NYSED SCIENCE UPDATE

THE OFFICE OF CURRICULUM & INSTRUCTION

Marybeth Casey, Director
Marybeth.Casey@nysed.gov

Erik Sweet,Supervisor
Erik.Sweet@nysed.gov

Ann Crotty,Associate in Instructional Service – Sci Ed
Ann.Crotty@nysed.gov

Nicole Marschilok,Associate in Instructional Services – Bio/Gen Sci
Nicole.Marschilok@nysed.gov

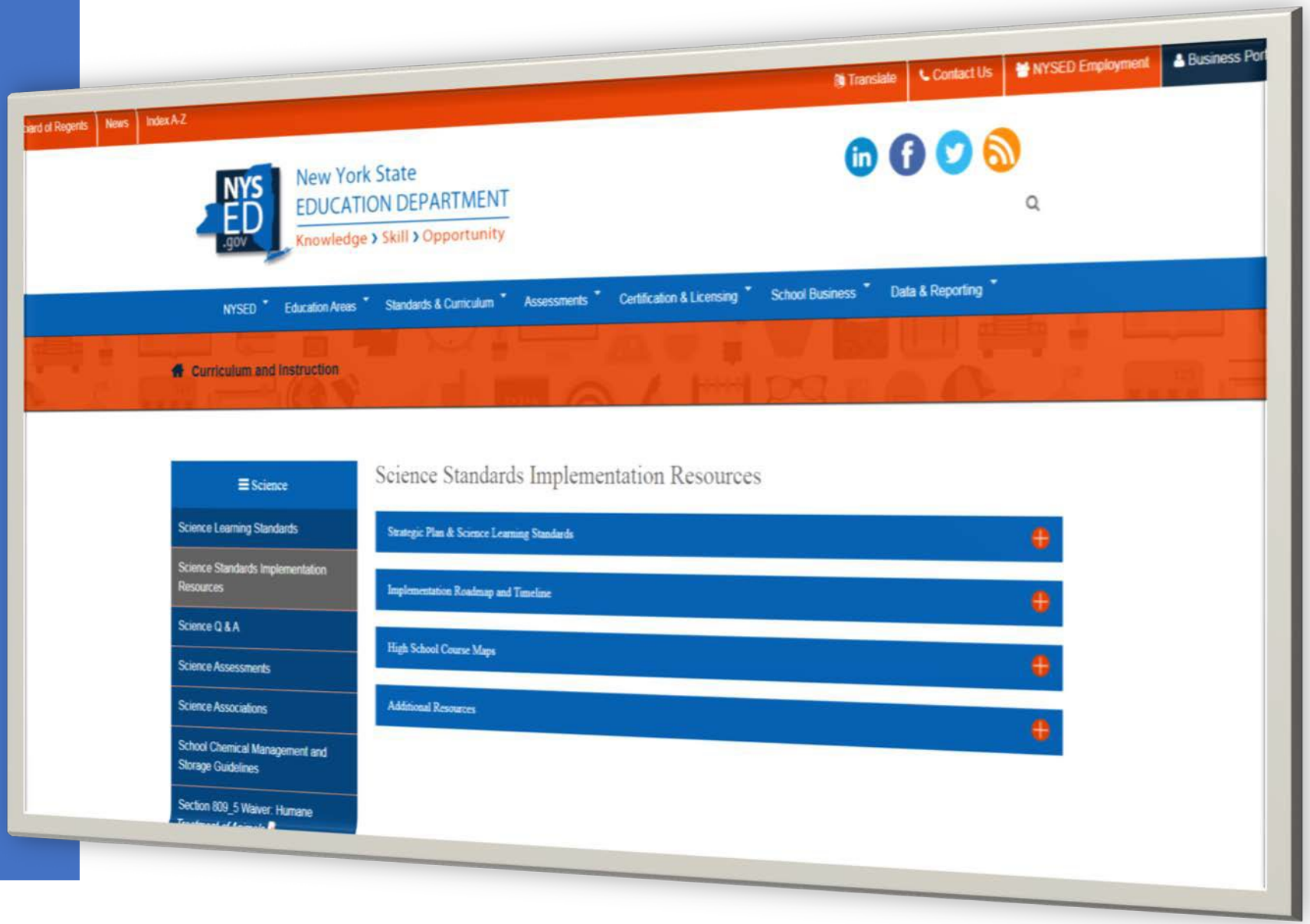
New York State
EDUCATION DEPARTMENT
Knowledge › Skill › Opportunity

NYS P-12 Science LEARNING STANDARDS

WELCOME!

SCIENCE

NYSED CURRICULUM AND INSTRUCTION WEBPAGE UPDATE



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NYS P-12 Science Learning Standards Implementation Roadmap

Phase I

July 2017- August 2019

- **Raise Awareness and Build Capacity**

Phase II

Sept. 2019 - August 2021

- **Transition and Implementation**

Phase III

Sept. 2021 - August 2024

- *Implementation and Sustainability*

NYSSLS Resources:

- Roadmap Overview and Frequently Asked Questions
- Introduction to New York State P-12 Science Learning Standards
- NYS P-12 Science Learning Standards

ROADMAP INTRODUCTION

The purpose of this New York State P-12 Science Learning Standards Implementation Roadmap is to serve as an at-a-glance guide for all stakeholder groups to facilitate attainment of the Statewide Strategic Plan for Science. This Roadmap is designed to assist in the transition to the new science standards as a resource that can be adapted by stakeholders at the local, regional, and state levels. Six key component areas as identified below, include a major goal supported by objectives and activities included in the Statewide Strategic Plan for Science. Effective standards implementation requires a system-wide commitment. The activities serve as a connection between the Statewide Strategic Plan for Science and this Roadmap is part of a larger comprehensive science standards systems implementation plan. Specific activities are suggested to be carried out through various actions by all stakeholder groups in a designated timeframe to create consistency across multiple levels over a multi-year, three-phase, implementation process. This roadmap is a tool that can be used to facilitate opportunities to engage every student in quality science education throughout their school career.

