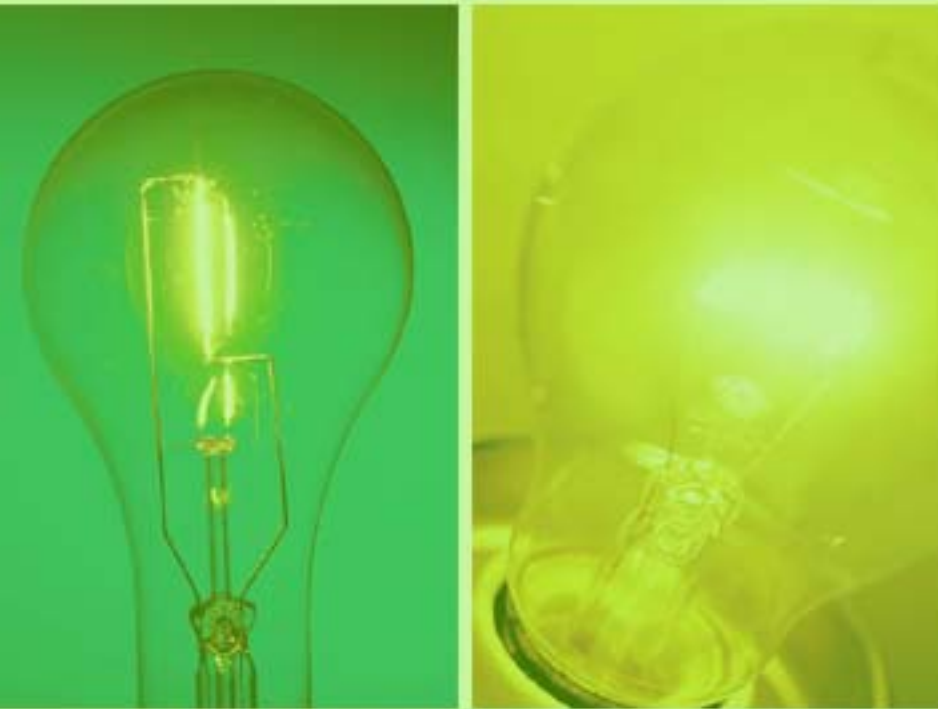


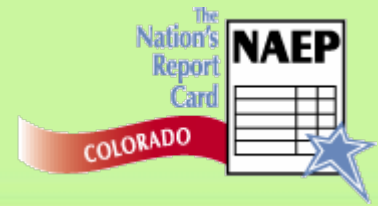
NAEP 2005 Science Results for Colorado and the Nation




Pam A. Sandoval
CO NAEP Coordinator

Year of Science
Keystone, CO
June 7, 2006

What is NAEP?



- The National Assessment of Educational Progress (NAEP) is also known as “The Nation’s Report Card.”
- Is the only nationally representative monitor of what students know and can do that is funded by the U.S. Department of Education.
- The assessments are designed to produce national and state level results; it is not a testing program for individual students or schools and does not report student results.
- National sampling began in 1969; state sampling in 1990.




CO Participation in NAEP Science

NAEP Science Assessment	
1996	YES - grade 8, NO - grade 4
2000	NO (grades 4 & 8 selected)
2005	YES - grades 4 & 8



Who was assessed in the nation?

- The NAEP 2005 assessment was administered to a random sample of fourth- and eighth-graders at the state level and at the national level.
- Forty-five jurisdictions participated, including 44 states and the Department of Defense Schools (Domestic and Overseas).
- Grade 4: Approximately 8,500 schools
- Grade 8: Approximately 6,400 schools



Who was assessed in Colorado?

- Colorado student participation:
 - Grade 4 about 2,700 students
 - Grade 8 about 2,500 students
- Eighty-six school districts participated in the science assessments.
- Two hundred eighty-one schools participated in the grades 4 and 8 2005 NAEP Science.

A decorative header image on the left side of the slide. It features a glowing yellow lightbulb on the left and a glass containing a yellow liquid on the right, set against a green background.

What is assessed?

- The NAEP Frameworks specify what is assessed and how it is to be assessed.
- The frameworks are approved by the National Assessment Governing Board (NAGB).
- The science framework is organized along two major dimensions:

Fields of Science: Content Strand
Earth
Physical
Life

Knowing and Doing Science
Conceptual Understanding
Scientific Investigation
Practical Reasoning



Distribution of questions

Target percentage distribution of questions – Fields of Science		
Content Strand	Grade 4	Grade 8
Earth	33	30
Physical	33	30
Life	33	40

Target percentage distribution of questions – Knowing and Doing Science		
	Grade 4	Grade 8
Conceptual Understanding	45	45
Scientific Investigation	45	30
Practical Reasoning	10	25

Timing and Blocks

- Students took 2 twenty-five minute blocks and a short background questionnaire. For students performing the hands-on task, it took an additional 25 minutes.
- NAEP uses matrix sampling. Each student takes a subset of the total set of questions, i.e., two blocks out of thirteen total blocks per grade level.
- Because each block is spiraled with other blocks and is administered to a representative sample of students, the results can be combined to produce average group and subgroup results based on the entire assessment.





How is NAEP science assessed?

- Science is assessed using three types of questions:
 - Multiple-choice questions
 - make up 55 percent of the assessment, and
 - four choices are presented.
 - Short, constructed-response questions
 - Require a few words or a sentence or two for an answer.
 - Extended, constructed-response questions
 - Require a paragraph or more; and
 - May also require a diagram or graph.

