THE WASHINGTON STATE BOARD OF EDUCATION

A high-quality education system that prepares all students for college, career, and life.

Title: Next Generation Science Standards Communication Plan		
As related to:	☐ **Goal One:** Develop and support policies to close the achievement and opportunity gaps. ☐ **Goal Two:** Develop comprehensive accountability, recognition, and supports for students, schools, and districts.	☒ **Goal Three:** Ensure that every student has the opportunity to meet career and college ready standards. ☐ **Goal Four:** Provide effective oversight of the K-12 system. ☐ **Other**
Relevant to Board roles:	☐ Policy leadership ☐ System oversight ☒ Advocacy	☒ Communication ☐ Convening and facilitating
Policy considerations / Key questions:	Does the Board want to move forward with working with partners on a communication plan for implementation of Next Generation Science Standards (NGSS).	
Relevant to business item:	The Board will consider a motion to approve next steps for an NGSS communication plan.	
Materials included in packet:	Included in this section of the packet are: • A staff memo that provides background information on NGSS • Two informational documents that illustrate how science instruction may change as a result of implementing NGSS • Introductory PowerPoint that summarize the memo • A template for a communication plan	
Synopsis:	At the January 2018 Board meeting, the Board will consider approving working with partners on a communication plan for implementation of Next Generation Science Standards. Implementing the standards with fidelity will require vertical and lateral cooperation within and across districts, agencies, and sectors. Effectively communicating about the standards is a way for the SBE to support standards implementation and also to support science educators who are directly involved in the work of implementation. In addition, the standards were designed with a commitment to equity in science education, to the extent that implementing the standards with fidelity means a commitment to educational equity. A communication effort on behalf of NGSS standards implementation complements and reinforces the Board's interest in advocacy for equity in education. At the January meeting, members will hear from a panel that will include Dr. Ellen Ebert, Science Director, Office of the Superintendent of Public Instruction (OSPI); Dr. Philip Bell, Executive Director, University of Washington Institute for Science and Math Education; Member Jeff Estes; as well as SBE staff, Linda Drake and Alissa Muller.	

NEXT GENERATION SCIENCE STANDARDS COMMUNICATION PLAN

Policy Considerations

One of the most significant parts of the State Board of Education's (SBE) 24-credit Graduation Requirements was a change in the science requirement—two credits of science with one credit of lab science changed to three credits of science with two lab sciences. Complementing this modification in the graduation requirements was a transformation in the state learning standards for science. Next Generation Science Standards (NGSS) were adopted in Washington in October, 2013; rules to implement 24-credit Graduation Requirements were adopted in July 2014. The Board felt that both of these changes were critical for helping Washington students prepare for life and work in the Twenty-first Century. According to Washington STEM, parents and voters in Washington concur with the Board. According to a survey, a substantial majority of voters think a high quality STEM (science, technology, engineering and math) education should be provided for every student, and that STEM education will improve the state's economy.

At the January 2018 Board meeting, the Board will consider moving forward with working with partners on a communications plan for implementation of Next Generation Science Standards. Implementing the standards with fidelity will require vertical and lateral cooperation within and across districts, agencies, and sectors. Effectively communicating about the standards is a way for the SBE to support standards implementation and also to support science educators who are directly involved in on-the-ground implementation.

In addition, the standards were designed with a commitment to equity in science education, to the extent that implementing the standards with fidelity means a commitment to educational equity. A communication effort on behalf of NGSS standards implementation complements and reinforces the Board's interest in advocacy for equity in education.

Attached to this memo is a PowerPoint presentation that summarizes information in this memo.

Background

The NGSS was developed, beginning in 2010, with a collaborative of 26 state Lead Partners, the National Research Council, the National Science Teachers Association, the American Association for the Advancement of Science, and Achieve. A committee of practicing scientists, cognitive scientists, science education researchers and science standards and policy experts provided guidance. The standards went through several rounds of review with multiple stakeholders. Two drafts were made public so comment and input could be collected from any interested member of the public. According to Achieve, no federal funds or incentives were used to create or adopt the standards.

Washington was the eighth state to adopt NGSS. So far, 18 states (Washington, Hawaii, Oregon, California, Nevada, Kansas, Arkansas, Iowa, Illinois, Michigan, Kentucky, West Virginia, Maryland, New Jersey, Delaware, Connecticut, Vermont, Rhode Island) and the District of Columbia have adopted the standards, and South Dakota has adopted similar standards. In addition, many districts have adopted the standards in states that have not adopted the standards as a state.