- **Outline of Contents**
  - Background
  - Component areas

All Phases	Phase I	Phase II	Phase III
• Standards • Curriculum • Professional Development to Enhance Instruction • Assessment • Materials and Resources Support • Administrative and Community Support	• Standards • Curriculum • Professional Development to Enhance Instruction • Assessment • Materials and Resources Support • Administrative and Community Support	• Standards • Curriculum • Professional Development to Enhance Instruction • Assessment • Materials and Resources Support • Administrative and Community Support	• Standards • Curriculum • Professional Development to Enhance Instruction • Assessment • Materials and Resources Support • Administrative and Community Support

  - Stakeholder groups
    - New York State Education Department-NYSED
    - Professional Learning Networks, Organizations and Associations
      - Teacher Centers, Department of Environmental Conservation, New York State Cultural Center, Regional Information Centers, STEM Hubs, Professional Associations, Higher Education Institutions, Informal Science Institutions, Business and Industry Partners
    - Educational Systems
      - Big 5/BOCES/Districts
  - Phases of implementation/PROPOSED Timeframes
    - **Phase I: Raise Awareness and Build Capacity** 07/2017-08/2019
    - **Phase II: Transition and Implementation** 09/2019-08/2021
    - **Phase III: Implementation and Sustainability** 09/2021-08/2024
- **General Organization Structure of the Roadmap**
  - Each component area is identified by a capital letter (A=Standards), with each objective identified by the component area letter and an objective number (A1=1st Standard objective). Each activity is identified by the key component area, the objective number and a lower-case letter (A1a=first activity within Standards component objective 1).
  - A checked box(es) identifies the phase(s) of implementation that an activity should be addressed by stakeholder groups. Activities may be addressed in more than one phase of implementation and may have different actions based on the stakeholder group and phase.

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NYS P-12 SCIENCE LEARNING STANDARDS IMPLEMENTATION ROADMAP

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NEW YORK STATE P-12 SCIENCE LEARNING STANDARDS IMPLEMENTATION ROADMAP		**Phases**		
		I	**II**	**III**
Goals/Objectives	**Key Implementation Activities**	**Raise Awareness and Build Capacity**	**Transition and Implementation**	**Implementation and Sustainability**
B. Curriculum Goal: Provide opportunities that are reflective of research and best practices for P-12 students to engage with scientific phenomena through implementation of innovative science curriculum programming that fosters learning, deep understanding, and application of core science content, conceptual understandings, and practices.				
B1. Objective: Survey current research pertaining to teaching and learning in science, science education, and cognitive science to develop relevant curriculum guidance and resources.	B1a.Explore, identify, and provide access to pertinent research.	✓		
	B1b.Align and incorporate relevant connections to engineering, technology, New York State Next Generation Mathematics Learning Standards (2017), and New York State Next Generation English Language Arts Learning Standards (Revised 2017).	✓		
	B1c.Provide funding opportunities for equitable development and/or adoption of exemplary science curriculum programming.	✓	✓	
	B1d.Develop articulated P-12 guidance to support curriculum development and implementation aligned to the new P-12 NYS science learning standards.	✓	✓	
	B1e.Provide funding opportunities for equitable implementation and evaluation of exemplary science curriculum programming at the regional and local levels.			✓
	B1f.Review and update curriculum guidance and resources to be reflective of changes in instructional technology, content, and best educational practices, emphasizing active engagement in STEM.			✓
B2. Objective: Build the capacity of regional centers and local school districts to implement curriculum and instructional programs that are based on the new P-12 NYS science learning standards.	B2a.Engage education stakeholders with expertise in various disciplines to support local and regional development, dissemination, and implementation of curriculum based on the new P-12 NYS science learning standards.	✓	✓	
	B2b.Leverage funding opportunities for partnerships and collaborations of science education stakeholders for the development, dissemination, and implementation of local and regional curriculum programming.	✓	✓	
	B2c.Support the implementation of exemplary, data-informed science curriculum programming and instructional materials, using cross-curricular connections from engineering, technology New York State Next Generation Mathematics Learning Standards (2017), and New York State Next Generation English Language Arts Learning Standards (Revised 2017) that strengthen, support, and reinforce the development of scientific literacy.		✓	
	B2d.Create opportunities that bring students into contact with working scientists, mathematicians, and engineers through innovative curriculum design, internships, and mentorships with institutes of higher education and/or business and industry partners.			✓
B3. Objective: Incorporate the use of technology to expand the development, dissemination, and implementation of curriculum	B3a.Leverage existing and seek new funding sources to support the use of technology to develop, disseminate, and implement science curriculum and instructional resources through various delivery platforms.			✓
	B3b.Utilize multiple platforms to access exemplary curriculum and instructional resources.			✓
	B3c.Build student resources by establishing community-based programs that provide relevant STEM applications in science curriculum and instructional programs.			✓

A checked box(es) identifies the phase(s) of implementation that an activity should be addressed by stakeholder groups.