Hands-on Tasks

At each grade level about half of the students were given hands-on tasks where students were given a set of equipment and asked to conduct an investigation and answer questions relating to the investigation.





How are results reported?

- Scale scores—indicate how much students *know and can do*
 - Average scale scores and percentiles
 - Range is 0-300
 - Achievement levels—what students *should know and be able to do*
 - Subscales
 - **Results are analyzed and summarized by subscales that correspond to the three content strands: Earth science, physical science, and life science.**
 - **An overall composite scale was developed by weighting each of the science subscales for the grade based on its relative importance in the framework.**



What are the achievement level descriptions?


- *Policy definitions of NAEP Achievement Levels:*
 - *Basic:* This level denotes partial mastery of prerequisite knowledge and skills that are fundamental for proficient work at each grade.
 - *Proficient:* This level represents solid academic performance for each grade assessed. Students reaching this level have demonstrated competency over challenging subject matter, including subject-matter knowledge, application of such knowledge to real-world situations, and analytical skills appropriate to the subject matter.
 - *Advanced:* This level signifies superior performance.



NAEP Achievement Level descriptions for science—set separately by grade:

Grade 4

- ***Basic*** Demonstrate some of the knowledge and reasoning required for understanding the Earth, physical, and life sciences at a level appropriate to grade 4. Also, should show a beginning understanding of classification, simple relationships and energy.
- ***Proficient*** Demonstrate the knowledge and reasoning required for understanding the Earth, physical, and life sciences. Should be able to formulate solutions to familiar problems as well as show a beginning awareness of issues associated with technology.
- ***Advanced*** Demonstrate a solid understanding of the Earth, physical, and life sciences as well as the ability to apply their understanding to practical situations. Should be able to combine information, data, and knowledge from one or more of the sciences to reach a conclusion or to make a valid prediction. Also, should recognize, design, and explain simple experimental procedures.



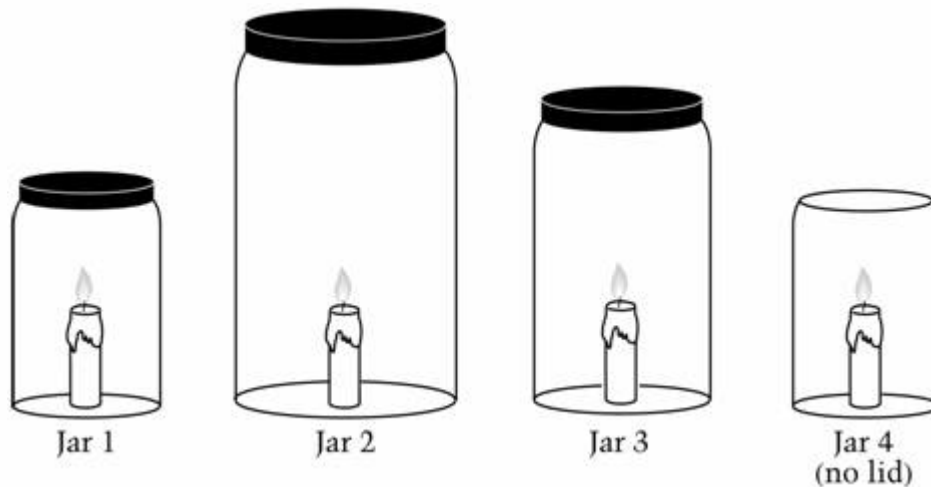
NAEP Achievement Level descriptions for science—set separately by grade: continued

Grade 8

- ***Basic*** Should demonstrate some of the knowledge and reasoning required for understanding the Earth, physical, and life sciences. Should also have a beginning understanding of cause-and-effect relationships.
- ***Proficient*** Should demonstrate much of the knowledge and many of the reasoning abilities essential for understanding the Earth, physical, and life sciences. Should show an awareness of environmental issues, especially those addressing energy and pollution.
- ***Advanced*** Should demonstrate a solid understanding of the Earth, physical, and life sciences as well as the abilities required to apply their understanding in practical situations. Should be able to provide an explanation for scientific results. Should have a modest understanding of scale and be able to design a controlled experiment.

Grade 4 Released Items

Pat set up four different jars with a burning candle in each jar. He put the lids on jars 1, 2, and 3, as shown in the picture below.



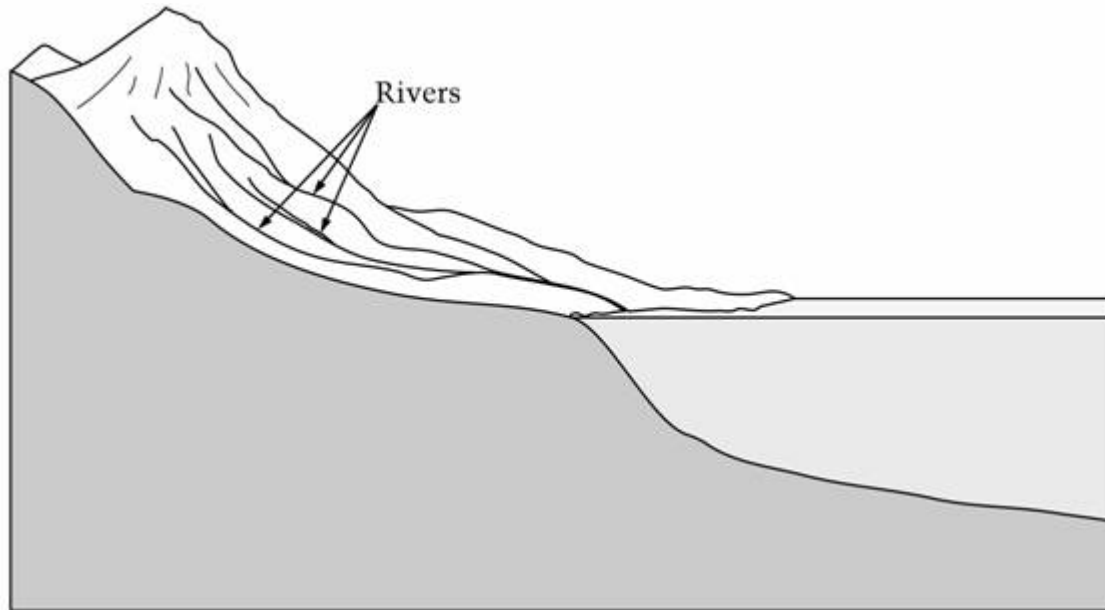
The candle in jar 1 burned for 2 minutes after the lid was put on. The candle in jar 2 burned for 8 minutes. About how long did the candle in jar 3 burn after the lid was put on?

