ALL NGSS
ALL DAY

13

12 EXPERTS **6** SESSIONS **1** ROOM

SPECIAL ONE-DAY EVENT

FREE TO ALL CONFERENCE ATTENDEES.
PARTICIPATE IN ONE OR MORE PRESENTATIONS.

For more details, visit ***www.nsta.org/ngss.***

NGSS@NSTA FORUM

FRIDAY, MARCH 13, 2015

McCormick Place, W183a/b

Take a deep dive into the *Next Generation Science Standards* with writers, state science supervisors, assessment experts, and more.

8:00–9:00 A.M.	Implementing the Vision of the *Framework* and *Next Generation Science Standards* Michael Lach
9:30–10:30 A.M.	Helping Students Make Sense of the World with Next Generation Science and Engineering Practices Brian Reiser
11:00 A.M.–12:00 P.M.	Developing and Evaluating Three-Dimensional Curriculum Materials Joe Krajcik
12:30–1:30 P.M.	Assessing *NGSS* in the Classroom Christopher Harris, Angela DeBarger, & Bill Penuel
2:00–3:00 P.M.	Curriculum Planning the *NGSS* Way Stephen Pruitt
3:30–5:00 P.M.	Implementing *NGSS*: Stories From the Front Lines Panel Discussion moderated by NSTA Executive Director David Evans

NEXT GENERATION SCIENCE STANDARDS
For States, By States

NGSS@ NSTA
STEM STARTS HERE

THE UNIVERSITY OF CHICAGO

Implementing The
Next Generation Science Standards

Michael Lach

March 13, 2015

ALL NGSS
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GUIDE TO
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THE NEXT
GENERATION
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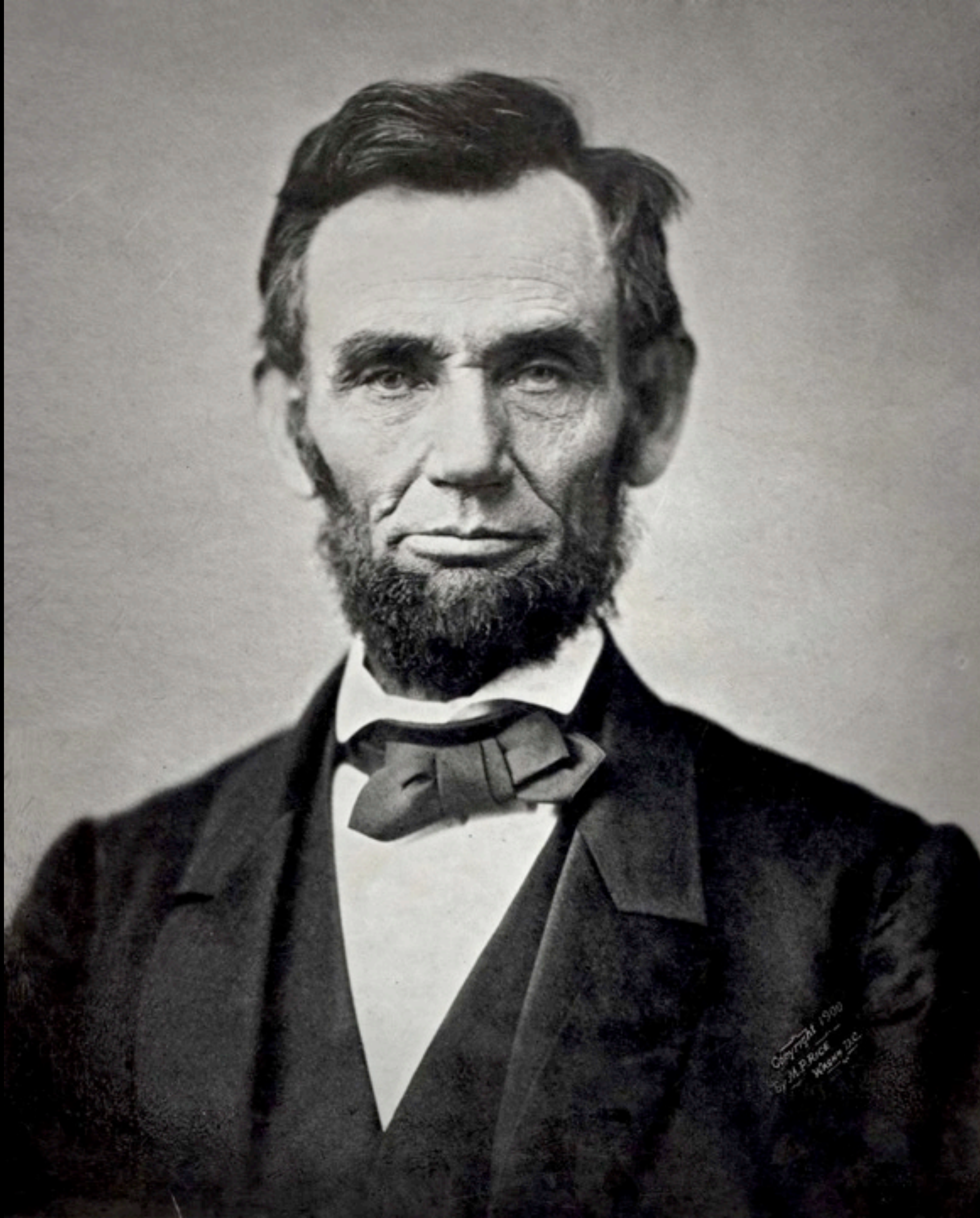
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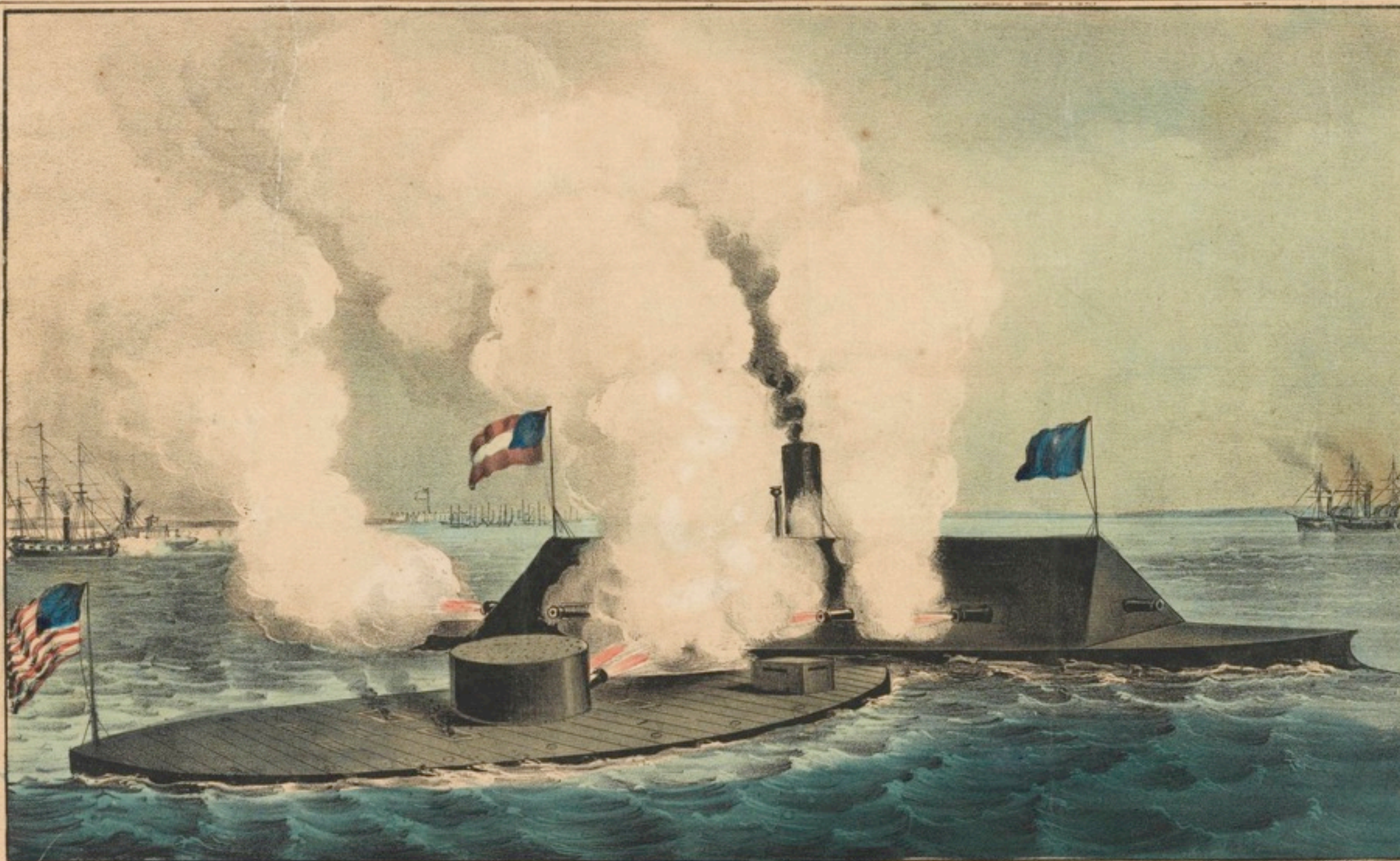


PUBLISHED BY CURRIER & IVES, 152 NASSAU ST NEW YORK

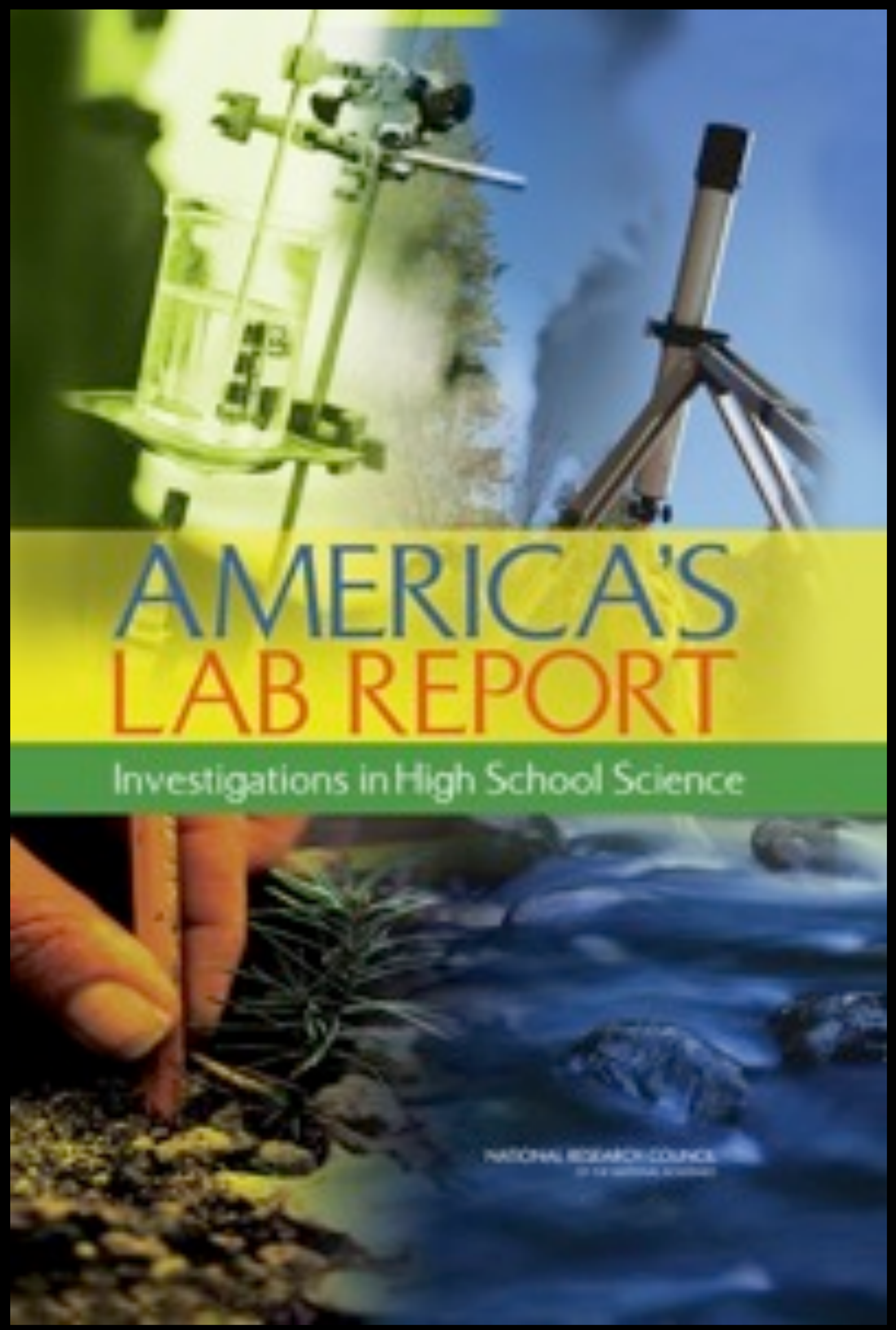
MINNESOTA. REBEL STEAMER.