Activities may be addressed in more than one phase of implementation and may have different actions based on the stakeholder group and phase.

D. Assessment Goal
D1. Objective
D1a. Activity

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PHASE II NEW YORK STATE P-12 SCIENCE LEARNING STANDARDS ROADMAP		**Actions** **Stakeholder Groups, Networks, and Partnerships** **NYSED, Professional Learning Networks,** **Big 5 School Districts, BOCES, School Districts,** **Institutes of Higher Education Partners, Business and Industry Partners…**	**Phase II** **09/2019-08/2021**
Goals/Objectives	**Key Implementation Activities**		**Transition and Implementation**
C3. Objective: Include components of science and engineering practices for pre-service STEM teacher and leader preparation programs and in continuing professional development opportunities that are based upon the new P-12 NYS science learning standards for in-service teachers and leaders.	C3a.Build teacher resources by establishing community-based programs that provide relevant STEM applications in science curriculum and instructional programs.		Phase II
	C3b.Create or access professional development opportunities that focus on the integration of science and engineering practices in STEM courses.		Phase II
	C3c.Articulate collaborations and partnerships between STEM stakeholders that support curriculum programming and instructional practices that are better aligned to college and career expectations.		Phase II
	C3d.Establish partnership programs between local education agencies and institutes of higher education to foster innovative comprehensive approaches that enhance pre-service and in-service teaching and learning of science and engineering practices.		Phase II
D. Assessment Goal: Support the development of assessments at the state, regional, and local levels that measure student achievement of all new P-12 NYS science learning standards, and use the data resulting from these assessments to enhance teaching and learning.			
D1. Objective: Explore established and contemporary science assessment models at the international, national, state, regional, and local levels to implement changes in the P-12 science assessment system that are reflective of the new NYS P-12 science learning standards.	D1a.Propose a P-12 science assessment system that reflects the core science content, conceptual understandings, and practices that are included in the new P-12 NYS science learning standards.		Also Phase I
D2. Objective: Understand and use relevant student achievement data from State	D2a.Collaborate with science education stakeholders statewide, regionally, and locally to provide professional development for teachers and leaders that is focused on		Also Phase I and III