- A) 1 minute
- ▶ B) 4 minutes
- C) 8 minutes
- D) 10 minutes

Grade 8 Released Items

The picture below can be used to show how sandstone can form along the edge of a large lake.

Draw and write on the picture to show the two main processes of sandstone formation.





Scoring & Performance

A “Complete Student Response” includes both parts of the sedimentary process.

- Part 1:
 - Rivers erode mountain material
 - Mountain material is carried by river
 - Erosion
- Part 2:
 - Hardens
 - Solidifies
 - Compacts
 - Builds up in layers

<u>Score</u>	<u>%age of Students</u>
--------------	-------------------------

Unsatisfac/incorrect	49%
-----------------------------	------------

Partial	18%
----------------	------------

Complete	3%
-----------------	-----------

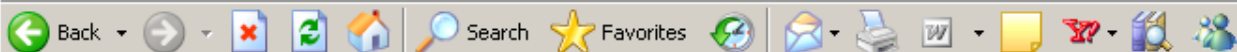
Omitted	27%
----------------	------------

Off task	2%
-----------------	-----------

NAEP Questions Tool

NAEP NQT v3.0 -- Search Option page - Microsoft Internet Explorer provided by CDE

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Main NAEP Questions (1990-2005; grades 4, 8, and 12)

Quick Search

Search for questions by subject and grade.

Science

Grade 4

(optional)



NAEP Science Cut Scores

NAEP Science Cut Scores – 4th Grade

Advanced (A)	205 - 300
Proficient (P)	170 - 204
Basic (B)	138 - 169
Below Basic (BB)	0 - 137

NAEP Science Cut Scores – 8th Grade

Advanced (A)	208 - 300
Proficient (P)	170 - 207
Basic (B)	143 - 169
Below Basic (BB)	0 - 142

Grade 4: Overall Results and Ethnicity in Proficiency

2005 NAEP Science Grade 4: (% Proficient and Above)	
Colorado	32 %
Nation	27 %

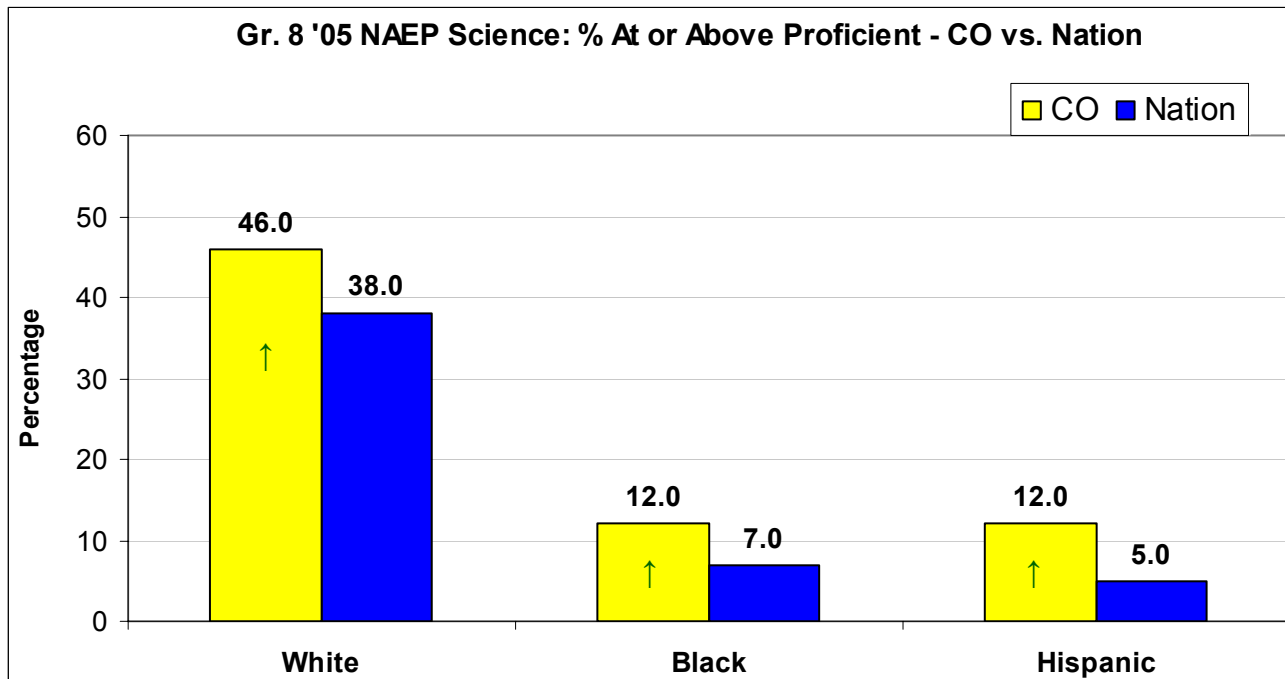
Results by Ethnicity % At or Above Proficient			
	Colorado	National Public	Difference
White	41	38	equal
Black	11	7	equal
Hispanic	13	10	equal
Asian / P.I.	32	34	equal
Amer. Indian	‡	15	N/A