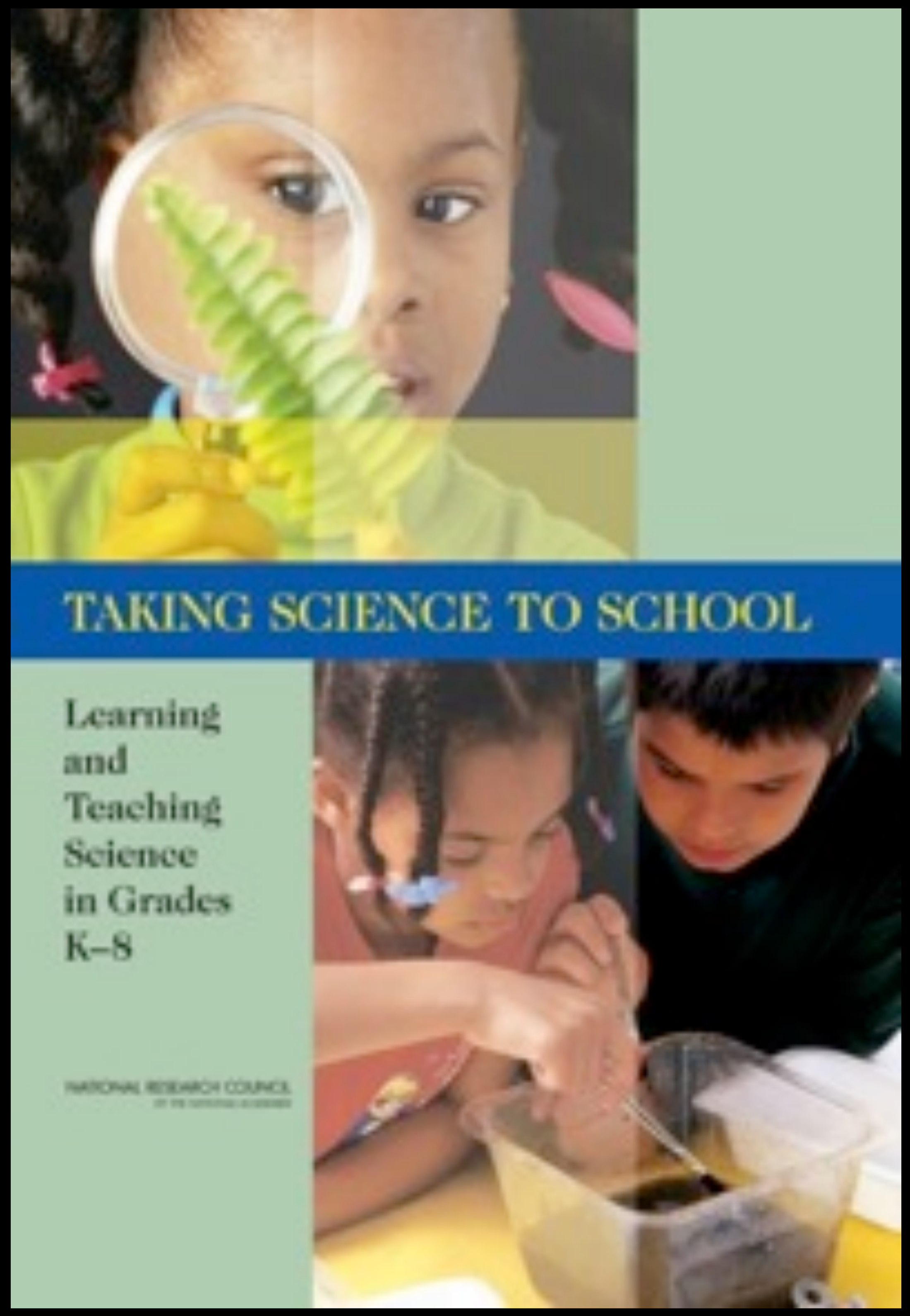
THE FIRST FIGHT BETWEEN IRON CLAD SHIPS OF WAR.

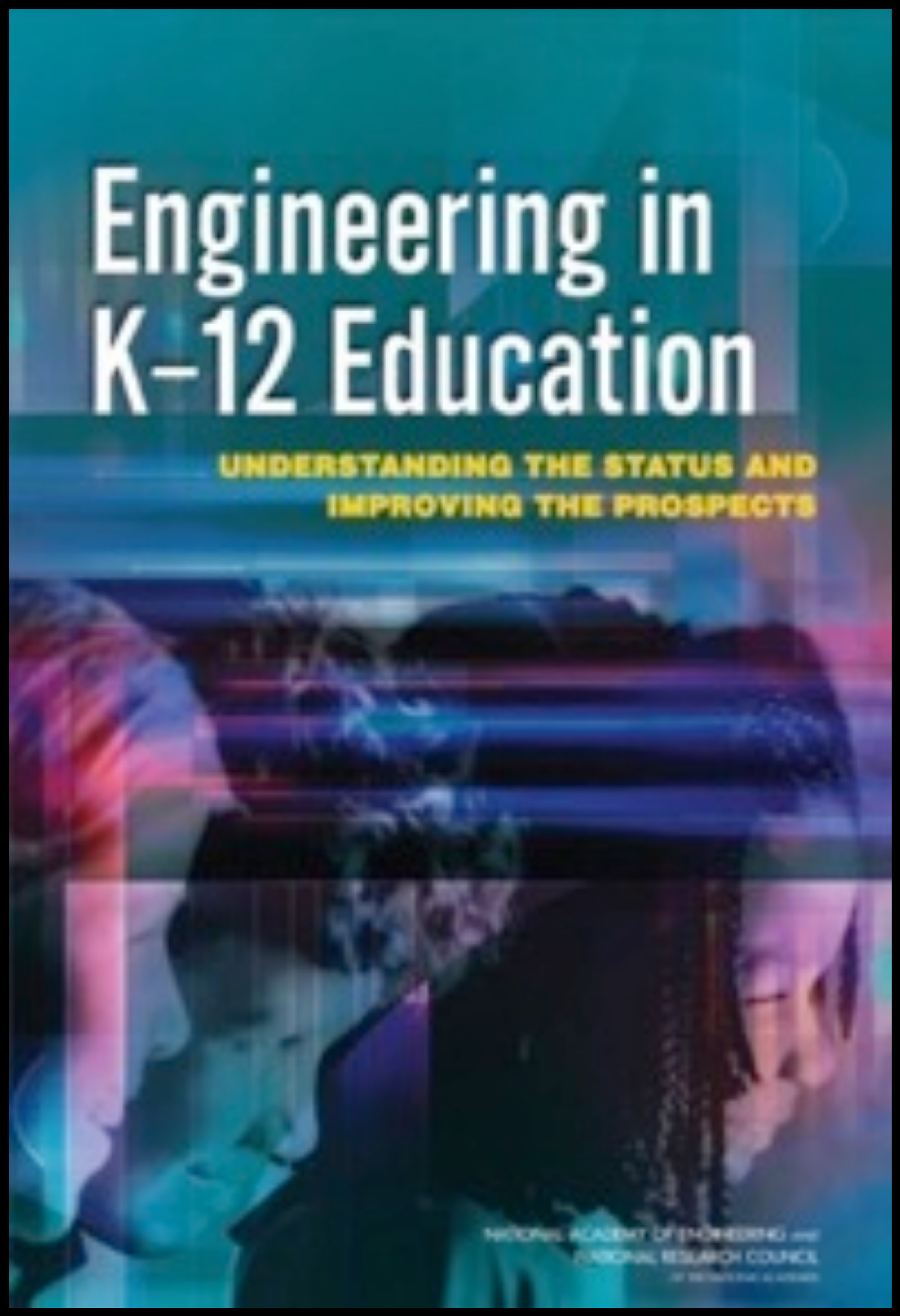
TERRIFIC COMBAT BETWEEN THE "MONITOR" 2 GUNS & "MERRIMAC" 10 GUNS.

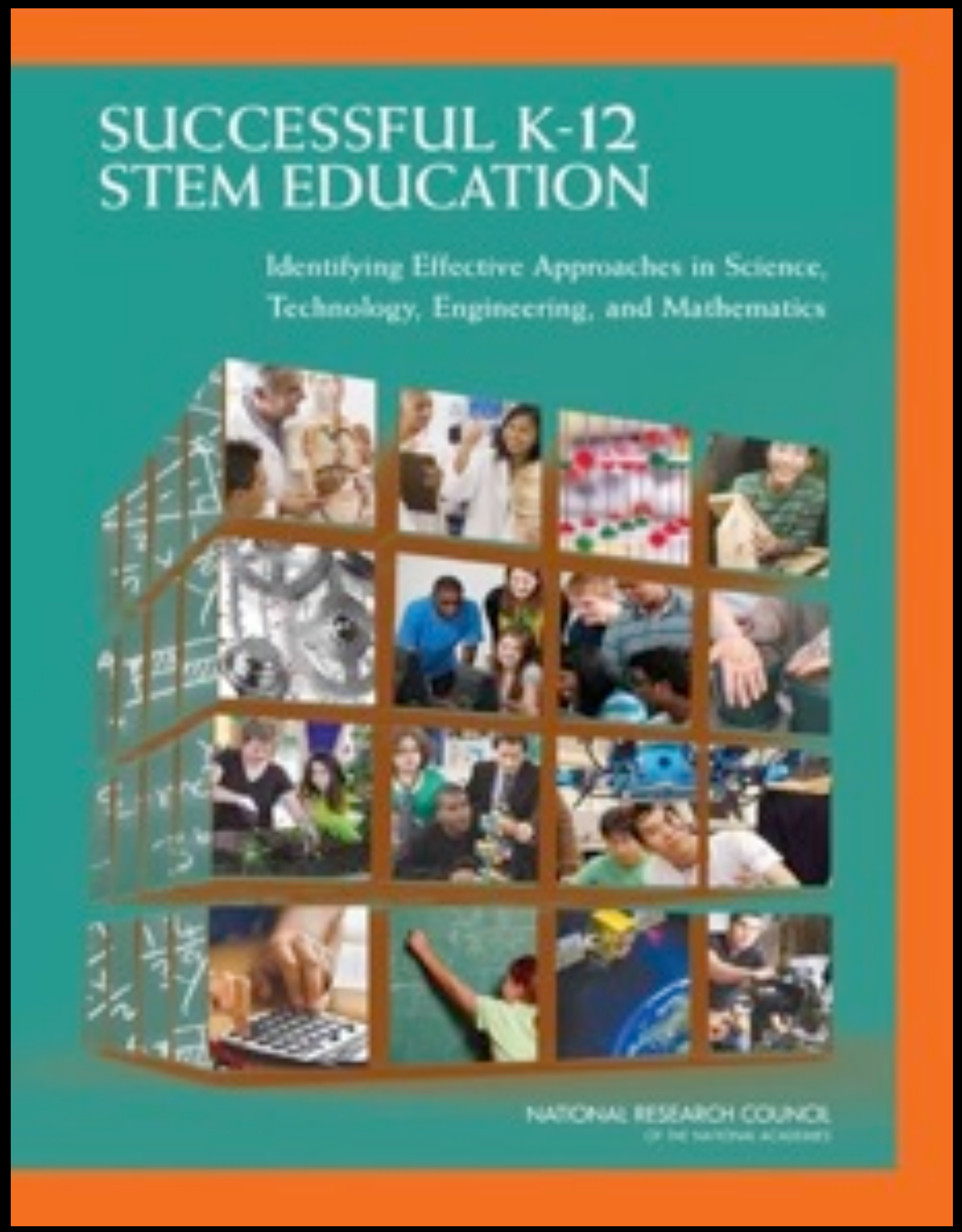
IN HAMPTON ROADS, MARCH 9TH 1862.