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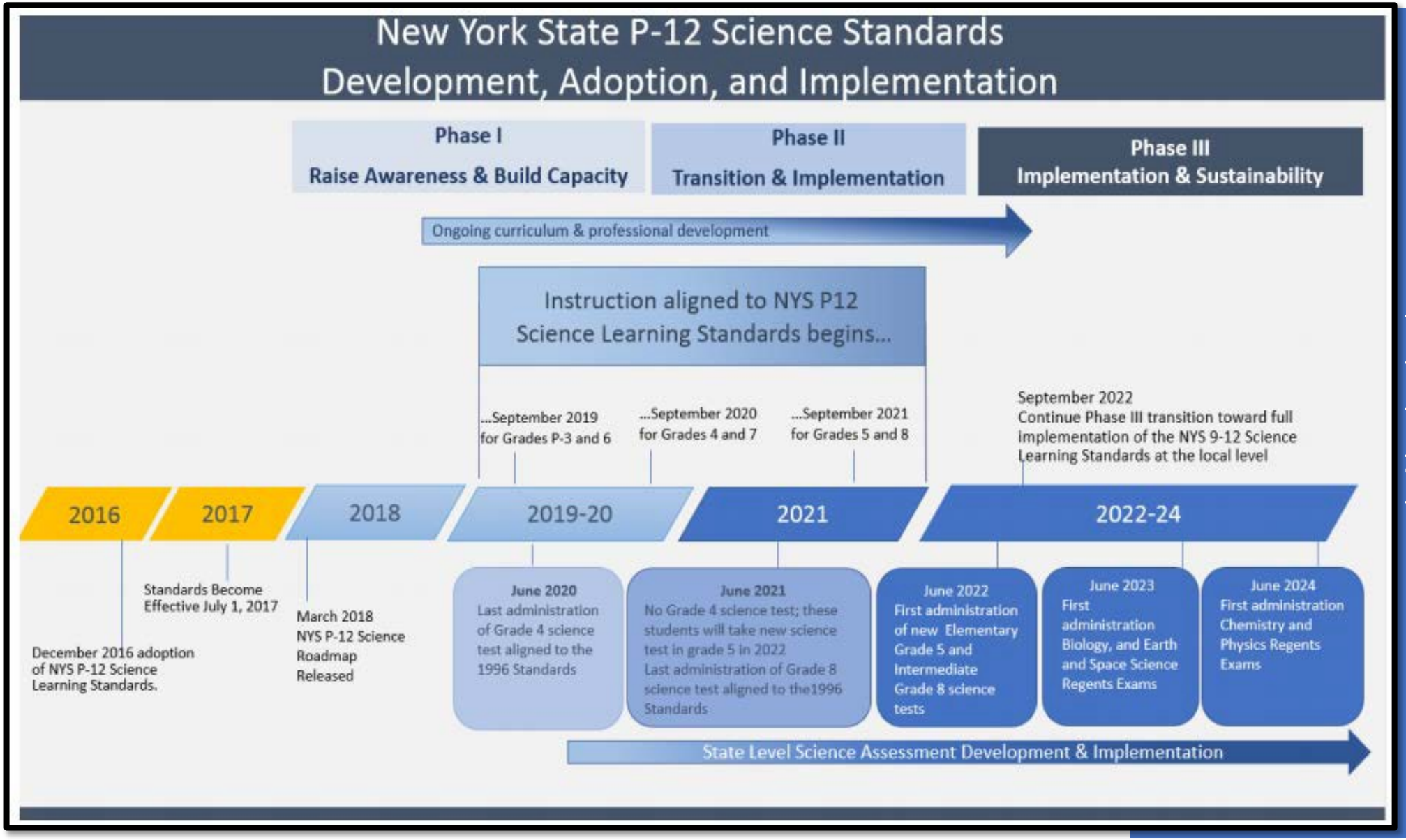
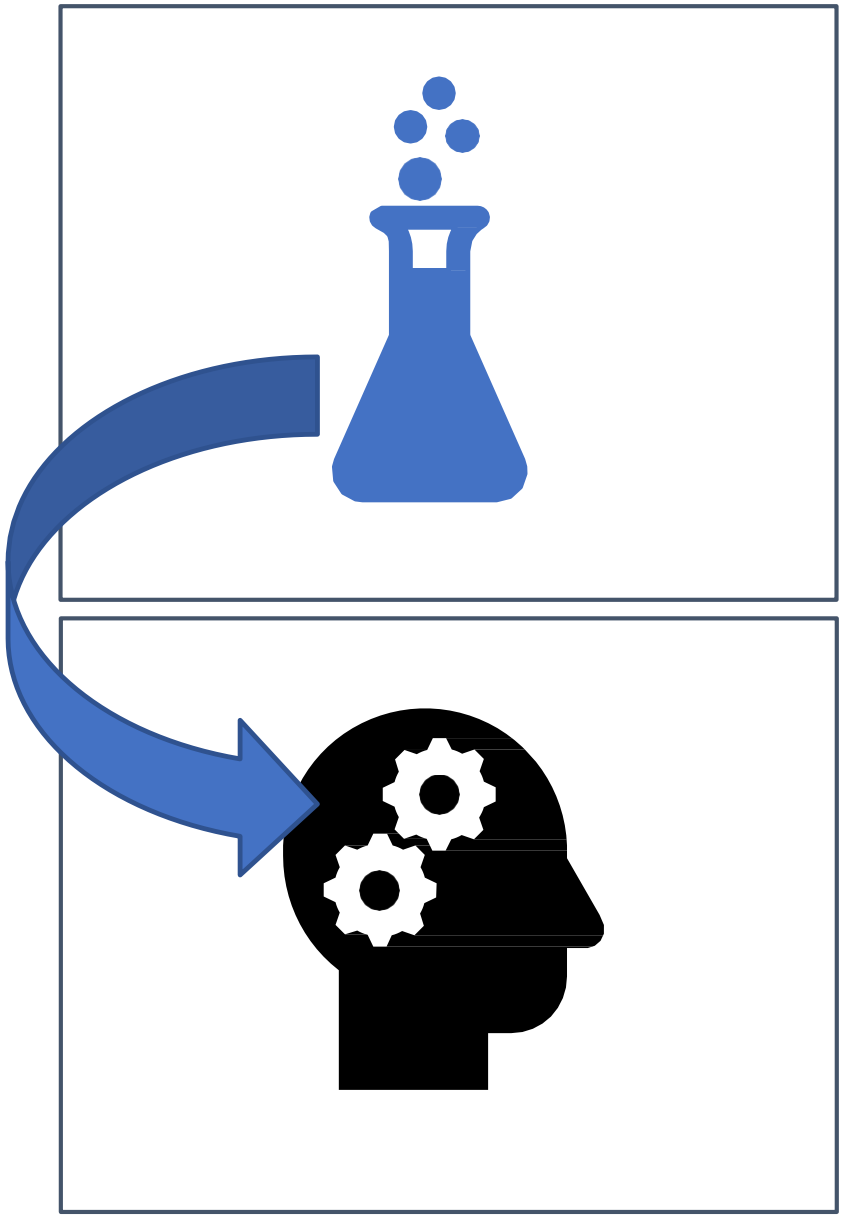
NEWYORK STATE P-12 SCIENCE TIMELINE





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SCIENCE ASSESSMENTS UPDATE

- Assessment Design Process
- Informing Instruction with Material Resulting from Assessment Design
- Timelines for New Assessments and (Tentatively) Releasing Test Development Documents
- Opportunities for Partnerships with NYSED to Prepare the Field for New Science Assessments