‡ = insufficient sample size

Grade 8: Overall Results and Ethnicity in Proficiency

NAEP Science Grade 8 % Proficient and Above		
	1996 ¹	2005
Colorado	32%	35%
Nation	27%	27%

¹ = accomm's not permitted



Grade 4: Overall Results & Ethnicity by AveSS

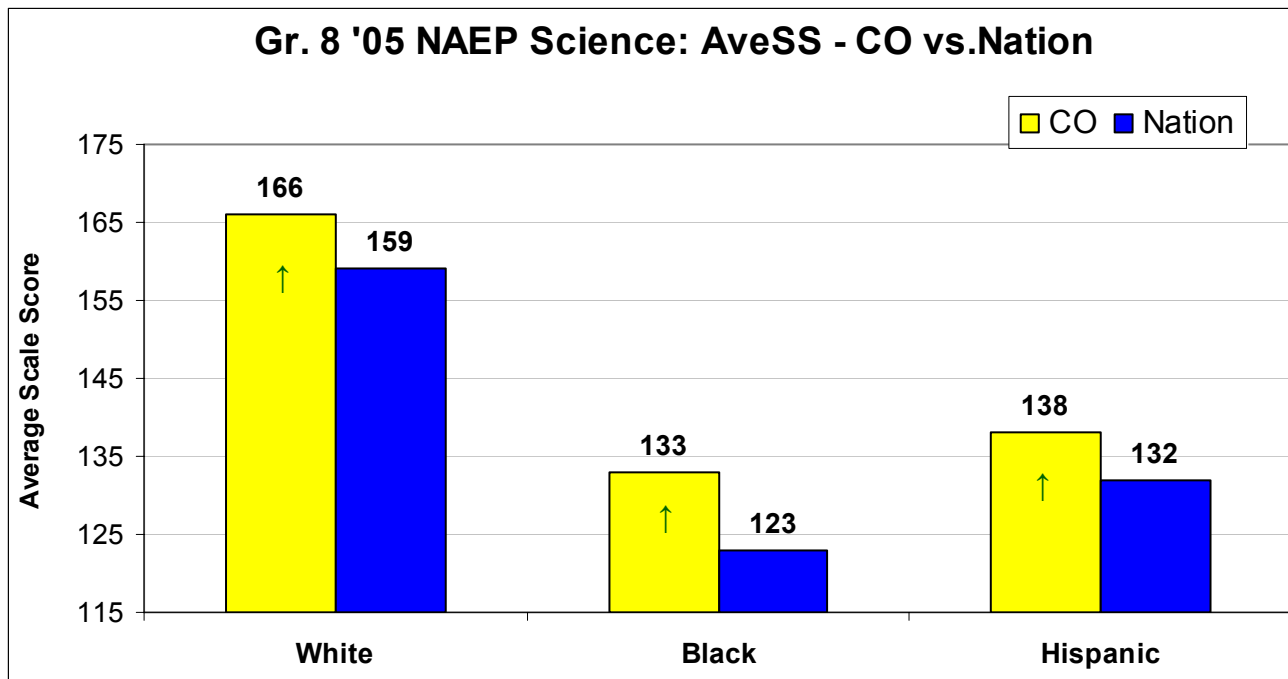
2005 NAEP Science Grade 4: Average Scale Score	
Colorado	155
Nation	149

Results by Ethnicity Average Scale Score			
	Colorado	National Public	Difference
White	163	161	CO significantly ↑
Black	139	128	CO significantly ↑
Hispanic	138	132	CO significantly ↑
Asian & P.I.	157	156	equal
Native Amer.	‡	139	N/A

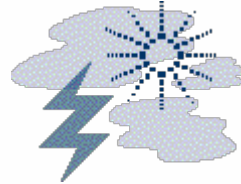
‡ = insufficient sample size

Grade 8: Overall Results & Ethnicity by AveSS

2005 NAEP Science Grade 8: Average Scale Score		
	1996 ¹	2005
Colorado	155	155
Nation	148	147

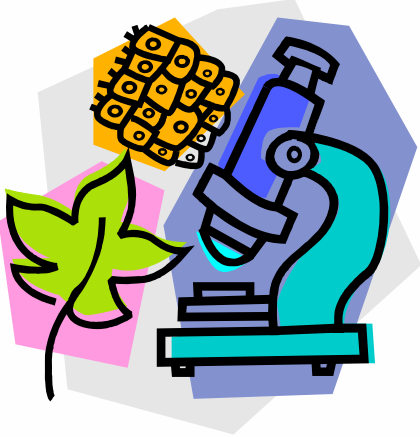


Grade 4 Subscales Results

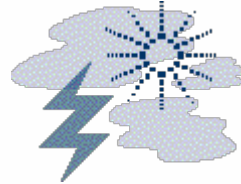


NAEP Grade 4 Results: Average Scale Score		
Jurisdiction	Field	Score
National Public	Physical	150
Colorado	Physical	159*
National Public	Earth	150
Colorado	Earth	155*
National Public	Life	148
Colorado	Life	151*