The development of the standards followed the development of a framework published by the National Research Council in 2011, the Framework for K-12 Science Standards, that provides the foundation for the standards through research on the ways student learn science effectively. The framework describes an integrated vision of K-12 science education, and outlines the major practices, crosscutting concepts and disciplinary core ideas that students should be familiar with by the end of high school. Dr. Philip Bell, who the Board will be hearing from at this meeting, was a member of the committee that developed the framework.

The Framework for K12 Science Standards defined several guiding assumptions for the new standards including:

- Children are Born Investigators
- Focusing on Core Ideas and Practices—limiting a set of core ideas to encourage depth of meaningful understanding
- Understanding Develops over Time
- Science and Engineering Require Both Knowledge and Practice
- Connecting to Students' Interests and Experiences
- Promoting Equity

Promoting equity in science education was a foundational assumption of the development of the standards framework. The framework calls out the benefit to both students and the study of science when students with diverse customs and orientations from different cultures engage in science—embracing diversity enhances science learning. Ultimately, the framework finds that, "The goal of educational equity is one of the reasons to have rigorous standards that apply to all students. Not only should all students be expected to attain these standards, but also work is needed to ensure that all are provided with high-quality opportunities to engage in significant science and engineering learning." The promotion of equity as an integral part of implementing science standards accords well with the Board's interest in educational equity, and could be part of the Board's work in promoting equity across graduation requirement subject areas.

Part of the vision of the framework that formulated in the standards is that teaching and learning of science involves three dimensions: 1) science and engineering practices, 2) crosscutting concepts, and 3) disciplinary core ideas. Each standard is described in each of these dimensions. The first dimension includes the behaviors employed by scientists, engineers and students to pursue scientific inquiry and learning. The second dimension includes concepts and big ideas such as cause and effect, energy and matter, stability and change, that link domains of science. The core content domains of physical sciences, life sciences, earth and space sciences and engineering, technology and applications of sciences are contained within the third dimension.

Implementing the NGSS standards with fidelity will require science instruction to change throughout K-12 education. Attached are two documents that illustrate how instruction may change:

1) A New Vision for Science Education, an infographic from the NGSS website, originally from the National Research Council, 2015, Guide to Implementing the Next Generation Science Standards.

2) Science Practices Continuum—Supervision. A tool from the Instructional Leadership for Science Practices website, that describes how instruction can progress.

Action

At the January 2018 Board meeting, the Board will have the opportunity to discuss NGSS standards implementation and consider approval of moving forward with working with partners on an NGSS communication plan.

This work would complement the Board's interest in advocating and developing policy to support educational equity. It is also related to the SBE's responsibility to provide consultation to the Office of the Superintendent of Public Instruction on standards and the assessment system, as well as identifying the score for meeting standard on statewide assessments. The SBE will also be approving achievement level scores at the January 2018 meeting on the new science assessment.

If you have questions regarding this memo, please contact Linda Drake at linda.drake@k12.wa.us.

A New Vision for Science Education

Implications of the Vision of the Framework for K-12 Science Education and the Next Generation Science Standards

SCIENCE EDUCATION WILL INVOLVE LESS:	SCIENCE EDUCATION WILL INVOLVE 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 to generate claims
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 "cookbook" 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	Student writing of journals, reports, posters, and media presentations that explain and argue
Oversimplification of activities for students who are perceived to be less able to do science and engineering	Provision of supports so that all students can engage in sophisticated science and engineering practices

Source: National Research Council. (2015). *Guide to Implementing the Next Generation Science Standards* (pp. 8-9). Washington, DC: National Academies Press. http://www.nap.edu/catalog/18802/guide-to-implementing-the-next-generation-science-standards

Science Practices Continuum - Supervision

This continuum is intended for teachers and administrators to use in guiding and evaluating science practice-based instruction. The levels reflect increasingly sophisticated instruction of the practices and are not grade-level specific; teachers of K-8 students can teach in developmentally appropriate ways at any of these levels. Appendix F in the NGSS provides significantly more detail for each practice (that should be integrated as both students and teachers develop greater fluency with each practice). The practices are grouped into the "Investigating" "Sensemaking" and "Critiquing" practices.