- New Science Assessments Measuring the NYS P-12 Science Learning Standards

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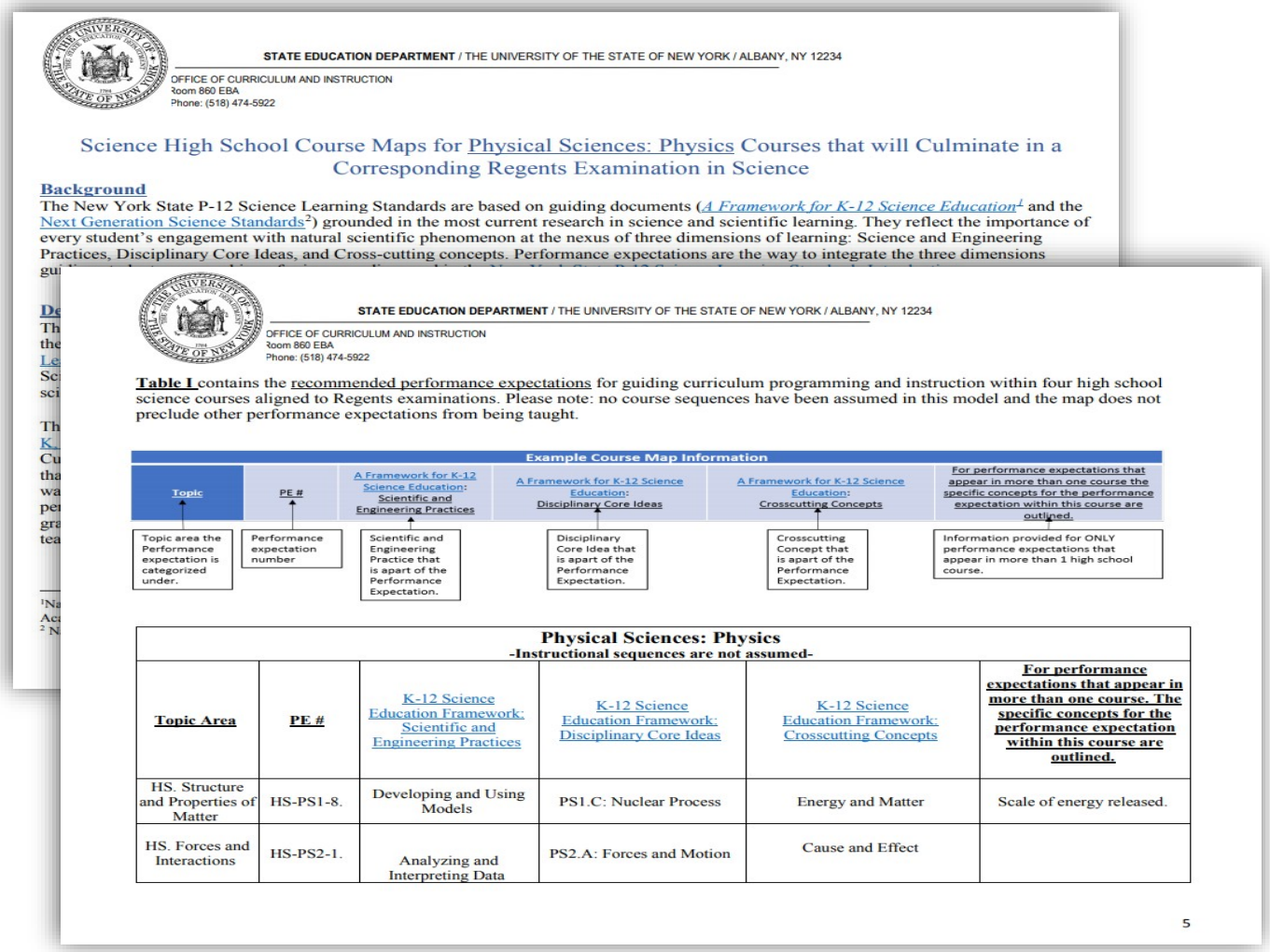
HIGH SCHOOL COURSE MAPS



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Room 860 EBA
Phone: (518) 474-5922

Science High School Course Maps for Physical Sciences: Physics Courses that will Culminate in a Corresponding Regents Examination in Science

Background

The New York State P-12 Science Learning Standards are based on guiding documents (*A Framework for K-12 Science Education*[1] and the Next Generation Science Standards[2]) grounded in the most current research in science and scientific learning. They reflect the importance of every student's engagement with natural scientific phenomenon at the nexus of three dimensions of learning: Science and Engineering Practices, Disciplinary Core Ideas, and Cross-cutting concepts. Performance expectations are the way to integrate the three dimensions

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Table I contains the recommended performance expectations for guiding curriculum programming and instruction within four high school science courses aligned to Regents examinations. Please note: no course sequences have been assumed in this model and the map does not preclude other performance expectations from being taught.

Example Course Map Information

Topic	PE #	A Framework for K-12 Science Education: Scientific and Engineering Practices	A Framework for K-12 Science Education: Disciplinary Core Ideas	A Framework for K-12 Science Education: Crosscutting Concepts	For performance expectations that appear in more than one course the specific concepts for the performance expectation within this course are outlined.
Topic area the Performance expectation is categorized under.	Performance expectation number	Scientific and Engineering Practice that is apart of the Performance Expectation.	Disciplinary Core Idea that is apart of the Performance Expectation.	Crosscutting Concept that is apart of the Performance Expectation.	Information provided for ONLY performance expectations that appear in more than 1 high school course.

Physical Sciences: Physics
-Instructional sequences are not assumed-

Topic Area	PE #	K-12 Science Education Framework: Scientific and Engineering Practices	K-12 Science Education Framework: Disciplinary Core Ideas	K-12 Science Education Framework: Crosscutting Concepts	For performance expectations that appear in more than one course. The specific concepts for the performance expectation within this course are outlined.
HS. Structure and Properties of Matter	HS-PS1-8.	Developing and Using Models	PS1.C: Nuclear Process	Energy and Matter	Scale of energy released.
HS. Forces and Interactions	HS-PS2-1.	Analyzing and Interpreting Data	PS2.A: Forces and Motion	Cause and Effect	

5

- Aligned to new Regents examinations in science
- Aligned to the New York State P-12 Science Learning Standards
- Includes:
  - Earth and Space Sciences
  - Life Sciences: Biology
  - Physical Sciences: Chemistry
  - Physical Sciences: Physics

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OFFICE OF CURRICULUM AND INSTRUCTION
Room 860 EBA
Phone: (518) 474-5922
E-mail: emscurric@nysed.gov; Web: www.nysed.gov/curriculum-instruction

Table I contains the recommended performance expectations for guiding curriculum, programming, and instruction within four high school science courses aligned to Regents examinations. Please note: no course sequences have been assumed in this model and the map does not preclude other performance expectations from being taught.