* = significantly different, CO ↑ Nation



Grade 8 Subscales Results

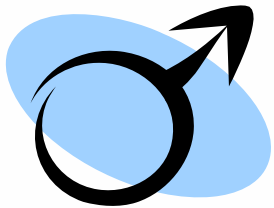


NAEP Grade 8 Results: Average Scale Score		
Jurisdiction	Strand	Score
National Public	Physical	144
Colorado	Physical	153*
National Public	Earth	149
Colorado	Earth	156*
National Public	Life	148
Colorado	Life	156*

* = significantly different, CO ↑ Nation



Grade 4 Gender



CO 4th Grade NAEP Gender Results		
	% At or Above Proficient	Average Scale Score
Male	35 ↑	157 ↑
Female	29	153

↑ = significantly higher

Grade 4 2005 NAEP Science				
Gender	Physical Science	Earth Science	Life Science	
Male	161 =	157 ↑	152 =	
Female	156 =	152	151 =	



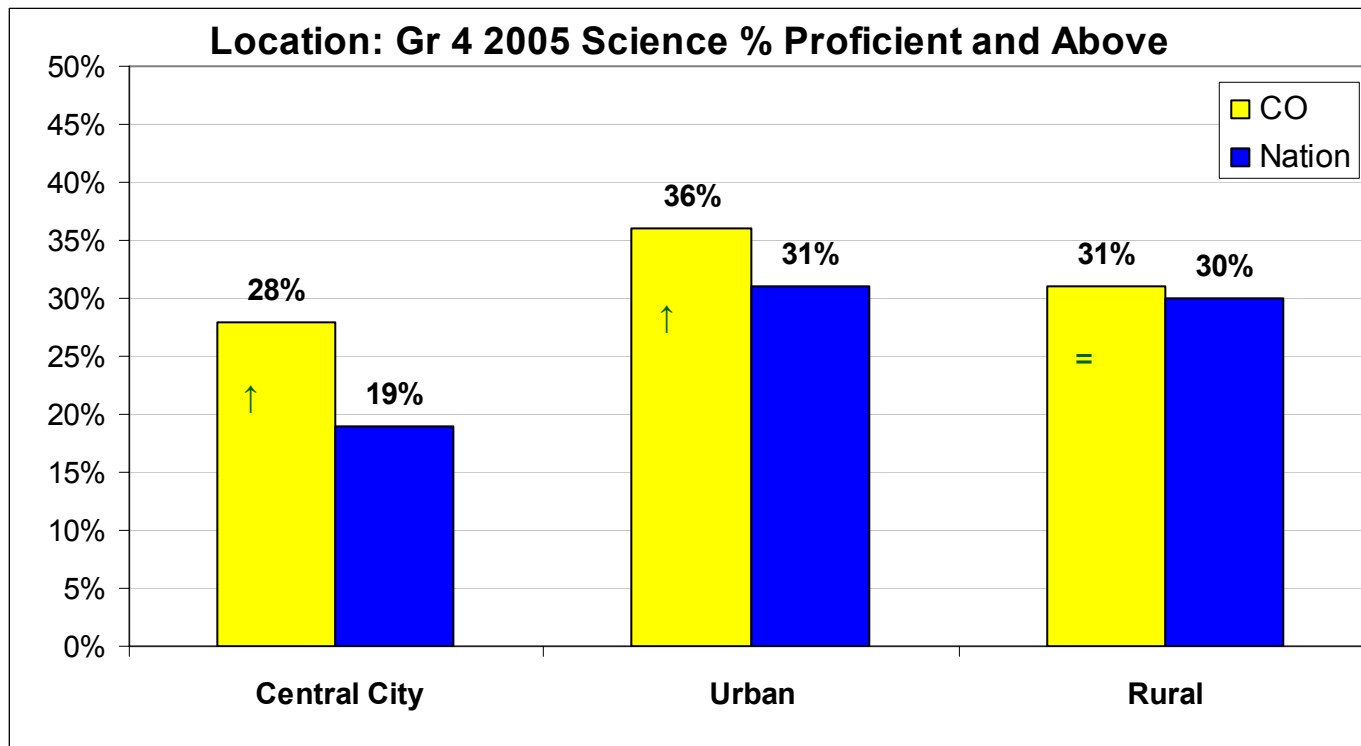
Grade 8 Gender

CO Science Grade 8 Gender - Average Scale Score

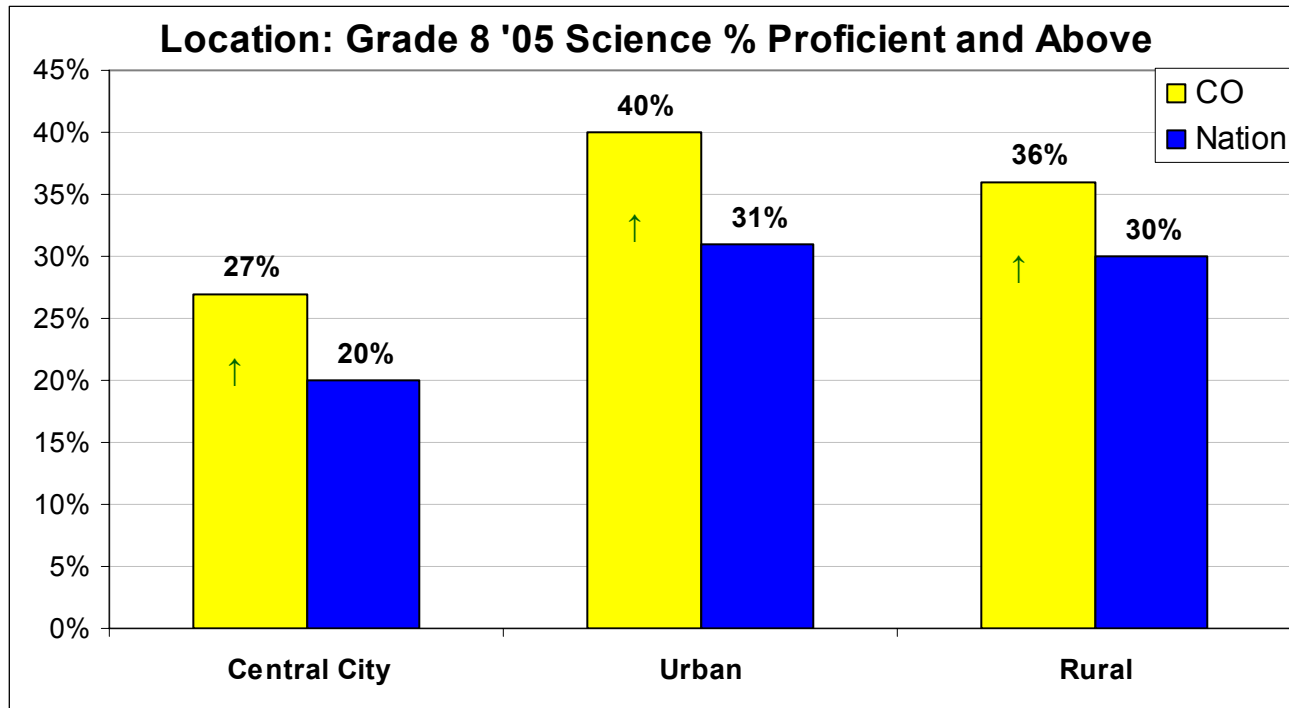
	<u>Male</u>	<u>Female</u>
1996	156	153
2005	158	152

Grade 8 2005 NAEP Science			
Gender	Physical Science	Earth Science	Life Science
Male	157 ↑	159 ↑	157 =
Female	149	153	154 =

