



New York State Science Education Consortium

A Cooperative Association of Professional Science Education Organizations

A Proposal to Support Teachers Transitioning to the New NYS Science Learning Standards

1. Introduction:

A scientifically literate public and vibrant scientific culture are essential for the future prosperity of the United States. This requires a high-quality science education and means that in addition to traditional content, students must develop key skills such as communication, collaboration, inquiry, and problem solving, that will serve them throughout their educational and professional lives¹. As a country, the United States is lagging behind many similar countries around the world. According to the Pew Research Center and specifically in science, the United States ranks 24th around the world in science (out of 71 countries) and 38th in math. This data summary was gathered from one of the biggest cross-national tests called the Programme for International Student Assessment (PISA), which every three years measures reading ability, math and science literacy and other key skills among 15-year-olds in dozens of developed and developing countries².

Further, in an article written by our New York State Science Education Consortium co-facilitator, Arnie Serotsky, and published in numerous online and print resources³, Mr. Serotsky noted that,

“The 2015 Trends in International Math and Science Study show questionable competitiveness of American students, reporting that U.S. grade four students ranked 10 out of 47 countries; U.S. grade eight students ranked 11 out of 39 countries. There is avoidance on the part of state high school students of the study of the physical sciences. In 2016, while 239,540 students took the Living Environment (New York state’s title for the biology course) Regents exam, only 106,408 took the chemistry Regents exam and only 47,917 took the physics Regents exam. There has been a decrease in hands-on, minds-on, inquiry based science instruction in elementary schools, and the pressures of the Common Core standards have resulted in drastic reductions in time spent on science instruction.”

Unfortunately, past New York State science standards, adopted in 1996, and common pedagogies to teach to those standards, though rich in content, have frequently not met the challenge of truly engaging students and creating critical thinkers and problem solvers. To prepare students for the challenges and opportunities of the future, and after considerable work, New York State has recently (December 2016) adopted the NYSP-12 Science Learning Standards (NYSP-12SLS¹⁰), which are based

on guiding documents found in “A Framework for K-12 Science Education⁴” and the “Next Generation Science Standards⁵”. These new standards are grounded in the most current research in science and scientific learning and 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 Crosscutting Concepts (3-D learning). When fully implemented, the NYSP-12SLS will result in coherent, rigorous instruction with students being able to acquire and apply scientific and mathematical knowledge to unique situations, as well as have the ability to communicate, think, reason, and problem solve scientifically⁶.

2. Supporting the transition to the NYSP-12SLS

The newly adopted standards will transform science education in NYS into a more equitable, meaningful, and rich experience for all students, but they are vastly different than the outgoing standards. Anticipating the incredible amount of effort required to develop and fully support the creation and implementation of these new standards, The New York State Science Education Consortium, participated in refining a document designed to guide and inform the process. The “Statewide Strategic Plan for Science⁷,” which was authored by staff within the New York State Education Department and later approved by the New York State Board of Regents in January of 2015, now serves as a planning and implementation resource to help support newly adopted P-12 science learning standards.

After this approval and to further support the transition and reinforce the importance of the objectives listed in the Statewide Strategic Plan for Science, the NYS Education department authored and published the “NEW YORK STATE P-12 SCIENCE LEARNING STANDARDS IMPLEMENTATION ROADMAP⁸.” Within that document, the Department notes,

“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 process⁸.”

Therefore, the Statewide Strategic Plan for Science and the New York State P-12 Science Learning Standards Implementation Roadmap are intimately tied to one another, and serve as the backbone for supporting the transition, implementation, and sustainability of the NYSP-12SLS.

3. Commitment to the support of the NYSP-12SLS

The NYS Education Department's 2015 approval of the Strategic Plan for Science in conjunction with their more recent creation of the Science Learning Standards Implementation Roadmap, demonstrate an incredible commitment to the improvement of our science classrooms. Further, the Department has outlined a proposed timetable in the Roadmap (page 1) as follows:

o 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

Based on this proposed timeframe, we are currently within the "Raise Awareness and Build Capacity" portion of the implementation process, however the "Transition and Implementation" phase is proposed to begin as early as next Fall. Based on a presentation delivered to the Board of Regents in the Fall of 2017 titled, "Fall 2017 New York State P-12 Science Learning Standards Updates⁹," the department is calling for "coherent professional development opportunities," as well a "continued focus of science education stakeholders on the critical components of the Statewide Strategic Plan for Science" (slide 11).

Therefore, this proposal directly targets the sections of the Statewide Strategic Plan for Science as well as the Science Learning Standards Implementation Roadmap that call for the provision of high quality professional development, and instructional and curricular support of teachers, allowing them to attain experience and expertise with the new pedagogy that the NYSP-12SLS demand.