		Level 1	Level 2	Level 3	Level 4
Investigating Practices	1. **Asking questions**	Teacher does not provide opportunities for students to ask questions.	Teacher provides opportunities for students to ask questions. Students' questions are *not typically scientific questions* (i.e., not answerable through the gathering of evidence or about the natural world).	Teacher provides opportunities for students to ask questions. Students' questions are both *scientific* and *non-scientific* questions.	Teacher provides opportunities for students to ask questions. Students' questions are typically *scientific* (i.e. answerable through gathering evidence about the natural world).
	3. **Planning and carrying out investigations**	Teacher does not provide opportunities for students to design or conduct investigations.	Teacher provides opportunities for students to conduct investigations, but these opportunities are typically *teacher-driven*. Students do *not* make decisions about experimental variables or investigational methods (e.g. number of trials).	Teacher provides opportunities for students to *design or conduct* investigations to gather data. These opportunities enable students to make decisions about experimental variables, controls and investigational methods (e.g. number of trials).	Teacher provides opportunities for students to *design and conduct* investigations to gather data. These opportunities enable *students to make decisions* about experimental variables, controls and investigational methods (e.g. number of trials).
	5. **Using mathematics and computational thinking**	Teacher does not provide opportunities for students to use mathematical skills (i.e., measuring, comparing, estimating) or concepts (i.e., ratios).	Teacher provides opportunities for students to use mathematical skills or concepts but these are *not connected* to answering a scientific question.	Teacher provides opportunities for students to use mathematical skills or concepts that are connected to *answering a scientific question.*	Teacher provides opportunities for students to *make decisions* about what mathematical skills or concepts to use. Students use mathematical skills or concepts to answer a scientific question.

Sensemaking Practices	2. **Developing and using models**	Teacher does not provide opportunities for students to create or use models.	Teacher provides opportunities for students to create or use models. The models focus on *describing* natural phenomena rather than predicting or explaining the natural world. Students *do not evaluate* the merits and limitations of the model.	Teacher provides opportunities for students to create or use models focused on *predicting or explaining* the natural world. Students *do not evaluate* the merits and limitations of the model.	Teacher provides opportunities for students to create or use models focused on *predicting or explaining* the natural world. Students *do evaluate* the merits and limitations of the model.
	4. **Analyzing and interpreting data**	Teacher does not provide opportunities for students to analyze data. Students may record data, but do not analyze it.	Teacher provides opportunities for students to work with data, which could include organizing or grouping the data. However, these opportunities *do not* support students in *recognizing patterns or relationships* in the natural world.	Teacher provides opportunities for students to work with data to organize or group the data in a table or graph. These opportunities support students in making sense of data by *recognizing patterns or relationships* in the natural world.	Teacher provides opportunities for students to *make decisions* about how to analyze data (e.g. table or graph) and work with the data to create the representation. Students make sense of data by *recognizing patterns or relationships* in the natural world.
	6. **Constructing explanations**	Teacher does not provide opportunities for students to create scientific explanations.	Teacher provides opportunities for students to create scientific explanations but students' explanations are *descriptive* instead of explaining how or why a phenomenon occurs. Students *do not* use appropriate evidence to support their explanations.	Teacher provides opportunities for students to construct explanations that focus on explaining *how or why a phenomenon* occurs. Students *do not* use appropriate evidence to support their explanations.	Teacher provides opportunities for students to construct explanations that focus on explaining *how or why a phenomenon occurs* and *use appropriate evidence* to support their explanations.

Critiquing Practices	7. **Engaging in argument from evidence**	Teacher does not provide opportunities for students to engage in argumentation.	Teacher provides opportunities for students to engage in argumentation where they support their *claims with evidence or reasoning*, but the discourse is primarily *teacher-driven*.	Teacher provides opportunities for students to engage in *student-driven argumentation.* The student discourse includes *evidence and reasoning* to support their claim. Students also agree and disagree, but rarely engage in critique.	Teacher provides opportunities for students to engage in *student-driven argumentation*. The student discourse includes evidence, reasoning that links the evidence to their claim, and *critique* of competing arguments during which students build on and question each other's ideas.
	8. **Obtaining, evaluating, and communicating information**	Teacher does not provide opportunities for students to read text for scientific information.	Teacher provides opportunities for students to *obtain* scientific information, but *do not evaluate* this information. Students also *do not* compare or combine information from multiple texts considering the strengths of the information and sources.	Teacher provides opportunities for students to *read and evaluate* text to obtain scientific information. Students *do not* compare or combine information from multiple texts considering the strengths of the information and sources.	Teacher provides opportunities for students to *read and evaluate* text to obtain scientific information. Students *compare and combine* information from multiple texts considering the strengths of the information and sources.