In which the little "Monitor" whipped the "Merrimac" and the whole "School" of Rebel Steamers









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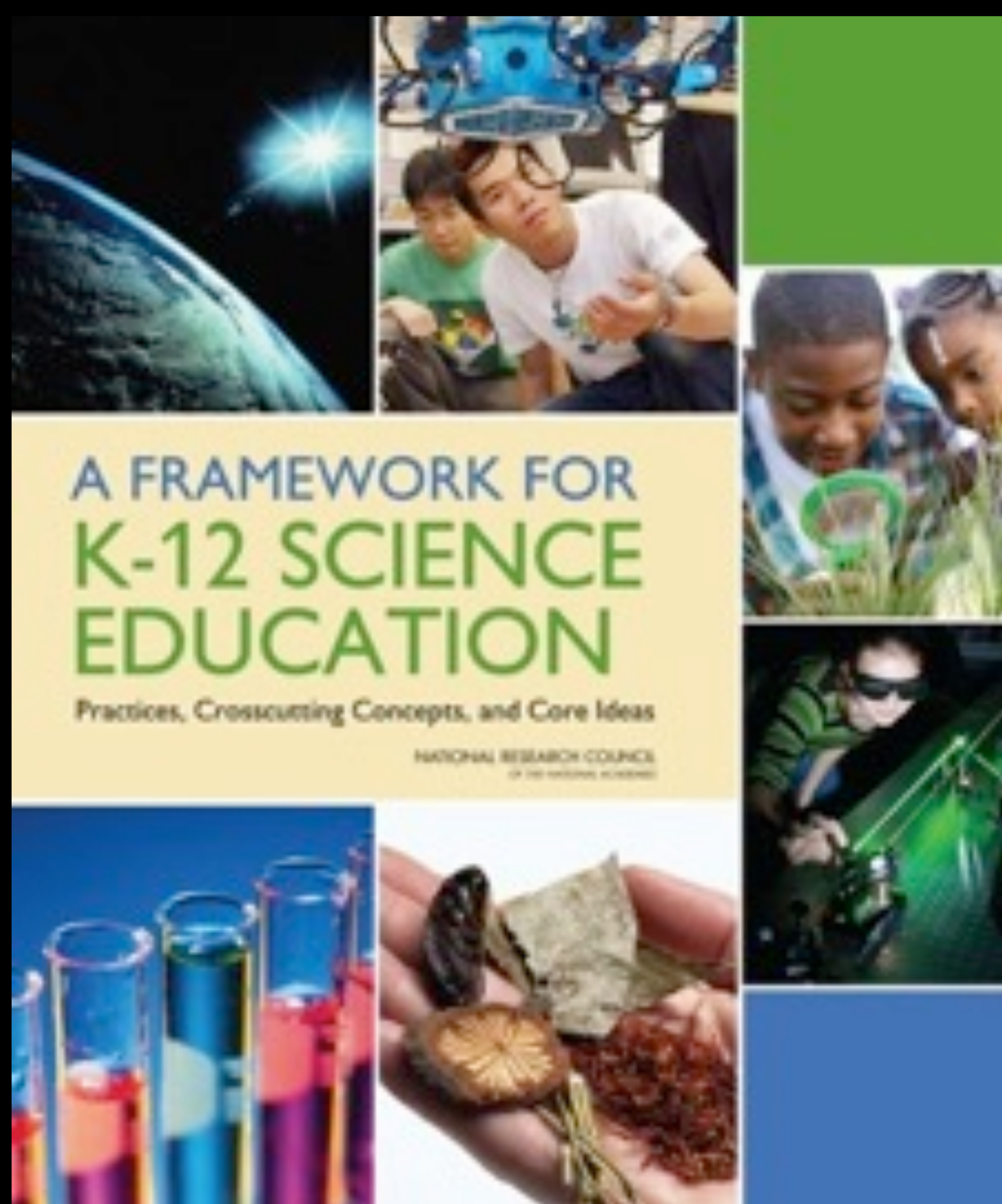
A FRAMEWORK FOR
K-12 SCIENCE
EDUCATION
Practices, Crosscutting Concepts, and Core Ideas
NATIONAL RESEARCH COUNCIL


NEXT GENERATION
SCIENCE
STANDARDS
For States, By States
NGSS Lead States


GUIDE TO
IMPLEMENTING
THE NEXT
GENERATION
SCIENCE
STANDARDS
NATIONAL RESEARCH COUNCIL

Committee


Guide to Implementing the Next Generation Science Standards

NATIONAL RESEARCH COUNCIL

ADVANCE COPY

Thursday, January 8, 2015

Review

Board on Science Education

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Stanford University

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Kansas State Department of Education

MICHAEL LACH
Center for Elementary Mathematics and Science Education and Urban Education Institute, University of Chicago

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Carnegie Foundation for the Advancement of Teaching

CARY SNEIDER
Center for Science Education, Portland State University

ROBERTA TANNER
Retired Physics Teacher, Thompson School District, Loveland, CO

The Committee's Charge

1. Lay-out necessary steps toward implementation of the Next Generation Science Standards.

2. Identify the parts of the education system that need to be attended to when implementing the standards and discuss the changes that need to be made to each part of the system.

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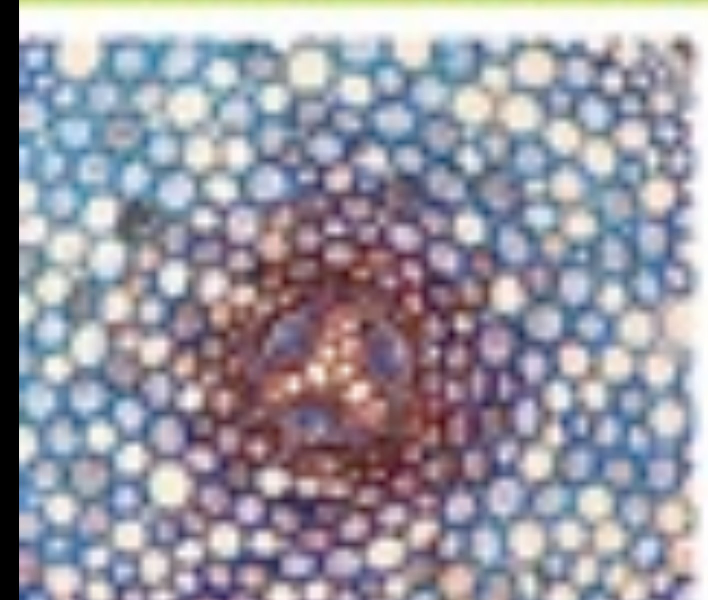
Standards

NEXT GENERATION SCIENCE STANDARDS

For States, By States

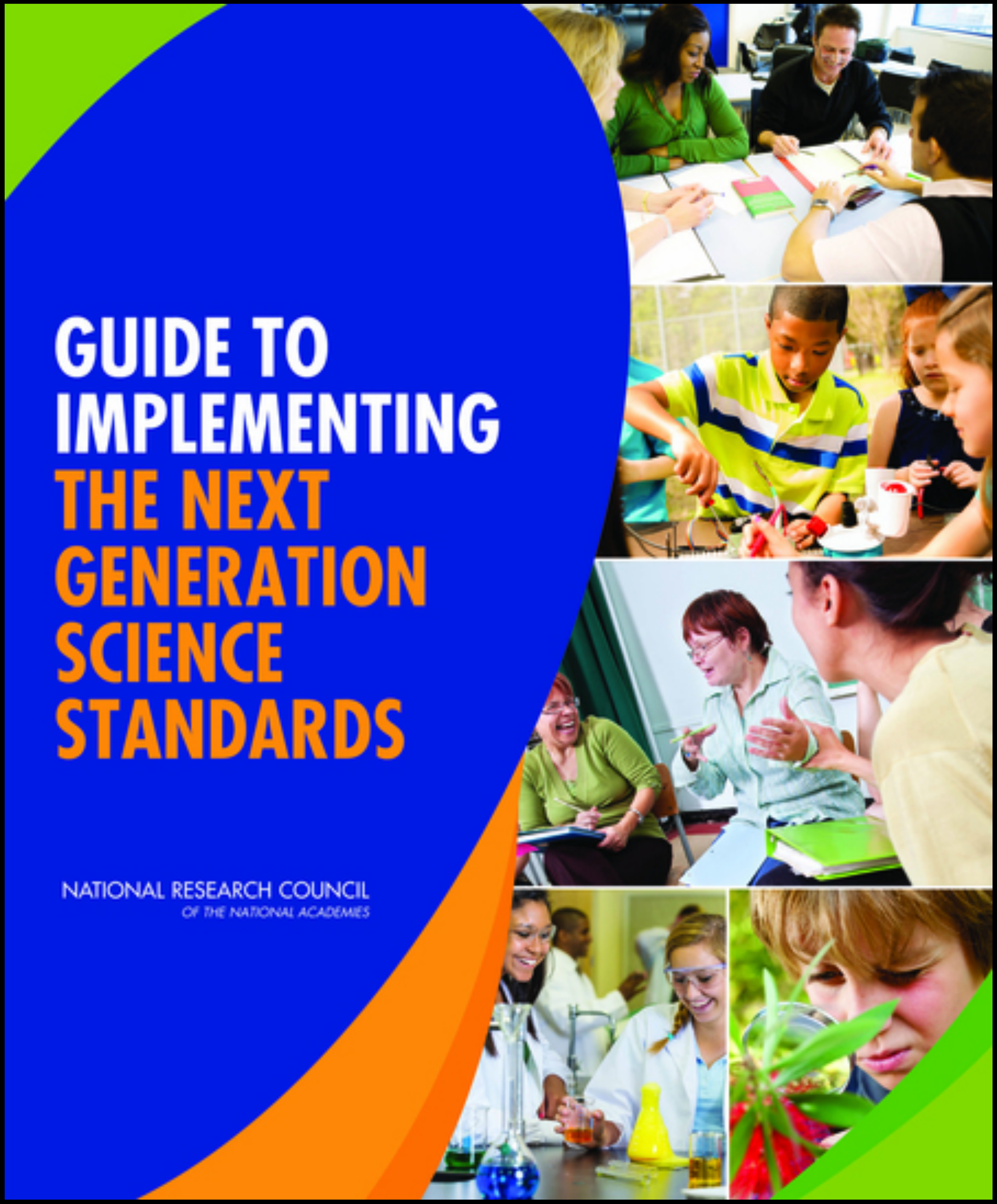
NGSS Lead States



“Standards alone accomplish very little.”

"Standards alone accomplish very little. But standards can help drive improvements when they inform all aspects of the educational system, including curriculum scope and sequence, curriculum resources, instruction, assessments, professional development for teachers and administrators, and state policies."


GUIDE TO IMPLEMENTING THE NEXT GENERATION SCIENCE STANDARDS
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Principles For Implementation