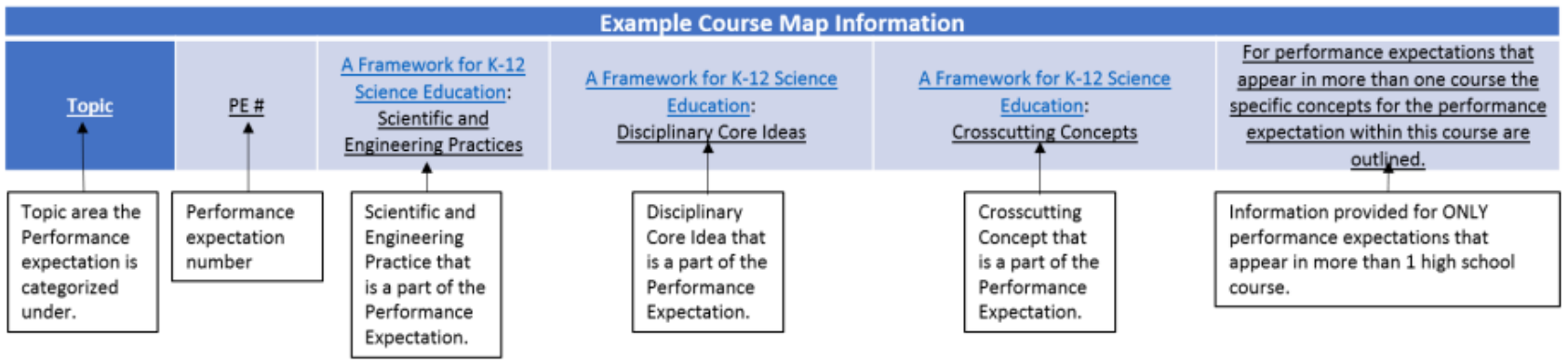


Table I

Life Science: Biology -Instructional sequences are not assumed-					
Topic	**PE #**	K-12 Science Education Framework: Scientific and Engineering Practices	K-12 Science Education Framework: Disciplinary Core Ideas	K-12 Science Education Framework: Crosscutting Concepts	**For performance expectations that appear in more than one course the specific concepts for the performance expectation within this course are outlined.**
HS. Structure and Function	HS-LS1-1.	Constructing Explanations and Designing Solutions	LS1.A: Structure and Function	Structure and Function	

Topic area

Student Performance Expectations (PE)

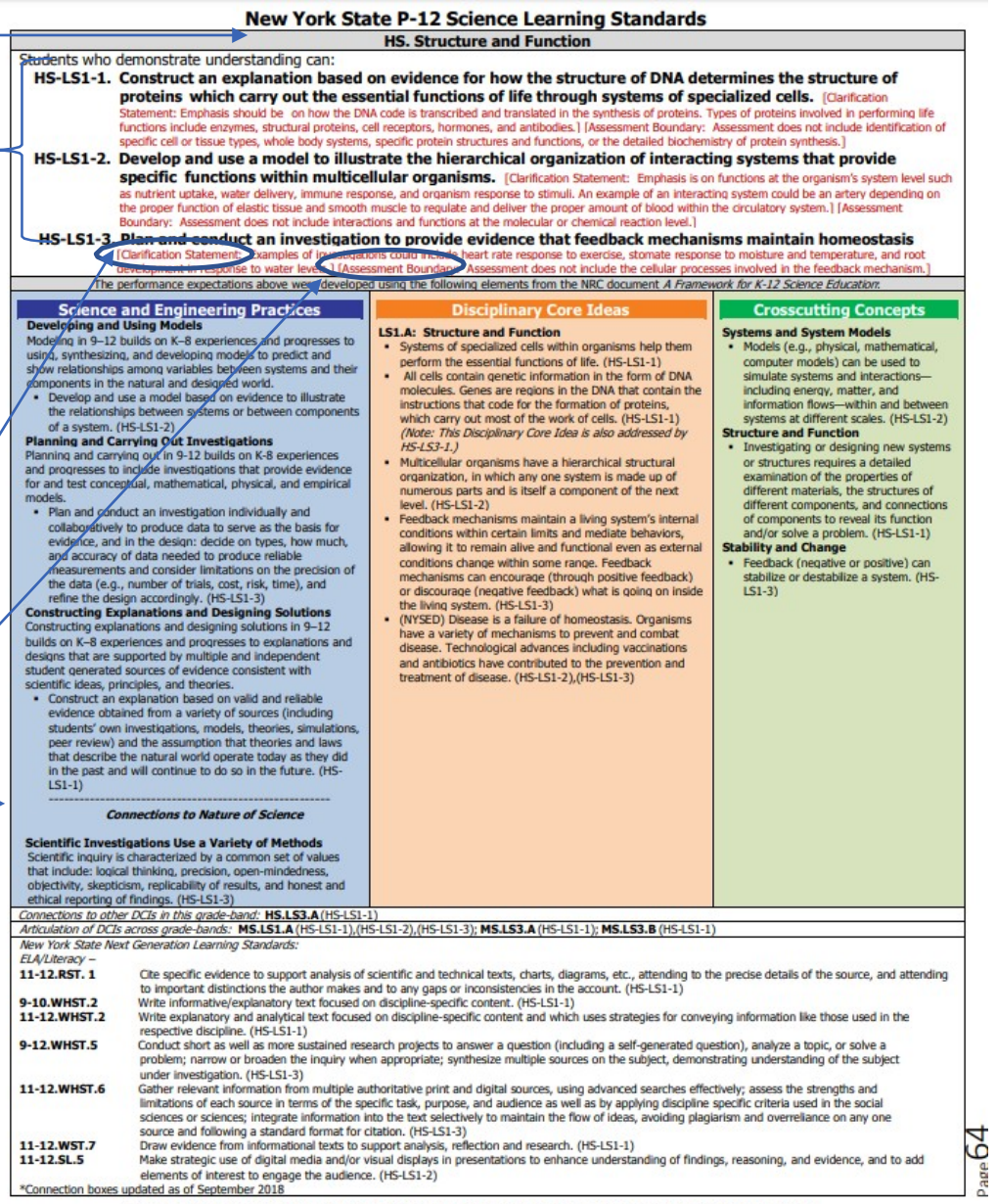
Highlighting indicates expectations that are different from the Next Generation Science Standards.