Specifically, one of the goals of the Strategic Plan states we must "Initiate, build, and sustain collaborations and partnerships to provide specific and focused professional development to support the teaching and learning of core science content, conceptual understandings, and practices P-12." Further, as an objective within that goal, the plan states, "Provide opportunities for local educational agencies to collaborate and partner with STEM education stakeholders to develop and implement effective professional development models that are based upon the new P12 NYS science learning standards." Finally, two activities listed within that objective read, "Target funding opportunities that support partnerships between business and industry, institutes of higher education, professional and science education associations, local education agencies, and other stakeholders to sustain professional development for teachers and leaders in science" and "Promote institutes, courses,

and/or workshops that enhance the teaching and learning of the individual disciplines associated with science, technology, engineering, and mathematics and the connections between these disciplines.” (Strategic Plan, page 5-6, Implementation Roadmap, page 5).

4. The Full Strategic Plan and Implementation Roadmap References which call for professional development funding.

The smaller excerpts of the Strategic Plan, above, were written specifically to demonstrate the relationship between the Strategic Plan, the Implementation Roadmap, and our funding request. In the interest of being as thorough as possible, find below, the actual and complete sections of the strategic plan that mention professional development, as well as the specific portions of the plan we believe relate directly to our funding proposal (italicized). Because the Implementation Roadmap is written in an expanded form of the Strategic Plan, this section will cite ONLY portions of the Strategic Plan. We have omitted the portions of the Implementation Roadmap in the interest of brevity, but each of the portions listed below are also found in the Implementation Roadmap on pages 5 and 6. The full portions of the Strategic Plan related to this funding proposal are as follows:

Goal: *Initiate, build, and sustain collaborations and partnerships to provide specific and focused professional development to support the teaching and learning of core science content, conceptual understandings, and practices P-12.*

Objective: *Provide opportunities for local educational agencies to collaborate and partner with STEM education stakeholders to develop and implement effective professional development models that are based upon the new P-12 NYS science learning standards.*

Activities:

- *Establish networks of stakeholders in STEM education to provide professional development that enhances the development, dissemination, and implementation of curriculum, instructional and assessment materials, and other resources.*
- *Engage local, state, and national professional and science education associations to lead and sustain STEM-related professional development opportunities for face-to-face and online collaboration.*
- *Build the capacity of interested business and industry experts to effectively partner with local educational agencies by promoting pertinent professional learning opportunities and resources.*

- *Target funding opportunities that support partnerships between business and industry, institutes of higher education, professional and science education associations, local education agencies, and other stakeholders to sustain professional development for teachers and leaders in science.*
- *Promote institutes, courses, and/or workshops that enhance the teaching and learning of the individual disciplines associated with science, technology, engineering, and mathematics and the connections between these disciplines.*
- *Create access to new and/or existing, online, on-demand venues for specific and focused professional development.*

Objective: *Increase teacher and leader participation and engagement in professional development opportunities that are based upon the new P-12 NYS science learning standards to build subject knowledge and pedagogical-content knowledge in the sciences by leveraging the expertise of science education stakeholders.*

Activities:

- *Design opportunities to coordinate professional development that articulates collaborations and partnerships across P-16.*
- *Target annual professional development in science that builds specific subject knowledge and pedagogical-content knowledge toward fulfilling the 175 hours required for maintenance of certification.*
- *Provide funding opportunities for teachers and leaders to participate in sustained, online or on-site professional development institutes, professional learning communities, courses, and/or workshops during the school year.*
- *Incorporate career-ladder incentives for teachers and leaders to provide professional development sessions and engage in professional development opportunities that are related to STEM education.*
- *Identify or develop and implement a needs assessment to determine the focus of future professional development opportunities.*
- *Create professional development opportunities that bring teachers and leaders into contact with working scientists, mathematicians, and engineers through internships and mentorships with peer teachers, institutes of higher education, and/or business and industry partners.*

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.*

Activities:

- *Build teacher resources by establishing community-based programs that provide relevant STEM applications in science curriculum and instructional programs.*
- *Create or access professional development opportunities that focus on the integration of science and engineering practices in STEM courses.*
- *Articulate collaborations and partnerships between STEM stakeholders that support curriculum programming and instructional practices that are better aligned to college and career expectations.*
- 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.

5. Proposal Summary:

To specifically address the activities listed above in order to support the New York's Strategic Plan for Science, the New York State Science Consortium requests the following actions and preliminary budget. This proposal and specific budget request must be further refined in collaboration with the NYS Education Department.