Components Of The System

Recommendations

Pitfalls

Drawing on existing National Research Council reports, the report will identify the parts of the education system that need to be attended to when implementing the standards and discuss the changes that need to be made to each part of the system. To address this charge, the committee examined the National Research Council reports on science education, as well as those on the broader education system. These sources were supplemented with peer-reviewed research on relevant topics and the members' collective expertise. 1See http://ngss.nsta.org/ for updates on which states have adopted the NGSS. 1-4   Overarching Principles for Implementation Successful implementation of the Next Generation Science Standards (NGSS) will take a sustained and coordinated effort. It will take multiple years to transition instruction in all classrooms in all schools in a district or state. To be successful, leadership at all levels need to carefully consider the changes and timeline that will be necessary to move toward the vision for science education laid out in the Framework for K-12 Science Education: Practices, Crosscutting Concepts, and Core Ideas (National Research Council, 2012) on which the NGSS are based. A first step in planning is to take stock of the current status of each major component of science education activity, both by itself and as part of a whole system, to determine what sequence of decisions and actions is needed and how long each change is likely to take. Some changes, such as starting to involve students in science and engineering practices in science classrooms, can be introduced quite quickly, though they will require more time and attention to be fully developed. Others, such as introducing new statewide assessments that are aligned with the NGSS, will require considerable time for development and testing before implementation (Bybee, 2013, National Research Council, 2014a). District and school leaders will also need to identify the critical policies and practices that can support or thwart the intended changes and make changes to these policies as needed. Examples include a district's adoption or development of particular curriculum materials and allocation of time and resources for teachers' professional development in science. Plans will need to include cultivating support among various communities for any needed policy changes. Those communities include critical actors both within and outside the school system. The key individuals in those communities need to be engaged early and repeatedly in the process, first to plan and later to provide critical feedback and support. The rest of this chapter discusses seven overarching principles can help guide planning: coherence across levels and components; the uniqueness of science; continuing support; need for networks, partnerships, and collaborations; sufficient time to implement well; equity; and ongoing and relevant communication. The specific recommendations in the remainder of the report incorporate the principles discussed below. Many of the pitfalls that we discuss in the remaining chapters arise when one or more of the principles are not applied effectively. 1) Attend to coherence across levels (state, district, schools), across grades, and across different components of the system (instruction, professional learning, curriculum, and assessment). Coherence matters (National Research Council, 2006b, 2012). Aligned and coherent supports and an expectation of ongoing collaborative work to understand and implement changes are key to successful reform efforts. The schools and school systems that are improving have all the components working together: tightly interwoven curriculum and assessment are connected 2-1   to management and evaluation processes, and these in turn drive professional learning at all levels (Smith and O'Day, 1991). Successful implementation of the NGSS, requires that all of the components across state, district, and school are aligned to support the vision in the Framework and NGSS. A standards-based system of science education needs to be coherent in a variety of ways (National Research Council, 2006b, 2012). It needs to be horizontally coherent: that is, the curriculum-, instruction-, and assessment-related policies and practices should all be informed by the standards, target the same goals for learning, and work together to support students' development of the knowledge and understanding of science. The system should be vertically coherent: that is, there should be a shared understanding at all levels of the system (classroom, school, school district, state) of the goals for science education and agreement about the purposes and uses of assessment. The system should also be developmentally coherent: that is, there needs to be a shared understanding across grade levels of what ideas are important to teach and of how children's understanding of these ideas can develop across grade levels. The Framework and NGSS support developmental coherence by describing how each core idea, practice, and crosscutting concept is expected to develop across the span from kindergarten through high school (K-12). In order to allow students to explore important ideas in science deeply across multiple grades, some topics that are currently taught may receive less emphasis or may need to be eliminated entirely (National Research Council, 2007). Coherence does not occur accidentally. To achieve it takes planning, political will, professional time, and on-going management. Leaders need to ensure that those responsible for different components or for different grade levels have the responsibility, opportunity, and authority to work together, rather than each moving ahead in isolation. At each school level or grade level within a school, those responsible for planning and implementing changes need to be aware of what changes are planned and what have already occurred in the earlier grades and also of what will be expected of the students in later grades. 2) Attend to what is unique about science Implementing science standards is different from implementing standards in English/language arts or mathematics, though some challenges will be similar. It is important to build on and coordinate with efforts to implement the new standards in mathematics and English/language arts while also attending to how science is different. Typically, there are fewer individuals with expertise in science and science pedagogy available within the school or district than individuals with comparable expertise in English/language arts and mathematics. And many administrators do not have science backgrounds. This kind of expertise is relevant when selecting instructional materials, sequencing curriculum, observing classrooms, and hiring educators. There are also some costs associated with science—for materials or laboratory space—that are different than the costs for mathematics and English/Language Arts. Finally, in many states, science is not as important for school and teacher accountability as the other two subjects and has therefore received less emphasis than they have. Implementation strategies have to respect and embody the differences between subjects even as they build on their similarities. Some pedagogical and classroom management strategies 2-2   apply across subjects, while some do not. It is important to consider links between standards in mathematics and English/language arts and the NGSS: one is the role of productive student discourse in all three and the changes in classroom culture required to support it (Michaels et al., 2008). A focus on science may pose particular challenges at the elementary level. In many schools and districts, very little science is currently taught in the elementary grades. According to a national survey of science education conducted by Horizon Research (see Trygstad, 2013), 39 percent of elementary classrooms did not include science every week. Elementary teachers spent, on average, only 20 minutes on science every day. In comparison, they spent 55 minutes for mathematics and 88 minutes for reading. Furthermore, analysis of 4th grade data from the 2009 National Assessment of Educational Progress (NAEP) in science showed that time spent on science varies widely by state, ranging from a low of 1.9 hours per week in Oregon, to a high of 3.8 hours per week in Kentucky , and that the time spent on science is significantly correlated with achievement in science (Blank, 2013).Data from California showed that 40 percent of elementary teachers spent an hour or less on science per week, and, of those, 13 percent spent less than 30 minutes per week (Dorph et al., 2011). Ensuring time for science at the elementary level is an important issue and will need to be considered early in the implementation process. That consideration needs to include the possibility of changing policies about time spent exclusively on other subjects.0 remediation, and the resources needed (such as space and materials) for investigative and design activities. It might also include discussion of how to integrate science, mathematics, and English/Language Arts (see National Academy of Engineering and National Research Council, 2014; National Research Council, 2014b). At the middle and high school levels, laboratory space and materials are more likely to be in place, but their role and use may need to be reconsidered to allow students to engage in the full range of science and engineering practices (National Research Council, 2006a). 3) Develop and provide continuing support for leadership in science at the state, district, and school levels. An early priority is to establish district and school leadership teams that involve a mix of stakeholders (including administrators, teachers, science education researchers, and representatives from the community) who are given the responsibility, resources, authority, and work time needed to lead the implementation effort. And before they can lead and support changes in instruction and curriculum, their learning needs need to be addressed, so they can then support the learning needs of all teachers. Teacher leaders are invaluable for supporting and institutionalizing changes. They work with other teachers and parents, as mentors to other teachers, and as facilitators of reflective learning, in the classroom and in the learning culture of a school (Coburn et al., 2012; Fogleman et al., 2006; Penuel and Riel, 2007; Spillane, 2006a, 2006b; Sun et al., 2013). The NGSS has already generated significant attention in the professional organizations of science teachers, such as the National Science Teachers Association and the National Science Education Leadership Association. Many science teachers are well ahead of their schools and even their states in thinking about the demands on their students that the NGSS will bring and how their own

Principle 1: Ensure coherence

- across levels (state, district, schools),
- across grades
- across different components of the system (curriculum, assessment, instruction, professional development)

Principle 1: Ensure coherence

Principle 2: Attend To What Is Unique About Science

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Table 4

A learning progression for understanding models as changeable entities

Level	Performances
4	*Students consider changes in models to enhance the explanatory power prior to obtaining evidence* supporting these changes. Model changes are considered to develop questions that can then be tested against evidence from the phenomena.
	Students evaluate competing models to *consider combining aspects of models* that can enhance the explanatory and predictive power.
3	*Students revise models in order to better fit evidence that has been obtained and to improve the articulation of a mechanism in the model.* Thus, models are revised to improve their explanatory power.
	Students compare models to *see how different components or relationships fit evidence more completely and provide a more mechanistic explanation of the phenomena.*
2	*Students revise models based on information from authority (teacher, textbook, peer) rather than evidence gathered from the phenomenon or new explanatory mechanisms.*
	Students make modifications to improve detail, clarity or add new information, without considering how the explanatory power of the model or its fit with empirical evidence is improved.
1	*Students do not expect models to change with new understandings*. They talk about models in absolute terms of right or wrong answers.
	Students compare their models to assess, if they are *good or bad replicas of the phenomenon.*

Principle 2: Attend To What Is Unique About Science

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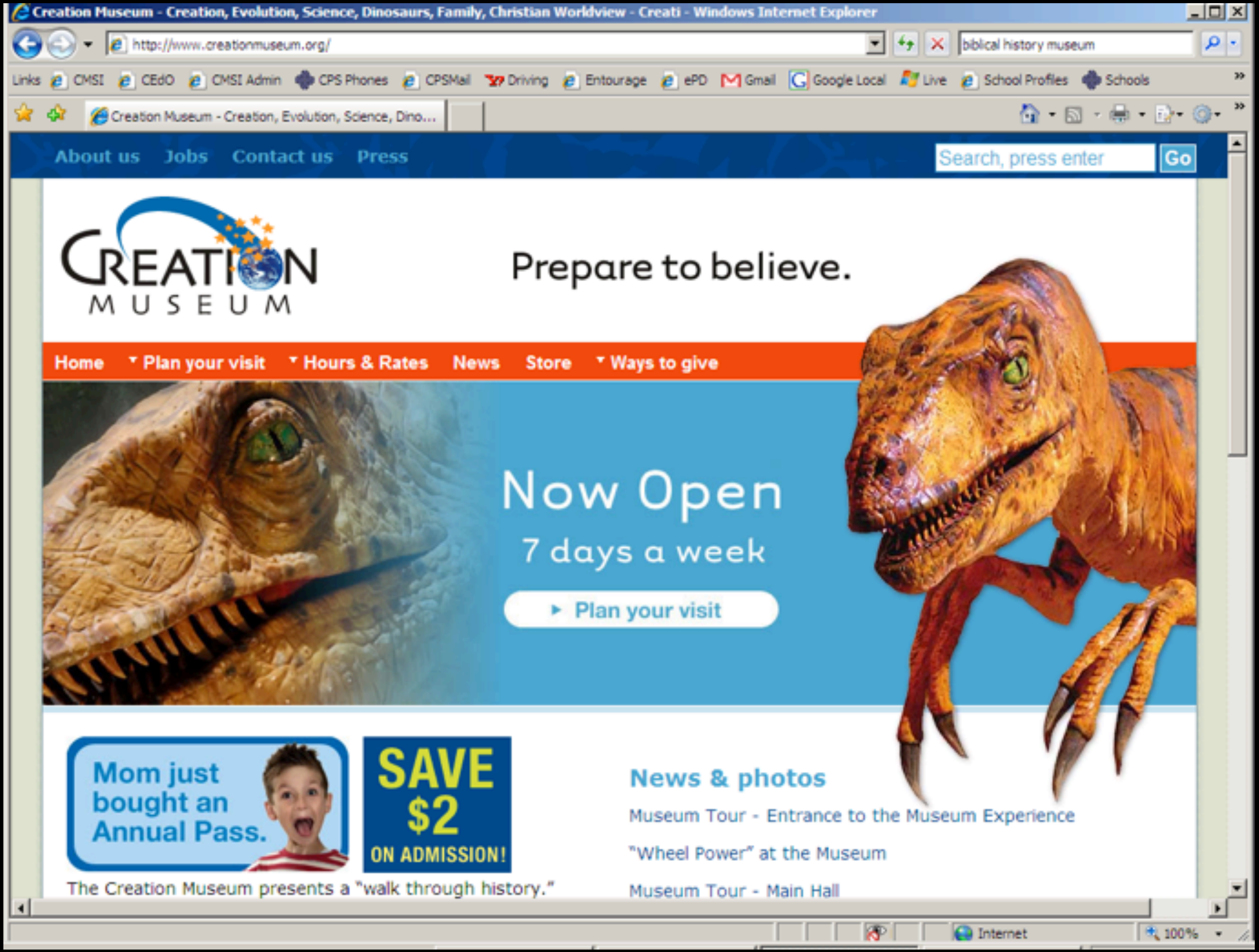

Principle 2: Attend To What Is Unique About Science

Principle 3: Develop and provide continuing support for leadership in science at the state, district and school levels

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Building Capacity for State Science Education (BCSSE)

