

TO: Board of Education

FROM: Randall Booker, Superintendent

SUBJECT: **PRESENTATION ON THE NEXT GENERATION SCIENCE STANDARDS**

I. **SUPPORT INFORMATION**

On September 4, 2013, California adopted new science standards that aligned with the national science standards, referred to as [Next Generation Science Standards](#) (NGSS). Public comment on the draft of the [California Science Framework](#) closed on August 29 2016. The framework is expected to be adopted this November by the State Board of Education. For additional information on the Next Generation Science Standards, please visit the [NGSS FAQ webpage](#) published by the California Department of Education.

The Next Generation Science Standards (NGSS) are distinct from prior science standards in three essential ways.

1) Performance. Prior standards documents listed what students should “know” or “understand.” These ideas needed to be translated into performances that could be assessed to determine whether or not students met the standard. Different interpretations sometimes resulted in assessments that were not aligned with curriculum and instruction. The NGSS has avoided this difficulty by developing performance expectations that state what students should be able to do in order to demonstrate that they have met the standard, thus providing the same clear and specific targets for curriculum, instruction, and assessment.

2) Foundations. Each performance expectation incorporates all three dimensions from the Framework—a science or engineering practice, a core disciplinary idea, and a crosscutting concept.

3) Coherence. Each set of performance expectations lists connections to other ideas within the disciplines of science and engineering, and with Common Core State Standards in Mathematics and English Language Arts.

The National Research Council's (NRC) [Framework](#) describes a vision of what it means to be proficient in science; it rests on a view of science as both a body of knowledge and an evidence-based, model and theory building enterprise that continually extends, refines, and revises knowledge. It presents three dimensions that will be combined to form each standard:

Dimension 1: Practices

The practices describe behaviors that scientists engage in as they investigate and build models and theories about the natural world and the key set of engineering practices that engineers use as they design and build models and systems. The NRC uses the term practices instead of a term like “skills” to emphasize that engaging in scientific investigation requires not only skill but also knowledge that is specific to each practice.

Part of the NRC's intent is to better explain and extend what is meant by "inquiry" in science and the range of cognitive, social, and physical practices that it requires.

Although engineering design is similar to scientific inquiry, there are significant differences. For example, scientific inquiry involves the formulation of a question that can be answered through investigation, while engineering design involves the formulation of a problem that can be solved through design. Strengthening the engineering aspects of the Next Generation Science Standards will clarify for students the relevance of science, technology, engineering and mathematics (the four STEM fields) to everyday life.

Dimension 2: Crosscutting Concepts

Crosscutting concepts have application across all domains of science. As such, they are a way of linking the different domains of science. They include: Patterns, similarity, and diversity; Cause and effect; Scale, proportion and quantity; Systems and system models; Energy and matter; Structure and function; Stability and change. The Framework emphasizes that these concepts need to be made explicit for students because they provide an organizational schema for interrelating knowledge from various science fields into a coherent and scientifically-based view of the world.

Dimension 3: Disciplinary Core Ideas

Disciplinary core ideas have the power to focus K–12 science curriculum, instruction and assessments on the most important aspects of science. To be considered core, the ideas should meet at least two of the following criteria and ideally all four:

- Have **broad importance** across multiple sciences or engineering disciplines or be a **key organizing concept** of a single discipline;
- Provide a **key tool** for understanding or investigating more complex ideas and solving problems;
- Relate to the **interests and life experiences of students** or be connected to **societal or personal concerns** that require scientific or technological knowledge;
- Be **teachable** and **learnable** over multiple grades at increasing levels of depth and sophistication.

Disciplinary ideas are grouped in four domains: the [physical sciences](#); the [life sciences](#); the [earth and space sciences](#); and [engineering, technology and applications of science](#).

PUSD K-12 NGSS Leadership Team

The District, led by Dr. Cheryl Wozniak, Director of Curriculum and Instruction, and Mr. Sati Shah, Principal at Millennium High School, developed an NGSS Leadership Team to discuss and plan for the transitions in science instruction, and develop a timeline and implementation plan to guide our process. The team, consisting of teachers, specialists, administrators, Board Members, students, and parents will review the new standards and ultimately make recommendations that finalize the implementation plan.

The NGSS Leadership Team will begin these discussions by becoming rooted in the following documents and resources:

[How to read the NGSS](#)
[3-dimensional science learning](#)
[Middle and high school course models](#)

October Board Workshop

On October 10, 2016 – 9:30am-11:30am (Ellen Driscoll Theater), the District will host a Board Workshop to provide an in-depth study of the Next Generation Science Standards. The Board Workshop is open to the public and all are encouraged to attend.

During this meeting, middle school and high school science teachers will educate Board Members, administrators, and any participants from the public by modeling the shifts in how science is taught under the Next Generation Science Standards.

Middle School Course Models

There are two middle school course models: discipline-specific (earth, life, physical) and integrated. Elementary students' science experiences have been all integrated each year. Middle school teachers have been integrating earth, life, and physical science concepts since NGSS standards were released. Most of the professional development middle school teachers have received has been focused on the integrated middle school course model. Middle school teachers on the NGSS Leadership Team will present the pros and cons of each model at the October 10th Board Workshop.

High School Models and New Courses

The high school science teachers have received training on the three course models offered by the state. This presentation provides an overview of the three models. High school teachers will present the pros and cons of each model at the Board Workshop. Over the next 2-3 months, we will be discussing any new high school science courses that will need to be recommended for adoption in 2017-18.

Professional Development

The shift to fully integrating science and engineering practices and crosscutting concepts into our science instruction will take several years. Over the past several years, the District has been working closely with teachers in providing professional development as part of our implementation plan. The following is a summary of professional development completed to date:

2014-15

- NSTA Conference in Long Beach- 22 teachers and admin district-wide
- District PD days on NGSS for secondary science teachers--PD led by ACOE

2015-16

- Elementary science specialists led training during Common Planning Times
- District PD days for secondary science teachers dedicated to NGSS-led by ACOE
- CSTA Conference in Reno- 2 middle school science teachers and administrator
- Release days for middle and high school science teachers with ACOE consultant
- Speaker Series event: How science instruction is changing
- LHS experts led elementary CPT and presented to science leadership team
- Elementary (3 teachers) and middle school (4 teachers) taught Amplify Science units
- Middle school teachers- multiple coaching sessions with LHS experts

2016-17

- August 15- PHS science teachers- training on the high school course models

- September 7 & 8- NGSS Rollout- 8 teachers and admin attended 2 full days of training on NGSS Implementation

NGSS Curriculum

There is no published curriculum for NGSS at this time. Middle and high school teachers are writing lessons and units during prep periods, after school, and on weekends. After the State Board of Education adopts a new Science Curriculum Framework, the review of publisher submitted Instructional Materials begins. New instructional materials for science should be available early 2019.

II. **RECOMMENDATION: REVIEW AND DISCUSSION**

Review and discuss the Next Generation Science Standards.