Grade 4 by Location

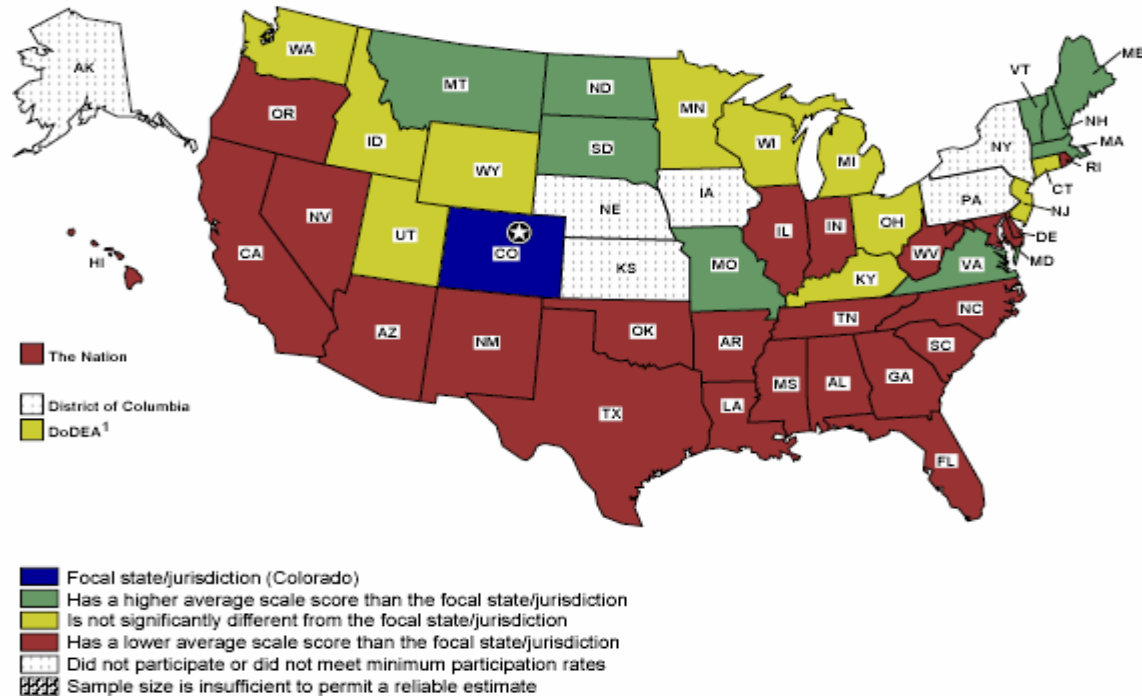


Grade 8 by Location



CO vs. Other States

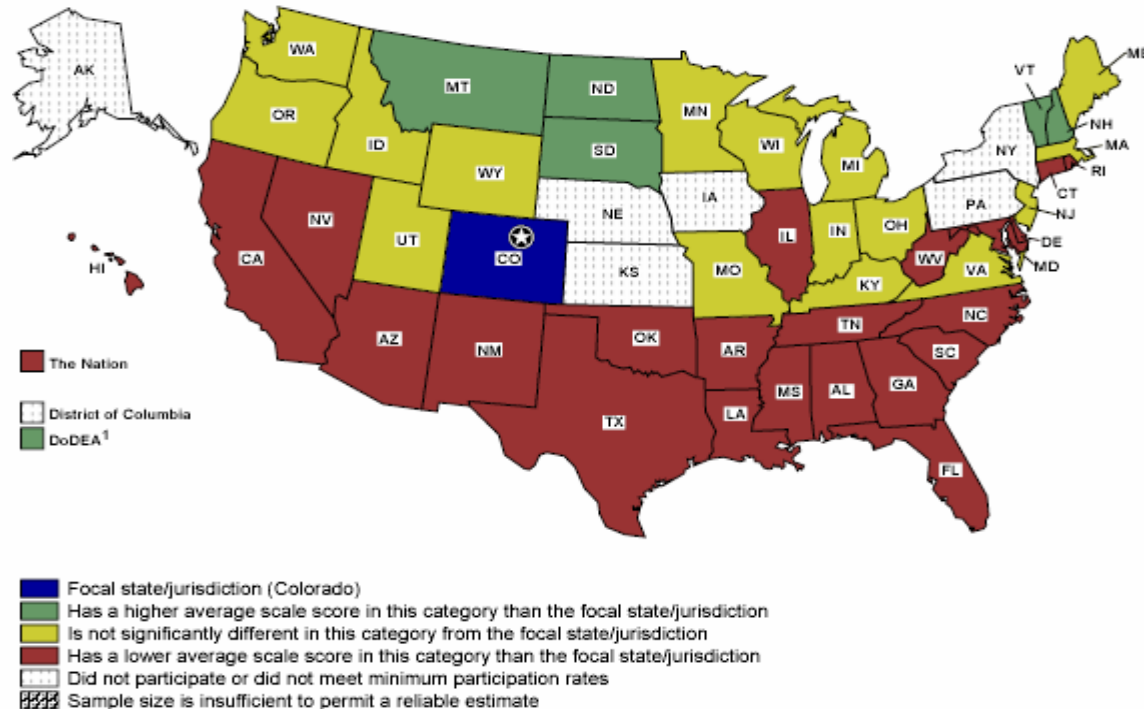
NAEP Gr. 4 2005 Science: AveSS Between States