NATIONAL SCIENCE EDUCATION LEADERSHIP ASSOCIATION

NSELA

NSTA National Science Teachers Association


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September

Principle 4: Build and leverage networks, partnerships, and collaborations

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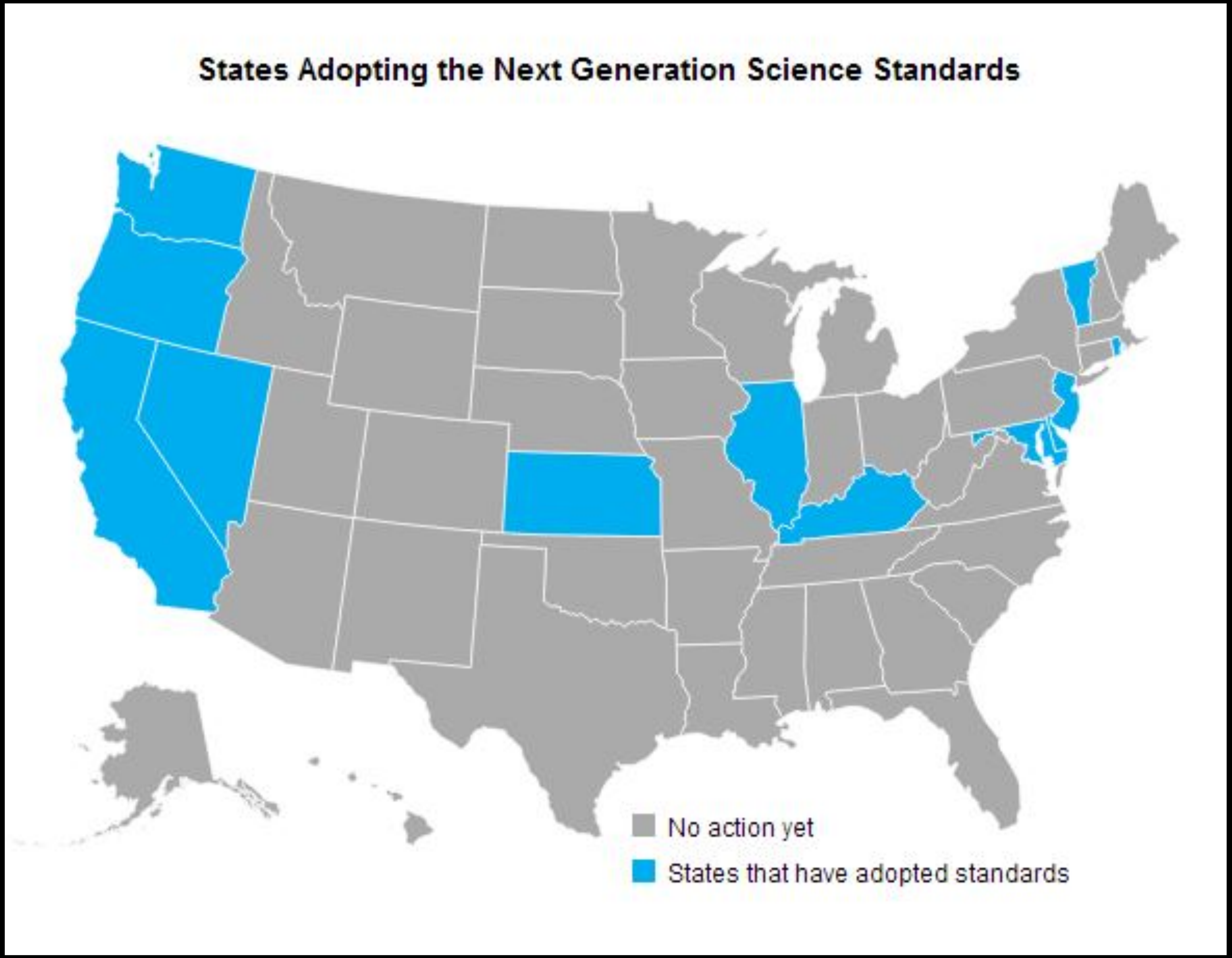
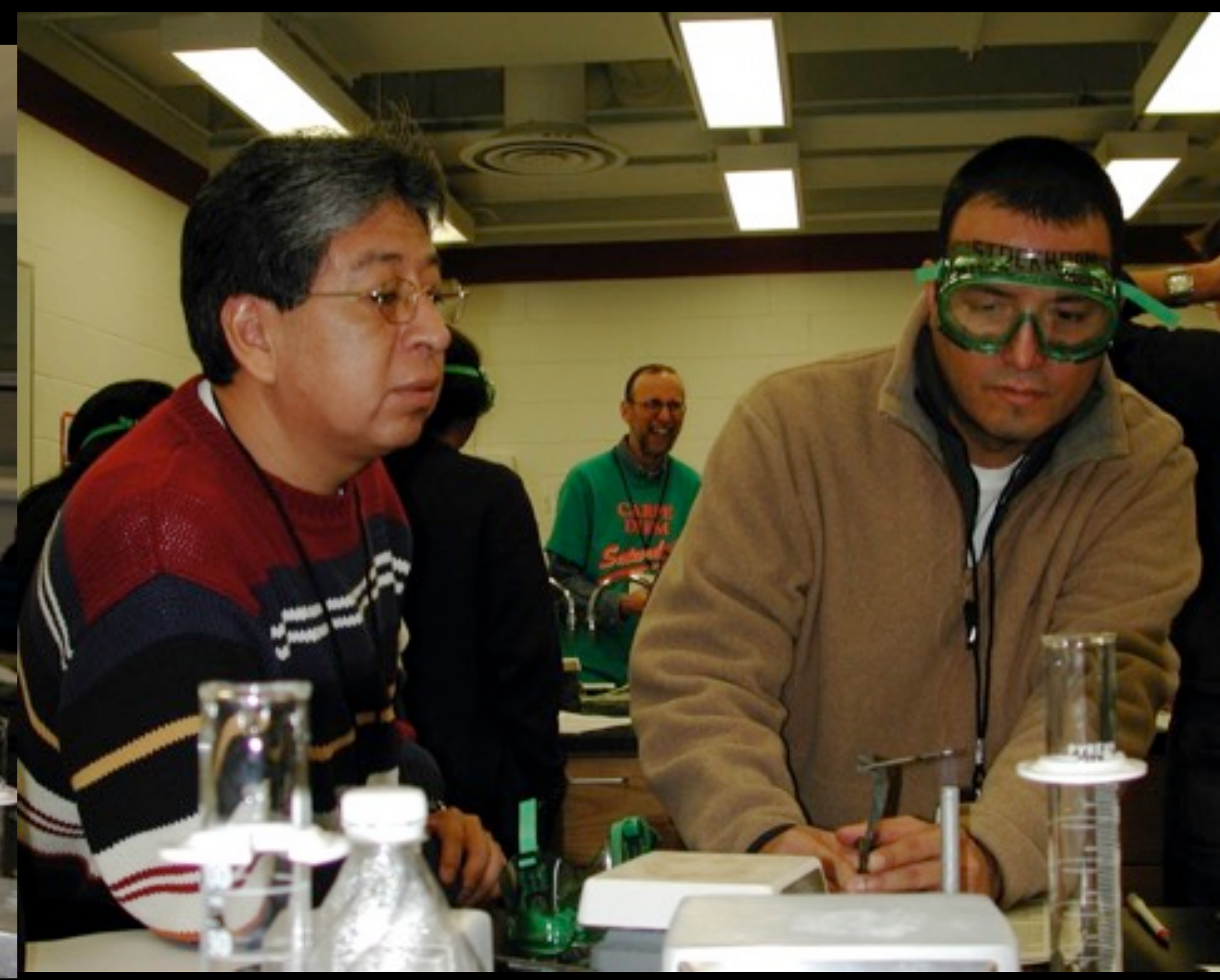



Agenda for I.C.
Inv 1:
Hands on
Tips / Tricks
V.I.I.
Inv 2:
Hands on
Cautions
Tip & Tricks
V.I.I


Where Are You?
Sisa
María Elena


CARPE
DIEM
Saturdays



Principle 5: Take enough time to implement well

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Principle 6: Make equity a priority

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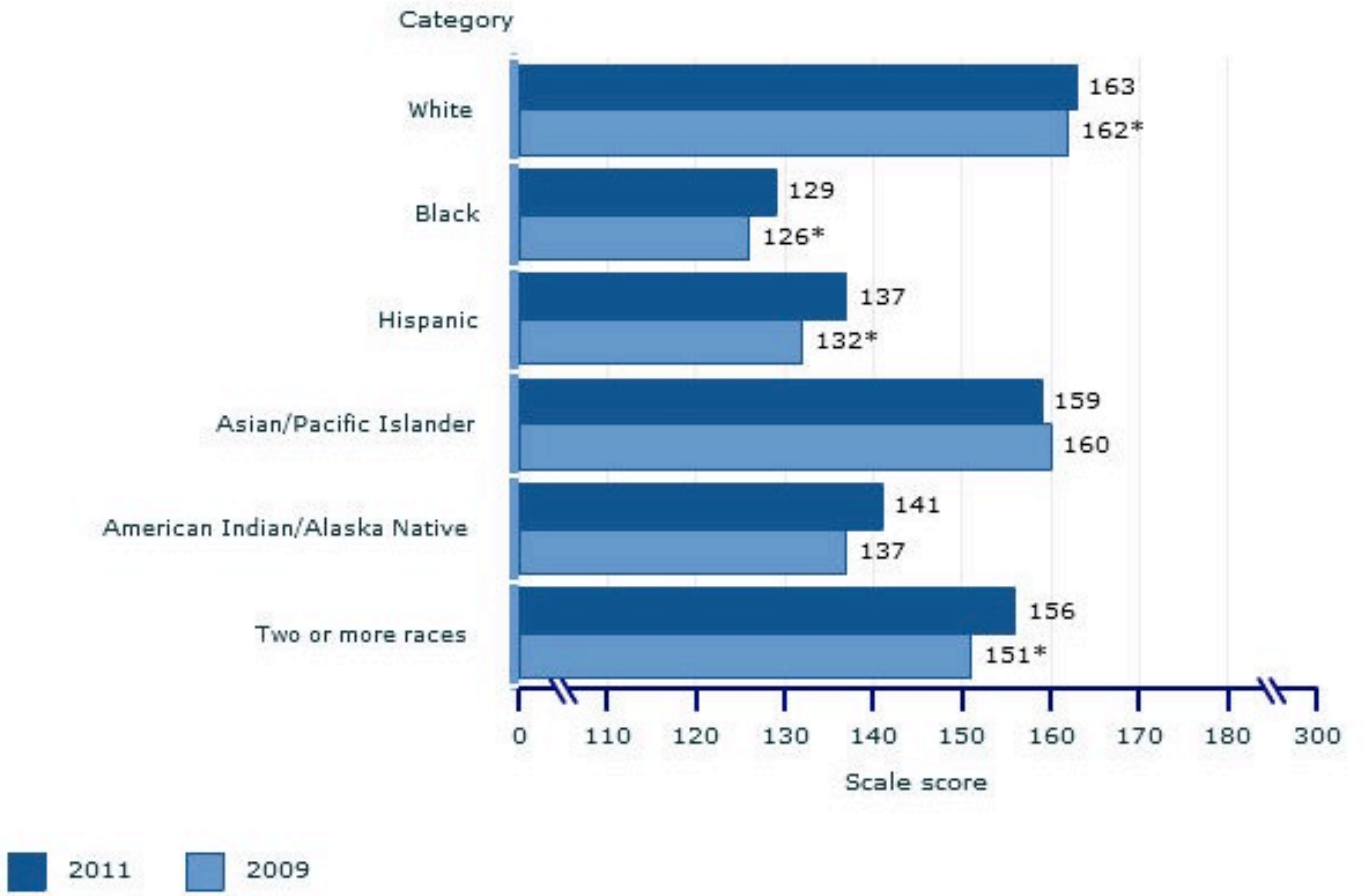
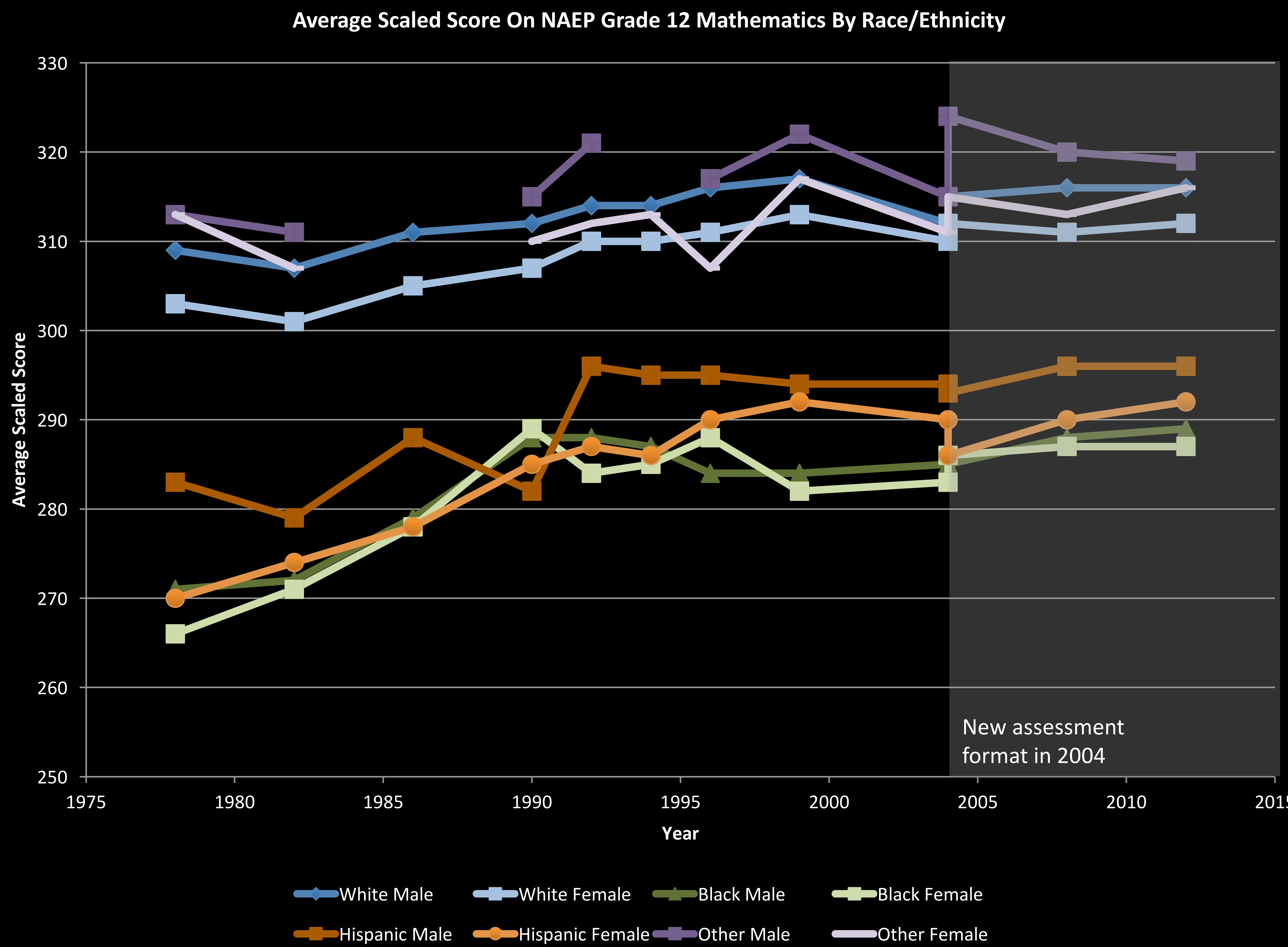


Category
White
163
162*
Black
129
126*
Hispanic
137
132*
Asian/Pacific Islander
159
160
American Indian/Alaska Native
141
137
Two or more races
156
151*
0
110
120
130
140
150
160
170
180
300
Scale score
2011
2009



Source: NAEP Longitudinal Data Explorer

Principle 7: Ensure that communication is ongoing and relevant

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1. Ensure coherence across levels, across grades, and across different components of the system
2. Attend to what is unique about science
3. Develop and provide continuing support for leadership in science at the state, district and school levels
4. Build and leverage networks, partnerships, and collaborations
5. Take enough time to implement well
6. Make equity a priority
7. Ensure that communication is ongoing and relevant

Principles For Implementation

↓

Components Of The System

↓ ↓

Recommendations Pitfalls

Instruction

Professional Learning

Curriculum Materials

Assessment

Collaboration

Policy and Communication

Instruction

Professional Learning

Curriculum Materials

Assessment

Collaboration

Policy and Communication

Instruction

RECOMMENDATION 1

Communicate and support a vision of instruction that is consistent with the Framework and the Standards

RECOMMENDATION 2

Support teachers in making incremental and continuing changes to improve instruction.