Classroom Culture Prioritizing Science Practices

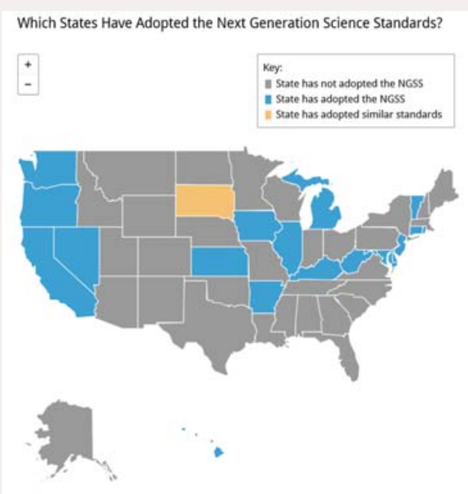
Less --More

Connected to the Natural World
Focused on Scientific Evidence
Student Directed and Collaborative
Informed by Critique

Next Generation Science Standards Communication Plan

January, 2018

Development and Adoption of the Next Generation Science Standards



- Development started in 2010
  - 26 lead states
  - National Research Council, National Science Teachers Association, American Association for the Advancement of Science and Achieve
- Washington was the eighth state (among 18) to adopt in October 2013, and among the first to have developed an assessment
- Implementing the standards well means students will do more analyzing, modelling, designing, investigating, constructing arguments, relating science to their own lives

Education Week: https://www.edweek.org/ew/articles/2015/05/06/districts-out-ahead-of-states-in-adopting.html?qs=ngss#map, accessed 12/27/2017

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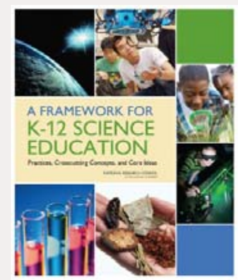
A Framework for K-12 Science Education

Guiding Assumptions:

- Children are Born Investigators
- Focusing on Core Ideas and Practices—limiting a set of core ideas to encourage depth of meaningful understanding
- Understanding Develops over Time
- Science and Engineering Require Both Knowledge and Practice
- Connecting to Students' Interests and Experiences
- Promoting Equity

National Research Council of the National Academy of Sciences, released July 2011



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Three-Dimensions

Science and Engineering Practices

- The cognitive, social and physical practices that are engaged during inquiry and investigation, engineering design, model-building, etc.

Crosscutting Concepts

- Includes cause and effect, scale and proportion, energy and matter

Disciplinary Core Ideas

- Four domains: physical sciences, life sciences, earth and space sciences, and engineering, technology and applications of science.
- Disciplinary core ideas have broad importance across disciplines
- Relate to the interests and life experiences of students
- Be teachable and learnable over multiple grades and increasing levels of depth and sophistication.

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State Board of Education and Science Education

- 24-Credit Graduation Requirements (WAC 180-51-068) specifies 3 credits of science, including 2 credits of lab science. Also defines lab science (in accordance with the National Academy of Science's 2006 America's Lab Report: Investigations in High School Science).
- Providing consultation to the Office of the Superintendent of Public Instruction on essential academic learning standards and the assessment system (RCW 28A.655.068, RCW 28A.655.070).
- Identification of achievement level scores on the statewide science assessment (RCW 28A.305.130).
- State Board of Education's interest in educational equity aligns with a foundational goal of the standards to promote educational equity in science.

NEXT GENERATION SCIENCE STANDARDS For States, By States

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Website:	www.SBE.wa.gov
Blog:	washingtonSBE.wordpress.com
Facebook:	www.facebook.com/washingtonSBE
Twitter:	@wa_SBE
Email:	sbe@k12.wa.us
Phone:	360-725-6025
Web updates:	bit.ly/SBEupdates

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THE WASHINGTON STATE BOARD OF EDUCATION

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2018 NGSS Implementation
SBE Communication Plan Template

Objective: SBE will utilize its leadership and advocacy role within the state to advance and amplify the successful implementation of NGSS and continued sustainability of high-quality science education.	
Partners	• •
Audience (Primary)	•
Audience (Secondary)	•
Key Information	•
Key Messages	•
Key Date(s)	•
Communication Channels and Vehicles	• o • o
Action Steps	•