TO: P-12 Education Committee

FROM: Ken Wagner

SUBJECT: Next Generation Science Standards

DATE: March 3, 2014

AUTHORIZATION(S):

SUMMARY

Issue for Discussion

This item provides an update on the process and progress related to the consideration of the Next Generation Science Standards.

Reason(s) for Consideration

For Information

Proposed Handling

This issue will come before the P-12 Education Committee for discussion at the March 2014 Regents meeting.

Procedural History

In 2010, the New York State Board of Regents (BOR) adopted the Common Core State Standards (CCSS) for English Language Arts (ELA) and Literacy and for Mathematics as part of New York's reform agenda to prepare students for success in college and the workplace. Likewise, the Board's Standards work group approved the Department's engagement in the development of the Next Generation Science Standards (NGSS) during its discussion in October 2010 (see http://www.regents.nysed.gov/meetings/2010Meetings/October2010/1010swd1.pdf).

Background Information

In September 2011, New York State joined as a Lead State Partner in the development process of the NGSS to advance science education in New York State, better prepare students for college and careers, and provide pathways into science, technology, engineering, and math (STEM) fields. In the role of Lead State Partner, the Department agreed to form a Statewide Leadership Team consisting of science education stakeholders, provide feedback at various stages in the development of the NGSS, and give the final published version of the NGSS serious consideration for adoption as New York State's science learning standards.

Status of NGSS Final Standards for Review

The NGSS are based on *A Framework for K–12 Science Education* (2012) developed by the National Research Council. The *Framework* provides a foundation for 21st century K-12 science education through decades of research on how students build deep conceptual knowledge in science and learn the *practice* of science. Through a multi-state collaborative process, the NGSS were developed, based on the new *Framework,* to address science and engineering practices, cross-cutting concepts, and disciplinary core ideas.

The final version of the NGSS was published in April 2013. These standards are accessible online at http://www.nextgenscience.org/next-generation-science-standards. The webpage includes several supporting documents explaining the structure of the NGSS and a number of appendices.

Survey and Analysis

In April 2013, the Board of Regents discussed a NYS Standards Evaluation Tool developed by Department staff with input from three science education stakeholder groups including the Science Content Advisory Panel, the Statewide Leadership Team, and representatives of the NYS Science Education Consortium. This standards evaluation tool includes key criteria from standards evaluation documents from the Fordham Institute, the College Board, and the Massachusetts Department of Education. These criteria were determined to be the most comprehensive criteria for analyzing the merits of standards in a side-by-side comparison. This evaluation tool was converted to a survey to gather feedback from the public at large.

This survey entitled *Comparing Current NYS Science Learning Standards and the Next Generation Science Standards to Certain Criteria* was posted on the Department's website in late July 2013 after the NGSS webpage was fully populated with all supporting documents and appendices. The public was invited to complete the survey and emails were sent through various networks. The survey closed on October 15, 2013.

Respondents were asked to compare the current New York State Science Learning Standards (NYSSLS) and the NGSS to the set of research-based standards evaluation criteria. The criteria were grouped into four key categories - **Organization of the Standards**, **Coherence**, **Clarity and Specificity**, and **Content and Rigor**. Respondents rated the current NYSSLS in how well they meet each criterion. Then, they did the same for the NGSS, against the same set of criteria.

Of the 4,318 respondents that started the survey, 2,554 (59%) provided a rating for at least one criterion. These 2,554 are considered to be "valid respondents". Of the valid respondents:

- Approximately 2/3 of respondents (64%) represented the following regions of the state: Western (18%), New York City (17%), Long Island (16%), and Central (12%).

- The remaining 1/3 of respondents, approximately 36%, represented the following upstate regions: Capital Region, North Country/Adirondacks and Lower Hudson Valley (8% each), Mid-Hudson Valley (7%), and Southern Tier (6%).

- 96% described themselves as an individual, not as a group/organization.

- 78% described themselves as teachers, 6% described themselves as principals, 4% described themselves as curriculum directors, and 2% described themselves as post-secondary educators.

- 39% indicated they held certification in only Adolescent Science (grades 7-12), 2% indicated they held certification only in Middle Childhood Science (grades 5-9), 25% indicated the held certification only in Early Childhood/Elementary (P-6), while 9% indicated they held certification in more than one areas named above.

Table 1, on the following page, shows the percentage of valid respondents who rated either set of standards against each criterion as "Adequately meeting this criterion" or "Meet this criterion to a great extent."