Instruction

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RECOMMENDATION 2

Support teachers in making incremental and continuing changes to improve instruction.

Less	More
Rote memorization of facts and terminology	Facts and terminology learned as needed while developing explanations and designing solutions supported by evidence-based arguments and reasoning
Learning of ideas disconnected from questions about phenomena	Systems thinking and modeling to explain phenomena and to give a context for the ideas to be learned
Teachers providing information to the whole class	Students conducting investigations, solving problems, and engaging in discussions with teachers' guidance
Teachers posing questions with only one right answer	Students discussing open-ended questions that focus on the strength of the evidence used the generate claims.

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Less	More
Students reading textbooks and answering questions at the end of the chapter	Students reading multiple sources, including science-related magazine and journal articles and web-based resources; Students developing summaries of information
Pre-planned outcome for "cook-book" laboratories or hands-on activities	Multiple investigations driven by students' questions with a range of possible outcomes that collectively lead to a deep understanding of established core scientific ideas
Worksheets	Students writing of journals, reports, posters, media presentations that explain and argue
Oversimplification of activities for students who are perceived to be less able to do science and engineering	Providing supports so that all students can engage in sophisticated science and engineering practices

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Instruction

RECOMMENDATION 3

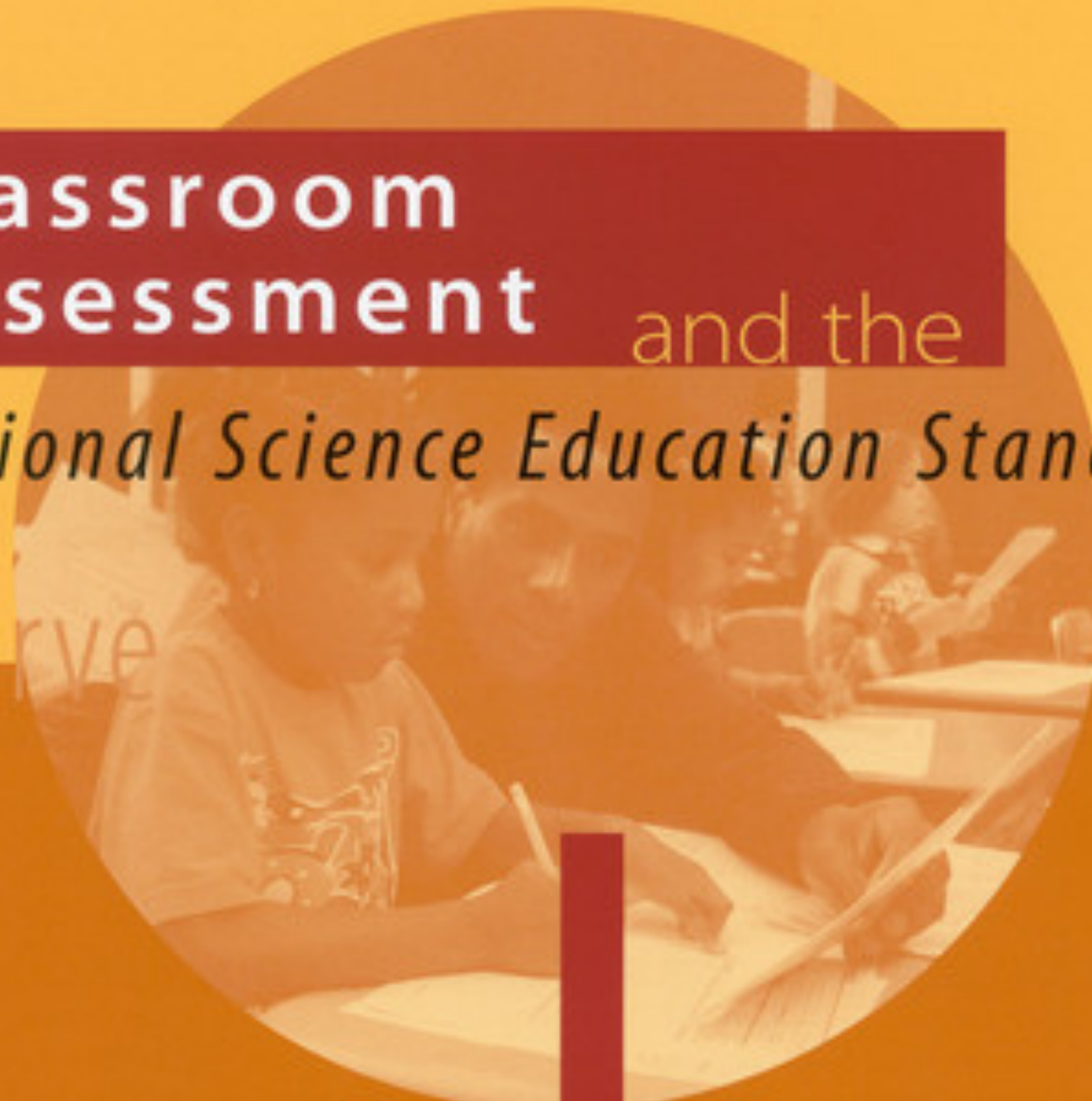
Develop a classroom culture that supports the new vision of science education.

RECOMMENDATION 4

Make assessment part of instruction.

evaluate

Classroom Assessment and the *National Science Education Standards*



observe

reflect

measure

understand

NATIONAL RESEARCH COUNCIL

Instruction: Pitfalls

- Providing Insufficient Support for Students
- Focusing Exclusively on the "Right Answers"
- Assigning Unproductive Student Tasks
- Expecting Instruction to Change Overnight
- Expecting Teachers to Do It Alone
- Being Reluctant to Let Go of Familiar Units or Favorite Activities

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Your Name: ____________________ Period: ____________________

Partner: ____________________ Date: ____________________

Partner: ____________________ Bag: ____________________

Purpose: To calculate the density of an object.

Pre-Lab: A block of gold has a length of 4.5 cm, a width of 2.3 cm, and a height of 7.2 cm. It's mass is 2 g. What is it's density?

Hypothesis: Which of the four objects has the greatest density? (Make an *educated* guess.)

Data: Complete the table using the information your group measured. Do your calculations on the back, and *show your work.*

Object	Material	Length (cm)	Width (cm)	Height (cm)	Volume (cm^3)	Mass (g)	Density (g/cm^3)	Float or sink?
A								
B								
C								
D								

Conclusion: Answer in complete sentences.

1. What four things do you need to find the density of an object?
2. What state (solid, liquid, gas) are your objects?
3. Which object has the greatest density?
4. Two of your densities should be almost the same number. Which objects have the closest densities? What materials are they made of?
5. If I gave you two different sized pieces of iron, one with a mass of 10g and one with a mass of 1000g, which will have the greater density? *(Careful!)*


What's the Density Of Water?


TELOPHASE I
PROPHASE II
METAPHASE I
ANAPHASE II
ELOPHASE I
METAPHASE II
ANAPHASE II

Instruction

Professional Learning

Curriculum Materials

Assessment

Collaboration

Policy and Communication

Professional Learning

RECOMMENDATION 5

Begin with leadership

RECOMMENDATION 6

Develop comprehensive, multiyear plans to support teachers’ and administrators’ learning.

Professional Learning

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PUBLIC AGENDA

“Despite forceful calls from business leaders and policymakers to upgrade math and science education, most superintendents (59%) and principals (66%) say this is not a serious problem in their local schools.”

Professional Learning

RECOMMENDATION 5

Begin with leadership

RECOMMENDATION 6

Develop comprehensive, multiyear plans to support teachers' and administrators' learning.

Professional Learning

RECOMMENDATION 7

Base design of professional development on the best available evidence

RECOMMENDATION 8

Leverage networks and partners

Professional Learning

RECOMMENDATION 7

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RECOMMENDATION 8

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own classroom have had to leave it to become administrators, district leaders, or policy-makers.

The Coming Age of Teacherpreneurs

America's public education system needs teacherpreneurs—classroom experts who teach students regularly, but also have time, space, and reward to spread their ideas and practices to colleagues as well as administrators, policy-makers, parents, and community leaders. The Center for Teaching Quality has supported as well as documented how this special brand of teacher leaders has begun to serve as online coaches, edugame developers, community organizers, and policy analysts, without leaving the classroom (*14*). In doing so, they have begun to solve problems of student and teacher learning that today's reformers have yet to identify. Daunting barriers remain, including the relatively large number of educators in school systems who never teach, the highly prescriptive teaching day, and top-down reformers whose political agendas are out of sync with the ideas of classroom experts. However, teacherpreneurs, because of their deep knowledge of students, families, and communities, are more likely to be embraced by their colleagues.

I am optimistic. Most Americans have trust and confidence in individual teachers (*15*), and new technologies that amplify teachers' collective wisdom and the impact of their leadership will resonate with parents and the public. Additionally, MetLife's most recent survey revealed that one in four teachers nationwide are extremely or very interested in hybrid roles that would allow them to both teach and lead outside their schools, districts, and states (*16*).

While these classroom experts should be highly paid, teacherpreneurship is not mainly about establishing a new income stream for underpaid professionals. It is much more about rewarding a new culture of schooling and creativity. As Peter Drucker said of entrepreneurs almost 50 years ago, "search for change, respond to it and exploit opportunities (*17*)." It is time for America to cultivate teacherpreneurs who will do the same, deepening and spreading best policies and practices for 21st-century teaching and learning.

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REVIEW

Professional Development for Science Teachers

Suzanne M. Wilson

The Next Generation Science Standards will require large-scale professional development (PD) for all science teachers. Existing research on effective teacher PD suggests factors that are associated with substantial changes in teacher knowledge and practice, as well as students' science achievement. But the complexity of the U.S. educational system continues to thwart the search for a straightforward answer to the question of how to support teachers. Interventions that take a systemic approach to reform hold promise for improving PD effectiveness.

Calls for improving science education in the United States, such as raising standards for all children and focusing the curriculum, are loud and clear. The Next Generation Science Standards (NGSS) [www.nextgenscience.org (*1*)] press for a vision of science teaching that emphasizes students' active engagement in genuine scientific problems, a commitment to "less is more," and an approach to make science appealing to all students. Of central importance are scientific practices and the integration of students' learning of core disciplinary concepts with active engagement in doing science (*2*). In addition, an increased emphasis on studying engineering is integrated throughout this new vision of science teaching and learning. Helping current teachers acquire the knowledge, skill, and will to meet these new standards is a daunting enterprise requiring large-scale professional development (PD) of high quality that is adaptable across myriad contexts.

Teachers in the United States have access to a wealth of PD opportunities, including summer institutes, coaching, mentoring, school-based professional learning communities, research experiences with practicing scientists, and "make-and-take" events that introduce teachers to new materials. Teachers study together, conduct inquiries, read research, learn new technologies, navigate multimedia environments, and read cases. These PD programs have different goals: Traditionally, much PD has focused on enriching teachers' content knowledge (CK), introducing new curriculum and instructional materials, enhancing pedagogical CK, or educating them about scientific inquiry. The U.S. PD system is a carnival of options.