PROPOSAL: Creation of the "New York State Science Education Professional Development Network" with representation from each BOCES region and each Big City. To create this network, we would make the following suggestions:

- Create 52, three-year PD positions titled, "PD Coordinator" (on average, 1 for each of the 37 NYS BOCES regions and 3 for each of the 5 big cities). Each PD Coordinator would be supervised by their respective BOCES or big city science administration and have the following responsibilities:
 - Create and appoint a chairperson of an advisory committee comprised of local stakeholders, including science education representatives from some of the component school districts and professional organizations. This committee would define, inform, and guide the role of the PD Coordinator. Specifically, this committee would:
 - Meet on a regular basis as defined by the committee
 - Define the PD needs of their local area regarding pedagogy and assessment
 - Define how those needs shall be addressed by the PD Coordinator including when and how professional development opportunities for the local area schools shall be offered
 - Assess the effectiveness of the PD opportunities and adjust accordingly in conjunction with the PD coordinator

- Based on the specific recommendations of their regional advisory committee, each PD Coordinator will plan and conduct appropriate PD opportunities
- Elicit feedback from participants of each PD opportunity
- Report all regional activities and participant feedback to the advisory committee as well as the Program Administrator (see below) on a regular basis
- Refine and adjust PD opportunities accordingly based on the participant feedback and advisory committee recommendations.
- Create a position titled, “Program Administrator” which would have the following responsibilities:
 - Develop an annual institute to develop all PD Coordinators in 3-D instruction and learning: best practices, and exemplary methodology and a variety of local formative and summative assessment models. This will ensure consistency of turnkey PD workshops throughout New York State.
 - Ensure coordination between regional PD Coordinators
 - Serve as a bridge between PD Coordinator, BOCES, and the NYSED.
 - Oversee budget of the New York State Science Education Professional Development Network
 - Evaluate each PD Coordinator as needed, but on at least an annual basis.
- BOCES/big cities would be responsible for hiring, supervising, and providing a locale for all PD coordinators.
- Formal evaluation of the overall program will be conducted on an annual basis.

Preliminary Budget/legislative request:

- Each PD Coordinator position will be salaried at \$75,000/year plus benefits. (\$110,000 budgeted per position includes benefits and supervision).
Each PD Coordinator position will have a \$5000/year budget. A portion of this budget will be used to fund personal professional development, including cost of the annual institute, travel, room and board. Remaining monies are to be used towards supporting the professional development of teachers in their area...materials, copies, etc.)
- 52 persons x \$110,000 = \$5,720,000 for positions
- 52 persons x \$5,000 = \$260,000 for budget allocation
- 1 Program Administrator x \$90,000
 - + \$35,000 for benefits
 - + \$52,000 for administrative assistant (salary and benefits)

Grand total = \$6,157,000 per year for 3 years = \$18,471,000 over 3 years.

6. Closing

The effort that it will take to transition NYS science education from the current standards to the NYSP-12SLS can only be described as enormous. Teachers, administrators, school districts, as well as the New York State Education Department will have many years of work ahead of them to make the transition, and many more years of work after that to support the maintenance of the new standards. We believe however, that this work is some of the most important work that we can do for the students of New York State. It will transform their thinking and communication processes, and vastly improve their functionality in the future work environment.

The New York State Science Education Consortium hopes that this proposal has:

- Illustrated the need and our support for change in our science classrooms
- Shown the relationship between the New York State Strategic Plan for Science and the New York State P-12 Science Standards Implementation Roadmap

- Demonstrated the commitment that the New York State Education Department has to both documents as well as the NYSP-12SLS document
- Cited the need for funding highly effective professional development based on the Strategic Plan and the Implementation Roadmap
- Proposed a reasonable and effective funding opportunity for the legislature to consider

We thank you for your time and effort in examining this document and look forward to effort ahead to make this proposal come to fruition.

References

¹ www.nextgenscience.org.

² <http://www.pewresearch.org/fact-tank/2017/02/15/u-s-students-internationally-math-science/>

³ <http://www.leaderherald.com/opinion/letters-to-the-editor/2018/04/new-york-states-efforts-to-transform-science-education/>

⁴ National Research Council. (2012). A Framework for K-12 Science Education: Practices, Crosscutting Concepts, and Core Ideas. Washington, DC: The National Academies Press. 2

⁵ National Research Council. (2013). Next Generation Science Standards: For States, By States. Washington, DC: The National Academies Press

⁶ http://www.p12.nysed.gov/ciai/mst/sci/NYS_Science_Intro.pdf (Sept., 2017) Introduction to the New York State P-12 Science Learning Standards

⁷ <http://www.p12.nysed.gov/ciai/mst/sci/documents/Final-Statewide-Strategic-Plan-for-ScienceRev.pdf> (July, 2017) Statewide Strategic Plan for Science

⁸ <http://www.nysed.gov/common/nysed/files/programs/curriculum-instruction/nysedimplementation-roadmapv13.pdf>

⁹ <http://www.nysed.gov/common/nysed/files/programs/curriculum-instruction/2018springnewyorkstatep-12sciencelearningstandards.pdf>

¹⁰ <http://www.nysed.gov/common/nysed/files/programs/curriculum-instruction/p-12-science-learning-standards.pdf>