Table 1: Percentage of valid respondents who rated either set of standards against each criterion as "Adequately meeting this criterion" or "Meet this criterion to a great extent"

2,554 valid respondents rated the New York State Science Standards (NYSSLS) and the Next Generation Science Standards (NGSS) on 21 criteria in four key categories. For each criterion, they rated each set of science standards as: • Do not meet this criterion, • Minimally meet this criterion, • Adequately meet this criterion, • Meet this criterion to a great extent Please note that the actual number of responses is not constant across all criteria.	% who rated the NYSSLS as "Adequately meeting this criterion" or "Meet this criterion to a great extent"	% who rated the NGSS as "Adequately meeting this criterion" or "Meet this criterion to a great extent"
Organization of the Standards		
The standards provide model pathways/sequences of student outcomes through elementary, middle, and high school that reflect progression in sophistication of content, concepts, and practices, that recur, as necessary, yet are not redundant.	65%	71% (*)
Standards provide alignment with New York State P-12 Common Core Learning Standards in Mathematics and English Language Arts & Literacy.	65%	72% (*)
Standards are systematic and clearly presented.	65%	68% (*)
Standards documents are easy to access and navigate.	75%	73%
Standards are presented to provide access and use in multiple ways to address curriculum, instruction, and assessment.	66%	68%
Coherence		
Standards include connections among science content, concepts, and practices.	57%	73% (*)
Standards include connections across science disciplines.	52%	57% (*)
Standards include connections in science to other learning standards (engineering/technology, mathematics, English language arts & literacy, social studies, etc.).	57%	72% (*)
Clarity and Specificity		
Standards are measurable through various forms of assessment.	68% (*)	49%
Standards provide clear guidance for curriculum and assessment development.	70% (*)	53%
Standards provide articulated boundaries and parameters for content, concepts, and practices.	71%	70%
Standards are assessable at different "grain sizes" with respect to content, concepts, and practices at a particular grade or grade-band.	55% (*)	51%
Standards are clearly written and lead to consistent interpretations drawn by educators.	71% (*)	66%
Standards include accurate content.	80% (*)	75%
Content and Rigor		
Standards include defined outcomes for career & college readiness in science at: High school grade levels, Intermediate grade levels, and Elementary grade levels.	63%	68% (*)
Standards outline essential content and cognitive demand either grade by grade or grade banded.	71%	70%
Standards providing for depth and breadth of content, concepts, and practices are	48%	66% (*)

evident and balanced.		
Standards provide opportunities to engage in scientific inquiry and practices.	64%	75% (*)
Standards provide opportunities to experience interdisciplinary themes within the sciences.	55%	69% (*)
Standards include subject specific disciplines at each grade band in: Biology, Chemistry, Earth and space sciences, and Physics.	78% (*)	69%
Standards include connections to engineering/technology at each grade band.	57%	72% (*)

Note: (*) denotes where the difference between the scores for the NYS Science Learning Standards and the Next Generation Science Standards are statistically significant at the p=0.05 level using a Chi Square analysis.

Survey results from the 2,554 valid respondents who provided a rating for at least one criterion show that:

- Respondents **rated the NGSS statistically higher in 11 out of 21 criteria** and **rated the NYSSLS statistically higher in 6 out of 21 criteria**. There are 4 criteria where the differences between the NGSS rating and the NYSSLS rating were not statistically significant.

- Adolescent Science (grades 7-12) teachers (n=1,001) and Early Childhood/Elementary (grades P-6) teachers (n=625) were the two largest subgroups of valid respondents[1].
    - On average, Adolescent Science teachers rated the NYSSLS higher than the NGSS on 14 out of 21 criteria.
    - On average, Early Childhood/Elementary teachers rated the NGSS higher than the NYSSLS on 15 out of 21 criteria.

- Both sets of standards have strengths and weaknesses when compared against the set of criteria used in the survey.

The analysis of only respondents who fully completed the survey (i.e., rated both NYSSLS and NGSS on all 21 criteria) (n=1,282) yields very similar results to the analysis of valid respondents who provided rating for at least one criterion. For example, complete responders rated the NGSS statistically higher than the NYSSLS on 10 criteria (compared to valid responders who rated the NGSS higher on 11 criteria).

[1] The category of “Adolescent Science teachers” includes only educators who indicated that they hold certification in any of the “Adolescent Science” areas, but did not indicate that they hold certification in any of the “Early Childhood/Elementary” or “Middle Grade Science” areas. The category of “Early Childhood/Elementary” teachers includes only educators who indicated that they hold certification in any of the “Early Childhood/Elementary” areas, but did not indicate that they hold certification in any of the “Middle Grade Science” or “Adolescent Science” areas.

Science Strategic Plan

In addition to this survey analysis, a science strategic plan is under development to guide planning and implementation if the Board of Regents elects to adopt new science standards, such as the NGSS, or update the existing NYSSLS. The strategic plan includes mission and vision statements and incorporates six critical components that would need to be addressed if new standards are adopted or existing standards are updated – Standards, Curriculum, Professional Development to Enhance Instruction, Assessment, Materials and Resource Support, and Administrative and Community Support.