An asterisk indicates an engineering connection to a practice or disciplinary core idea.

Clarification Statements are examples and additional guidance.

The Assessment Boundaries delineate content limits of concepts that may be assessed in large-scale assessments

Foundation box: Designates which PE uses this practice.



New York State P-12 Science Learning Standards

HS. Structure and Function

Students who demonstrate understanding can:

HS-LS1-1. **Construct an explanation based on evidence for how the structure of DNA determines the structure of proteins which carry out the essential functions of life through systems of specialized cells.** [Clarification Statement: Emphasis should be on how the DNA code is transcribed and translated in the synthesis of proteins. Types of proteins involved in performing life functions include enzymes, structural proteins, cell receptors, hormones, and antibodies.] [Assessment Boundary: Assessment does not include identification of specific cell or tissue types, whole body systems, specific protein structures and functions, or the detailed biochemistry of protein synthesis.]

HS-LS1-2. **Develop and use a model to illustrate the hierarchical organization of interacting systems that provide specific functions within multicellular organisms.** [Clarification Statement: Emphasis is on functions at the organism's system level such as nutrient uptake, water delivery, immune response, and organism response to stimuli. An example of an interacting system could be an artery depending on the proper function of elastic tissue and smooth muscle to regulate and deliver the proper amount of blood within the circulatory system.] [Assessment Boundary: Assessment does not include interactions and functions at the molecular or chemical reaction level.]

HS-LS1-3. **Plan and conduct an investigation to provide evidence that feedback mechanisms maintain homeostasis** [Clarification Statement: Examples of investigations could include heart rate response to exercise, stomate response to moisture and temperature, and root development in response to water levels.] [Assessment Boundary: Assessment does not include the cellular processes involved in the feedback mechanism.]

The performance expectations above were developed using the following elements from the NRC document *A Framework for K-12 Science Education*:

Science and Engineering Practices

Developing and Using Models

Modeling in 9–12 builds on K–8 experiences and progresses to using, synthesizing, and developing models to predict and show relationships among variables between systems and their components in the natural and designed world.

- Develop and use a model based on evidence to illustrate the relationships between systems or between components of a system. (HS-LS1-2)

Planning and Carrying Out Investigations

Planning and carrying out in 9-12 builds on K-8 experiences and progresses to include investigations that provide evidence for and test conceptual, mathematical, physical, and empirical models.

- Plan and conduct an investigation individually and collaboratively to produce data to serve as the basis for evidence, and in the design: decide on types, how much, and accuracy of data needed to produce reliable measurements and consider limitations on the precision of the data (e.g., number of trials, cost, risk, time), and refine the design accordingly. (HS-LS1-3)

Constructing Explanations and Designing Solutions

Constructing explanations and designing solutions in 9–12 builds on K–8 experiences and progresses to explanations and designs that are supported by multiple and independent student generated sources of evidence consistent with scientific ideas, principles, and theories.

- Construct an explanation based on valid and reliable evidence obtained from a variety of sources (including students' own investigations, models, theories, simulations, peer review) and the assumption that theories and laws that describe the natural world operate today as they did in the past and will continue to do so in the future. (HS-LS1-1)

Connections to Nature of Science

Scientific Investigations Use a Variety of Methods

Scientific inquiry is characterized by a common set of values that include: logical thinking, precision, open-mindedness, objectivity, skepticism, replicability of results, and honest and ethical reporting of findings. (HS-LS1-3)