¹ Department of Defense Education Activity.

CO vs. Other States continued

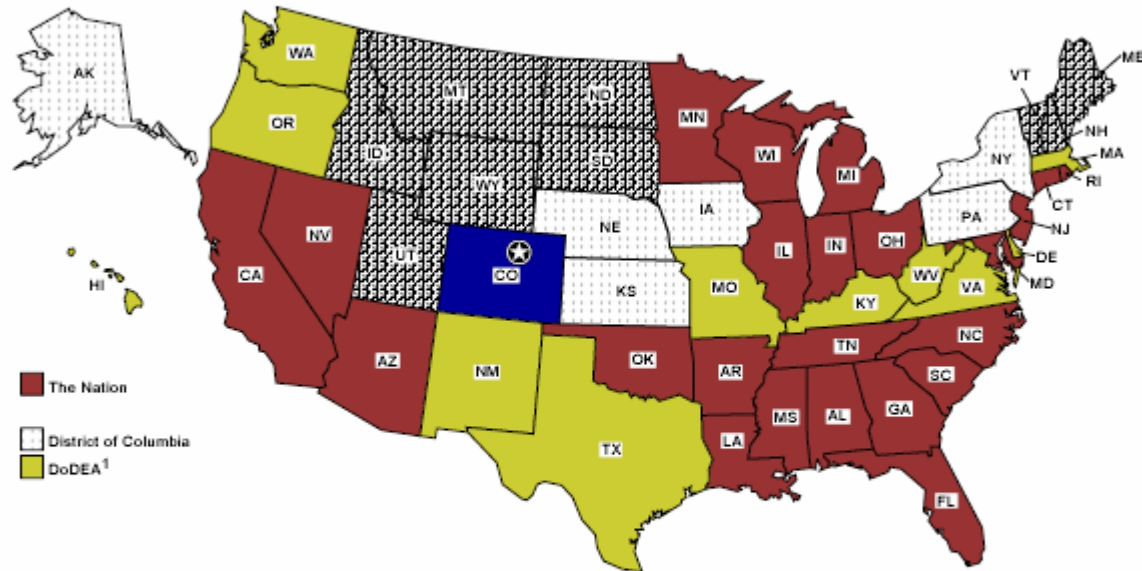
NAEP Gr. 8 2005 Science: AveSS Between States



¹ Department of Defense Education Activity.