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Research on Science PD

Carefully designed research, drawing from a range of disciplinary approaches from ethnographies to randomized clinical trials, has begun to shed light on what makes for effective PD. Five general characteristics have been identified: (i) focusing on specific content, (ii) engaging teachers in active learning, and (iii) enabling the collective participation of teachers (sometimes administrators), as well as (iv) coherence (aligned with other school policy and practice) and (v) sufficient duration (both in intensity and contact hours) (*3*–*6*).

Researchers have nominated five additional factors for effective PD: (i) activities are close to practice (*7*), (ii) participants' physical and psychological comfort is taken into account (*8*), (iii) teachers are immersed in inquiry experiences and witness models of inquiry teaching (*6*), (iv) curriculum materials are educative for teachers and students (*9*, *10*), and (v) teachers receive direct instruction in the teaching specified in inno-

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2. engaging teachers in active learning
3. enabling the collective participation of teachers (sometimes administrators)
4. coherence (aligned with other school policy and practice)
5. sufficient duration (both in intensity and contact hours)

Professional Learning: Pitfalls

- Underestimating the Shift Needed in One’s Own Practice
- Underestimating the Need for Ongoing Support
- Failing to Provide Opportunities for Administrators to Learn About the NGSS
- Offering “One Size Fits All” Learning Opportunities

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Unpacking the NGSS

SUMMER PROFESSIONAL DEVELOPMENT

Date and Time: Wednesday, July 22, 2015; 8:30-3:00
Target Audience: K-12 teachers, administrators, STEM coordinators
Registration Fee: $75 (discount is available for those who sign up for two or more summer PDs)

Description: The Next Generation Science Standards (NGSS) website includes many fantastic features that might be hard to find without an expert guidance. Let's unpack the standards together! Participants in this PD will explore the NGSS website, discover its many features and search options, compare standards with the Massachusetts' revised STE framework, and practice using both resources to guide the development of integrated STEM units. The second part of the day will be devoted to standard-based lesson planning in grade level teams.

Tentative agenda:

- Opening and introduction
- Unpacking the NGSS
  - Background
  - The Frameworks for K-12 Science Education
  - The three domains: practices, concepts, and disciplinary core ideas
  - How to search the NGSS website

Bringing Next Generation Science Standards Outdoors

Adopt-An-Ecosystem and CIMBY Teacher Professional Development Day
Northside College Preparatory High School, 5501 N Kedzie Ave, Chicago, IL 60625 (Tentative)
Saturday, October 4, 2014, 8:30 a.m. – 3:30 p.m.

Join us as we explore rich learning environments right outside of your classroom. Learn from local environmental experts, practice place-based service learning techniques, and take home supplies and resources. CPS high school and middle school science teachers are encouraged to attend (CIMBY teachers are required). CPS will provide 5 CPDUs, funding for Adopt-An-Ecosystem field experiences, lesson plans and kits, breakfast and lunch.

Sessions will focus on the eight Science and Engineering Practices (Examples below)

- *Asking questions and defining problems*: Adopt-A-Beach Classroom Connections
- *Developing and using models*: Dichotomous Key ID
- *Planning and carrying out investigations*: Chicago Wilderness Habitat Research
- *Analyzing and interpreting data*: Macroinvertebrate Bingo
- *Using mathematics and computational thinking*: Percent Cover and Vegetation Monitoring
- *Constructing explanations and designing solutions*: Chicago River Water Chemistry
- *Engaging in argument from evidence*: Calumet Mysteries
- *Obtaining, evaluating, and communicating information*: Urban Ecology and Local Wildlife

Register on CPSU, search for 'Bringing NGSS' (Code: 24060).

Contact Samantha Mattone at scmattone@cps.edu or 773-553-6386 for more information.

Next Generation Science Standards Workshop II

Lessons and Activities for the Classroom

Date: March 25, 2014 (Tuesday)
OR
April 21, 2014 (Monday)

Time: 8:15 - 9:00 : Registration
9:00 - 3:30 : Workshop
(Includes Lunch)

Location: Moraine Valley CC
Conference Ctr. (Bld. M)
Palos Hills, IL

Audience: Elementary thru HS:
- Science Teachers
- Science Curriculum Dir.
- Principals
- other Administrators

(School Teams Encouraged)

CPDUs: 5 Credits

Cost: $185 / person (Incl. Lunch)

Capacity: 350 Max. Per Session
(All prior dates have sold out.)

Deadlines: **March 25 Session**
Register By: **March 10**
Payment Due: **March 14**

April 21 Session:
Register By: **March 31**
Payment Due: **April 4**

To Register: http://ngss.info

The Next Generation Science Standards (NGSS) are scheduled for their second reading by ISBE in January 2014 and soon after, adoption. Implementing NGSS is a challenge! NGSS requires the integration of the three dimensions and a shift to a more student-centered learning environment where students demonstrate their ability to do science using the Science and Engineering Practices. This requires a shift in not only content covered, but in instructional methods as well. This transition is complicated and will take years to accomplish for most districts.

Join us as we talk in detail about bundling Performance Expectations into units and work through subject / grade specific lessons and activities that you can implement in your classroom!

In this workshop we will begin our day with a short full group presentation and then move quickly to break–out sessions where you will receive materials and instruction on NGSS aligned lessons and activities for a complete curricular unit for your grade / subject. After lunch, each content area will attend another session and work through a second instructional unit. At the end of the day you will have materials and resources for two curricular units that are aligned with NGSS!

This workshop will be led by Dr. Carol Baker, NGSS Writing Team Member. You will have a chance to hear from teachers who are currently teaching NGSS aligned units and gain further insight that will help you in your implementation efforts!

This is a hands-on workshop given by experts with a deep understanding of the NGSS. Please come prepared to “dig into” the NGSS. If you have a laptop to use, consider bringing it as most materials will be developed and shared electronically. Free WiFi will be available but may be limited.

NOTE: This is our “NGSS Level II” workshop. It is highly recommended that participants for this workshop have attended a Level I workshop, introducing NGSS, given by Dr. Carol Baker or Norm Dahm. Examples include our NGSS workshops held in 2013 (Fermilab, Argonne, Champaign) or IL-ASCD NGSS Workshops (12/2013 - Bloomington, 02/2014 - Naperville). We highly recommend that those who have not attended a Level I workshop participate in our 3-4 hour online Introduction to NGSS Webinar. See our website for details.

Instruction

Professional Learning

Curriculum Materials

Assessment

Collaboration

Policy and Communication

Curriculum Materials

RECOMMENDATION 9

Do not rush to completely replace all curriculum materials.

RECOMMENDATION 10

Decide on course scope and sequencing.

RECOMMENDATION 11

Be critical consumers of new curriculum materials.

RECOMMENDATION 12

Attend to coherence in the curriculum.

Curriculum Materials

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Curriculum Materials

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Table 2: Conceptual Progression Model Course Map – High School

The table below connects the high school NGSS performance expectations to the component ideas from the *Framework* that they were based on. These connections are based on the information in the NGSS foundation boxes. In this table, the component ideas are arranged into courses based on the organization shown in Figure 3.

COURSE 1

PS1.A	HS-PS1-1.
	HS-PS1-2.
	HS-PS1-3.
	HS-PS1-4.
PS1.B	HS-PS1-5.
	HS-PS1-6.
	HS-PS1-7.
PS2.A	HS-PS2-1.
	HS-PS2-2.
	HS-PS2-3.
PS2.B	HS-PS2-4.
	HS-PS2-5.
	HS-PS2-6.
PS3.A	HS-PS3-2.
	HS-PS3-3.
PS3.B	HS-PS3-1.
	HS-PS3-4.
PS4.A	HS-PS4-1.
	HS-PS4-2.
	HS-PS4-3.
	HS-PS4-5.
LS2.A	HS-LS2-1.
	HS-LS2-2.
ESS1.B	HS-ESS1-4.
ESS2.B	HS-ESS2-1.
	HS-ESS2-3.
ESS2.C	HS-ESS2-5.
ESS3.A	HS-ESS3-2.
ETS1.A	HS-ETS1-1
ETS1.B	HS-ETS1-3
	HS-ETS1-4
ETS1.C	HS-ETS1-2

COURSE 1 Repeats

PS1.B	HS-PS1-2.
	HS-PS1-4.
PS2.B	*HS-PS1-1.*
	HS-PS1-3.
PS3.A	*HS-PS2-5.*
PS3.B	HS-PS3-1.
PS4.A	*HS-ESS2-3.*
ESS1.B	*HS-ESS2-4.*
ESS2.B	*HS-ESS1-5.*

COURSE 2

PS3.C	HS-PS3-5.
PS4.B	HS-PS4-4.
LS1.A	HS-LS1-1.
	HS-LS1-2.
	HS-LS1-3.
LS1.B	HS-LS1-4.
LS1.C	HS-LS1-5.
	HS-LS1-6.
	HS-LS1-7.
LS2.B	HS-LS2-3.
	HS-LS2-4.
	HS-LS2-5.
LS3.A	HS-LS3-1.
LS3.B	HS-LS3-2.
	HS-LS3-3.
ESS1.A	HS-ESS1-1.
	HS-ESS1-2.
	HS-ESS1-3.
ESS2.A	HS-ESS2-1.
	HS-ESS2-2.
	HS-ESS2-3.
	HS-ESS2-4.
ESS2.D	HS-ESS2-6.
ESS3.B	HS-ESS3-1.

COURSE 2 Repeats

PS3.D	HS-PS3-3.
	HS-PS3-4.
	HS-PS4-5.
	HS-LS2-5.
	HS-ESS1-1.
PS4.B	HS-PS4-3.
	HS-PS4-5.
	HS-ESS1-2.
PS4.C	HS-PS4-5.
ESS2.A	HS-ESS2-1.
	HS-ESS2-3.
ETS1.A	HS-ETS1-1
ETS1.B	HS-ETS1-3
	HS-ETS1-4
ETS1.C	HS-ETS1-2

COURSE 3

PS1.C	HS-PS1-8.
LS2.C	HS-LS2-6.
	HS-LS2-7.
LS2.D	HS-LS2-8.
LS4.A	HS-LS4-1.
LS4.B	HS-LS4-2.
	HS-LS4-3.
LS4.C	HS-LS4-4.
	HS-LS4-5.
LS4.D	HS-LS4-6.
ESS1.C	HS-ESS1-5.
	HS-ESS1-6.
ESS2.E	HS-ESS2-7.
ESS3.C	HS-ESS3-3.
	HS-ESS3-4.
ESS3.D	HS-ESS3-5.
	HS-ESS3-6.

COURSE 3 Repeats

PS1.C	*HS-ESS1-5.*
	HS-ESS1-6.
LS2.C	HS-LS2-2.
LS4.C	HS-LS4-2.
	HS-LS4-3.
	HS-LS4-6.
ESS2.D	HS-ESS2-4.
	HS-ESS2-7.
	HS-ESS3-6.
ESS3.A	HS-ESS3-1.
ETS1.A	HS-ETS1-1
ETS1.B	HS-ETS1-3
	HS-ETS1-4
ETS1.C	HS-ETS1-2

Key to Highlighting
PE appears in two DCIs within the same course
PE is identified in NGSS as a secondary connection to this component idea
PE connected to two component ideas between two courses

Curriculum Materials: Pitfalls

- Asking "Which Standard Are You Teaching Today"?
- Waiting Before Beginning to Change Instruction
- Failing to Provide Resources to Support Student Investigations and Design Projects

Curriculum Materials: Pitfalls

- Asking "Which Standard Are You Teaching Today"?
- Waiting Before Beginning to Change Instruction
- Failing to Provide Resources to Support Student Investigations and Design Projects

WEEKLY LESSON PLANS

Week 13 11/25-11/29

Subject: Physical Science

Teacher: Lach

I. State your department's SIP State Goals. State the corresponding learning outcomes if applicable to your learning area.

Students will have a working knowledge of

- the concepts and basic vocabulary of biological, physical, and environmental sciences and their application to life and work in contemporary technological society.
- the social and environmental implications and limitations of technological development.
- the principles of scientific research and their application in simple research projects.
- the processes, techniques, methods, equipment, and available technology of science.

II. State the specific objectives for accomplishing these goals and outcomes.

Please see attached sheet for a list of the essential questions students will be able to answer.

III. List the resources and materials you are planning to use (textbooks, self–written materials, lessons, computers, etc.)

This week, I'll use the following materials.

- Some labs and playsheets that I've written.
- Metric rulers, double–beam balances, washers, paper clips, and 1 cm^3 blocks.
- A variety of chemicals with differing densities.