Disciplinary Core Ideas

LS1.A: Structure and Function

- Systems of specialized cells within organisms help them perform the essential functions of life. (HS-LS1-1)
- All cells contain genetic information in the form of DNA molecules. Genes are regions in the DNA that contain the instructions that code for the formation of proteins, which carry out most of the work of cells. (HS-LS1-1) *(Note: This Disciplinary Core Idea is also addressed by HS-LS3-1.)*
- Multicellular organisms have a hierarchical structural organization, in which any one system is made up of numerous parts and is itself a component of the next level. (HS-LS1-2)
- Feedback mechanisms maintain a living system's internal conditions within certain limits and mediate behaviors, allowing it to remain alive and functional even as external conditions change within some range. Feedback mechanisms can encourage (through positive feedback) or discourage (negative feedback) what is going on inside the living system. (HS-LS1-3)
- (NYSED) Disease is a failure of homeostasis. Organisms have a variety of mechanisms to prevent and combat disease. Technological advances including vaccinations and antibiotics have contributed to the prevention and treatment of disease. (HS-LS1-2),(HS-LS1-3)

Crosscutting Concepts

Systems and System Models

- Models (e.g., physical, mathematical, computer models) can be used to simulate systems and interactions—including energy, matter, and information flows—within and between systems at different scales. (HS-LS1-2)

Structure and Function

- Investigating or designing new systems or structures requires a detailed examination of the properties of different materials, the structures of different components, and connections of components to reveal its function and/or solve a problem. (HS-LS1-1)

Stability and Change

- Feedback (negative or positive) can stabilize or destabilize a system. (HS-LS1-3)

Connections to other DCIs in this grade-band: **HS.LS3.A** (HS-LS1-1)

Articulation of DCIs across grade-bands: **MS.LS1.A** (HS-LS1-1),(HS-LS1-2),(HS-LS1-3); **MS.LS3.A** (HS-LS1-1); **MS.LS3.B** (HS-LS1-1)

New York State Next Generation Learning Standards:

ELA/Literacy –

11-12.RST. 1	Cite specific evidence to support analysis of scientific and technical texts, charts, diagrams, etc., attending to the precise details of the source, and attending to important distinctions the author makes and to any gaps or inconsistencies in the account. (HS-LS1-1)
9-10.WHST.2	Write informative/explanatory text focused on discipline-specific content. (HS-LS1-1)
11-12.WHST.2	Write explanatory and analytical text focused on discipline-specific content and which uses strategies for conveying information like those used in the respective discipline. (HS-LS1-1)
9-12.WHST.5	Conduct short as well as more sustained research projects to answer a question (including a self-generated question), analyze a topic, or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation. (HS-LS1-3)
11-12.WHST.6	Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the specific task, purpose, and audience as well as by applying discipline specific criteria used in the social sciences or sciences; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation. (HS-LS1-3)
11-12.WST.7	Draw evidence from informational texts to support analysis, reflection and research. (HS-LS1-1)
11-12.SL.5	Make strategic use of digital media and/or visual displays in presentations to enhance understanding of findings, reasoning, and evidence, and to add elements of interest to engage the audience. (HS-LS1-2)

*Connection boxes updated as of September 2018

*The performance expectations marked with an asterisk integrate traditional science content with engineering through a Practice or Disciplinary Core Idea.

The text in the "Disciplinary Core Ideas" section is reproduced verbatim from A Framework for K-12 Science Education: Practices, Cross-Cutting Concepts, and Core Ideas unless it is preceded by (NYSED).

New YorkState P-12 Science Learning Standards

HS. Structure and Function

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COLLABORATIVE PARTNERS

Teacher Centers

- 126 Regional Centers across New York State
- NYS Teacher Centers Map and Locations

BOCES S/CDN Science Statewides Professional Development

Office of Bilingual Education and World Languages

in collaboration with Dr. Okhee Lee (New York University)

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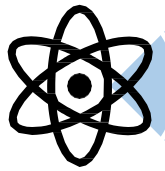
SCAP Science Content Advisory Panel

BIG 5 Buffalo, Rochester Syracuse, Yonkers NYCDOE

Science Consortium



STANYS

PAEMST

- New York State can recognize up to three Mathematics finalists and three Science finalists teaching.
- Of the State finalists in Mathematics and Science, up to two finalists in mathematics or science from each state will be recognized at the National level.
- The nomination period is open from November 1, 2019 - March 1st, 2020 for a K- 6 educator.
- The deadline to submit an application is May 1st, 2020.
- For more information pertaining to the PAEMST (2019-2020) nomination and application process visit the PAEMST website.

NYSED SCIENCE SUMMIT 2020

MARCH 23RD 2020
NYS MUSEUM

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CONTENT AREA NOTIFICATION SERVICE

Content Area Notification Service Sign-up Form

- Direct communication to content-area educators via email
  N-6, Math, ELA, Science, Social Studies, PE, Arts, LOTE, Health, School Counselors, & CTE
- Available to teachers & administrators
- Only information previously released and available elsewhere will be included
- Used on an "as-needed" basis;won't clutter your inbox!

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EARLY LEARNING UPDATE

New York State Prekindergarten Learning Standards: A Resource for School Success

New York State Kindergarten Learning Standards: A Resource for School Success

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QUESTIONS?

Phone: (518)474-5922

Website: www.nysed.gov/curriculum-instruction

http://www.nysed.gov/curriculum-instruction/science

Ann Crotty, Ed.D - Ann.Crotty@nysed.gov

Nicole Marschilok, MAT/M.S. Ed. - Nicole.Marschilok@nysed.gov

Questions pertaining to science curriculum and instruction: ScienceStandards@NYSED.GOV

Questions pertaining to science assessment:

emscassessinfo@nysed.gov