Black Students

NAEP Gr. 4 2005 Science



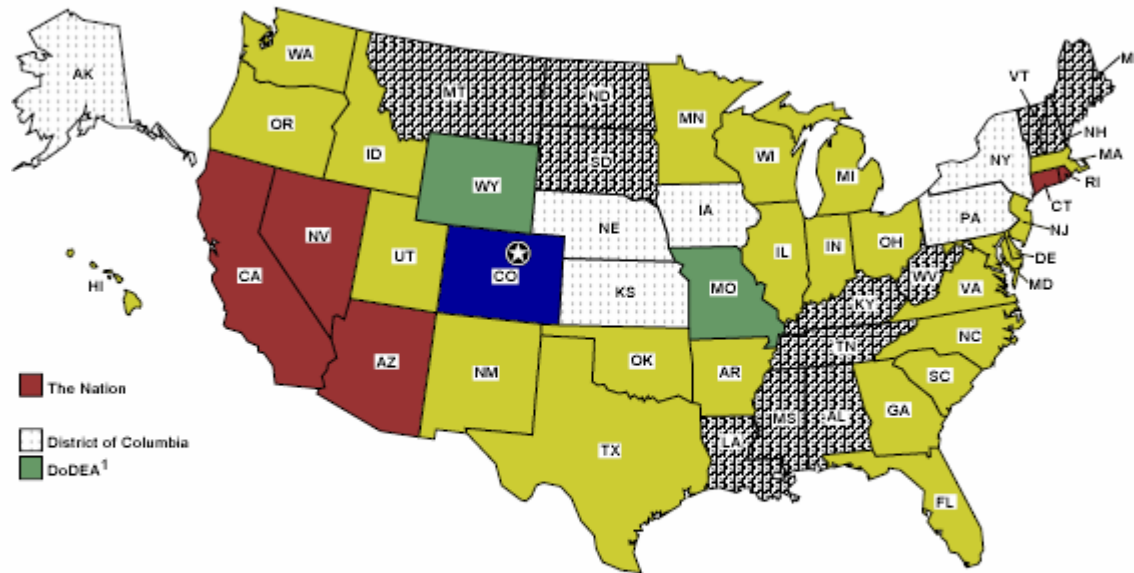
- The Nation
- District of Columbia
- DoDEA¹

- Focal state/jurisdiction (Colorado)
- Has a higher average scale score in this category than the focal state/jurisdiction
- Is not significantly different in this category from the focal state/jurisdiction
- Has a lower average scale score in this category than the focal state/jurisdiction
- Did not participate or did not meet minimum participation rates
- Sample size is insufficient to permit a reliable estimate

¹ Department of Defense Education Activity.

Hispanic Students

NAEP Gr. 8 2005 Science



The Nation

District of Columbia

DoDEA¹

Focal state/jurisdiction (Colorado)

Has a higher average scale score in this category than the focal state/jurisdiction

Is not significantly different in this category from the focal state/jurisdiction

Has a lower average scale score in this category than the focal state/jurisdiction

Did not participate or did not meet minimum participation rates

Sample size is insufficient to permit a reliable estimate

¹ Department of Defense Education Activity.



2009 Science Framework

1996-2005 Framework	2009 Framework
Few science standards available	<i>Benchmarks for Science Literacy</i> ; <i>National Science Education Standards</i> ; TIMSS; PISA; state standards
Life, Earth, & Physical Science	Life, Earth/Space, & Physical Science
Distribution by content area: equal in grades 4 & 12, more emphasis on Life science in 8 th	Equal distribution at grade 4, emphasis on Earth/Space science in 8 th , emphasis on Physical and Life science in 12 th
Content presented as bullets and short phrases	Content presented as statements in tables organized by content subscales and grades
Three abstract themes & questions about the nature of science	Cross-cutting content among Life, Earth/Space, and Physical sciences; item contexts include history and nature of science

2009 Science Framework

continued

1996-2005 Framework	2009 Framework
Knowing & Doing Dimension: <ul style="list-style-type: none"> - Conceptual Understanding - Scientific Investigation - Practical Reasoning 	Science Practices: <ul style="list-style-type: none"> - Identifying science principles - Using science principles - Using scientific inquiry - Using technological design ** *Steering Committee position – use only as context for items
Paper-and-pencil items Hands-on performance tasks for a subsample of students >60% Constructed response (CR) <40% Multiple choice items (MC)	Paper-and-pencil items, innovative types Hands-on performance tasks Interactive computer tasks (ICT) Hands-on and ICT for subsample of students 50% CR; 50% MC items
	Item formats for naïve conceptions
	Examples of generating and interpreting items
Only a few sample items in Specifications	Illustrative items in Framework, many more sample items and scoring guides in Specs

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NAEP 2009 Item Format

Multiple choice and Constructed-Response Items

At each grade, as measured by student response time,
50% constructed-response; 50% multiple choice.

- Conventional multiple choice; complex multiple choice (P-O-E Items)
- Short and Extended constructed response items

Hands-on and Interactive Computer Tasks

- Administered to a subsample of students
- At each grade, at least 4 hands-on and interactive computer tasks total.
- At each grade, at least 1 hands-on and at least 1 interactive computer task.

The number of interactive computer tasks not to exceed the number of hands-on tasks.

(p. 108)

A decorative graphic on the left side of the slide, featuring a glowing lightbulb with a green and yellow gradient background.

Types of Interactive Computer Tasks

- Information search and analysis
- Empirical investigation
- Simulation
- Concept mapping



Interactive Computer Tasks

Benefits

- Deep probes of science knowledge and practice
- Can do things not possible in other formats
- Potentially cost effective
- Captures wide range of student responses
- Used in international science assessments
- Engaging to students

Challenges

- Equipment availability/ access
- Limited research
- Range of school and student experiences
- Development costs

NAEP Public Web site

NAEP - The Nation's Report Card - National Assessment of Educational Progress - NAEP - Microsoft Internet Explorer provided by

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National Assessment of Educational Progress

THE NATION'S REPORT CARD



Results of the
2005 National and
State Science
Assessment

NOW AVAILABLE

INSIDE NAEP

NEW & NOTEWORTHY



Thank you!

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