IV. Describe a variety of lessons and activities that will be done in the classroom. For each, describe what the teacher will do and what the students will do.

Please see attached sheet.

V. Describe how you will assess students' achievement of the objectives.

Classwork will be collected and graded for completion.

Labs will be collected and graded for accuracy.

Quizzes will be assigned and graded for accuracy.

Best work of students will be kept for their portfolio.

Rachel Carson Elementary School

CHICAGO PUBLIC SCHOOLS DAILY LESSON PLAN	
Name: Christina Pawelec Room: 310 Grade: 6	Date:
Time Frame: 60 min.	**Subject: Science Lab**
Connecting to Standards: Illinois Learning Standards	**ILS -** **12.B.** Know and apply concepts that describe how living things interact with each other and with their environment. **12.B.3a** Identify and classify biotic and abiotic factors in an environment that affect population density, habitat, and placement of organisms in an energy pyramid.
New Generation Science Standards	**MS-LS1-5.** Construct a scientific explanation based on evidence for how environmental and genetic factors influence the growth of organisms. **PS1-3.** Make observations and measurements to identify materials based on their properties.
Learning Outcomes/Goals	• Determine pH of various soil samples. • Choose a crop(s) best suited to grow in the Chicago area. • Design a garden for chosen crop(s).
Differentiated	Model all activities for students. Provide verbal and written directions in clearly stated steps. Provide visual aids, models, or examples. Allow more time for completion of class assignments. Work in group setting. Chunking text for notes. Lower level students may choose 2-3 crops. Higher level students may choose 5-6 crops and give evidence why other crops are unsuitable.
Assessment	Formative: Test various soil samples for pH. Research and collect information on various plants. Summative: Write a summary defending your choice of crop(s) suitable for planting within the area based on evidence gathered. Draw a blueprint for a garden using chosen crop(s).
Materials/Technology	Various soil samples / Small plastic cups or test tubes Hydrion pH strips / Toothpicks or stirrers Distilled water / Paper towels Crop cards / Chicago-area planting fact sheet Goggles / pH color scale

I can make observations to determine the effect of sunlight on the earth's surface.

I can build a structure that will change the warming effect of sunlight on the earth's surface.

Next Generation Science Standards "I Can" Statements: Kindergarten

Subjects	Science
Grade Levels	Kindergarten
Resource Types	Minilessons, Bulletin Board Ideas, Task Cards
Product Rating	4.0 29 ratings

PDF (Acrobat) Document File
Be sure that you have an application to open this file type before downloading and/or purchasing.
2.56 MB | 8 pages

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PRODUCT DESCRIPTION

Use these 13 printable kindergarten "I Can" statements to help introduce and teach the Next Generation Science Standards in a meaningful way (standard numbers included on each card). Each "I Can" card is accompanied with a kid-friendly illustration, so the standards can be introduced and revisited in a way that makes sense in a kindergartener's mind. With the simple language and visual reminders, kindergarteners are able to quickly learn and apply new science concepts.

Total Pages	8
Answer Key	N/A
Teaching Duration	N/A

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Assessment

RECOMMENDATION 13

Create a new system of science assessment and monitoring.

RECOMMENDATION 14

Help teachers develop appropriate formative assessment strategies.

DEVELOPING ASSESSMENTS FOR THE NEXT GENERATION SCIENCE STANDARDS

NATIONAL RESEARCH COUNCIL
OF THE NATIONAL ACADEMIES

Assessment: Pitfalls

- Failing to Differentiate the Purposes of Assessment
- Failing to Respond to Assessment Results
- Using Old Assessments While Mandating New Instructional Methods

Assessment: Pitfalls

- Failing to Differentiate the Purposes of Assessment
- Failing to Respond to Assessment Results
- Using Old Assessments While Mandating New Instructional Methods

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Collaboration

RECOMMENDATION 15

Create opportunities for collaboration.

RECOMMENDATION 16

Identify, participate in, and build networks.

RECOMMENDATION 17

Cultivate partnerships.

Collaboration: Pitfalls

- Lacking a Common Understanding of the Vision
- Having Competing Goals Among Partners
- Failing to Clarify Responsibilities and Monitor Partnerships
- Failing to Establish Mutually Respectful Relationships and Roles


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2014
Tulsa Public Schools
Twenty Thousand Dollars
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STEM Grant
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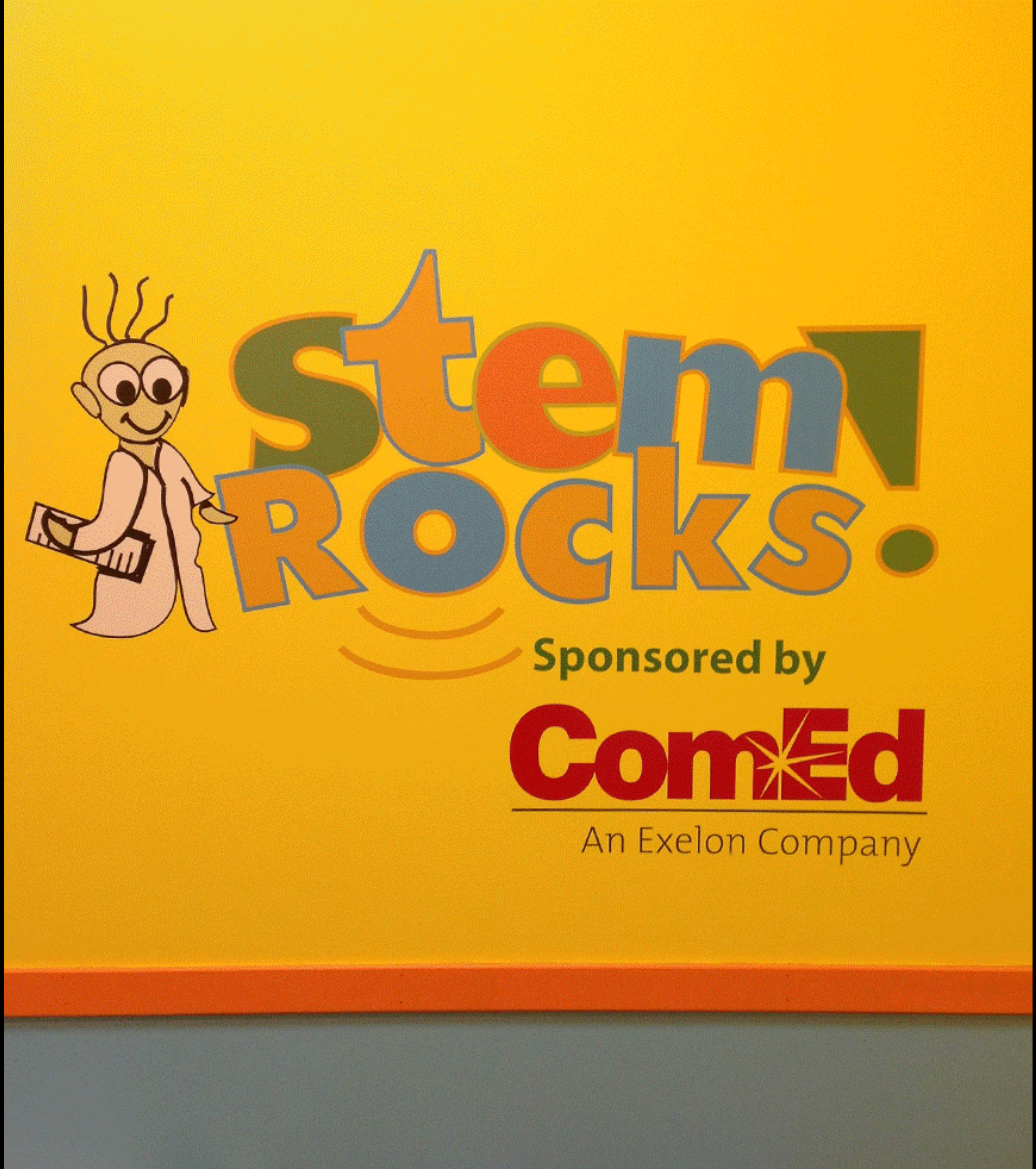
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Policy and Communication

Policy and Communication

RECOMMENDATION 18

Ensure existing state and local policies are consistent with the goals for implementing the Next Generation Science Standards.

RECOMMENDATION 19

Create realistic timelines and monitor progress.

Policy and Communication

RECOMMENDATION 20

Use A Framework for K-12 Science Education: Practices, Crosscutting Concepts, and Core Ideas and Next Generation Science Standards to drive teacher preparation.

RECOMMENDATION 21

Communicate with local stakeholders.

Policy and Communication: Pitfalls

- Assuming Existing Policies Are Adequate to Support the NGSS
- Failing to Communicate with Parents and the Community
- Being Unprepared for Unintended Consequences
- Assigning Responsibility without Authority or Resources


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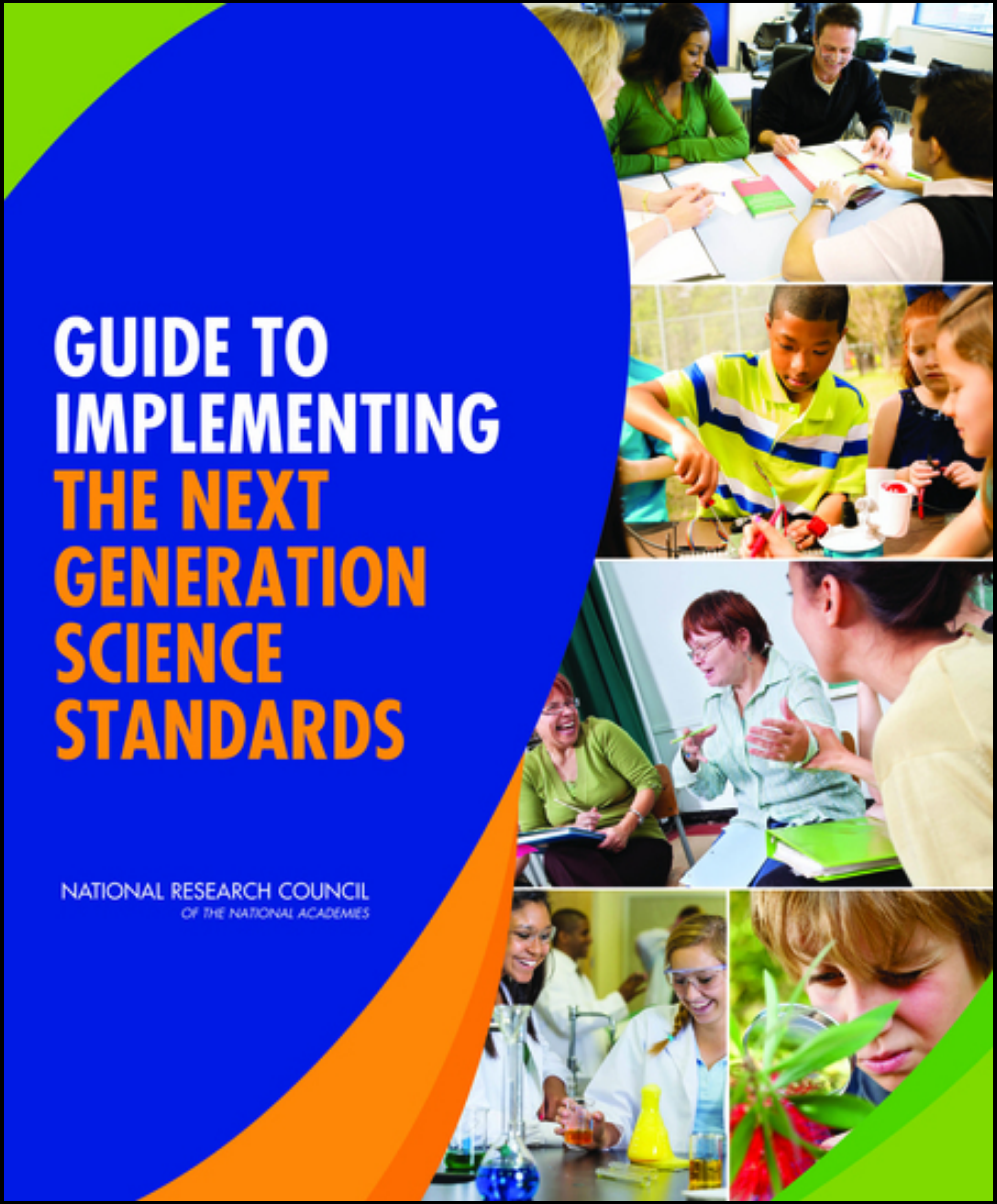
Components Of The System

Recommendations

Pitfalls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