An early draft of this strategic plan was shared with members of the New York State Science Education Consortium (Consortium) during their summit meeting in July 2013. During the summit, attendees were asked to provide feedback related to the strategic plan's goals, objectives, and activities for consideration. These recommendations were reflected in a new iteration of the plan that was shared again in November with members of the Consortium.

Next Steps

An updated draft of the Strategic Plan was shared with additional stakeholders including, but not limited to, members of the Statewide Leadership Team and the Science Content Advisory Panel for feedback prior to being presented to the Board. The Statewide Leadership Team and the Science Content Advisory Panel will also convene with Department staff to review and comment on the full analysis of the survey data in March and April. A recommendation will be formed after full analysis of the survey data with various stakeholder groups including, but not limited to, the Science Content Advisory Panel, the Statewide Leadership Team, and members of the NYS Science Education Consortium.

Recommendation

It is recommended that Department staff continue to analyze feedback, both quantitative and qualitative, from the public survey, develop a comprehensive and detailed analysis of the survey, and continue to develop the strategic plan including input from the three stakeholder groups mentioned above.

Department staff will present a recommendation to the Board regarding the adoption or update of New York's science standards, as well as a proposed strategic plan to guide their implementation.

Attachment A

Stakeholder Groups for NGSS

Statewide Leadership Team (SLT) - *convened by SED; provided feedback to Achieve at various stages of NGSS*	Organization
Sheila Appel	IBM
Margaret Ashida	Battelle/STEMx
Kelly Baudo	Buffalo Public Schools
Nicole Bobel	Buffalo Public Schools
Greg Borman	CUNY
Michael Carpenter	SUNY Albany College Nanoscale Science and Engineering
Jackie Carrese	Capital Area Science Supervisors Association
Michael Chan	Rochester City School District
Natasha Cooke-Nieves	American Museum of Natural History
Linda Curtis-Bey	NYC Department of Education
Joseph Dragone	Ballston Spa Central School District
Kim Drake Hyland	Guilderland Central School District
Don Duggan-Haas	Paleontological Research Institution
Linda Gentiluomo	Schenectady City School District
Kristen Huff	Regents Research Fund
Odalys Igneri	NYC Department of Education
Michael Jabot	SUNY Fredonia
David Kanter	New York Hall of Science
Anu Malipatil	Regents Research Fund
David Marmor	NYC Department of Education
Judy Mayer	Yonkers Public Schools
Denise McNamara	NYC Department of Education
Julie Nucci	Cornell University
William Ottman	Syracuse City School District
Fred Pidgeon	Science Teachers Association of New York State
Charlene Rydgren	Malone Central School District
Thomas Shiland	Saratoga Springs City School District
Jan Stark	Port Jervis City School District
Henry Strada	NYS Technology and Engineering Educators Association
Mark Vaughn	Corning Incorporated
Chuck Ver Straeten	New York State Museum/Geological Survey
Brian Vorwald	Science Teachers Association of New York State
Judy Wegman	Brighton Central School District
Ken White	Brookhaven National Laboratory
Kathy Wronski	Lyndonville Central School District

Science Content Advisory Panel (SCAP) - *convened by SED; advises on the revision and implementation of NYS science learning standards*	Organization
Lawrence R. Aaronson	Utica College
Marie Anderson	Kingston City School District
Jennifer Baxter	Palmyra-Macedon Central School District
Fernando Espinoza	SUNY Old Westbury
Karen Harris	Schodack City School District
Karen Huffman-Kelly	Genessee Community College
David Kanter	New York Hall of Science
Denise McNamara	NYC Department of Education
William Panaram	NYC Department of Education
Kate Perry	Robert C. Parker School
Shane Price	Lyndonville Central School District
Ann Rivet	Columbia University
Susan Sciglibaglio	Bethpage Union Free School District
Mark Vaughn	Corning Incorporated
Linda Weinberg	SUNY Delhi

NYS Science Education Consortium - *convened by consortium; combination of leaders from the 16 regional sections of STANYS and teacher professional organizations across the state*	Organization
John Augenstein	Science Council of New York City
Jackie Carrese	Capital Area Science Supervisors Association
John Cunninham	Science Council of New York City
Connie Duff	New York State Science Education Leadership Association
Steve Fielman	Science Teachers Association of New York State
Fran Hess	Science Teachers Association of New York State
Kathy Hoppe	Science Teachers Association of New York State
Mary Loesing	Long Island Science Education Leadership Association
Linda Padwa	Biology-Chemistry Professional Development Network
Fred Pidgeon	Science Teachers Association of New York State
Patricia Price	Higher Education Representative
Arnie Serotsky	Science Teachers Association of New York State, Co-Facilitator
Mary Thomas	Science Teachers Association of New York State
Bruce Tulloch	Facilitator
Brian Vorwald	Science Teachers Association of New York State