NGSS Transition Teacher Education

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Considerations for NGSS Transition Planning

- The NGSS present a new vision for science education, one that aims to develop student proficiency in doing science.

- While it is important to think about goals for eventual course offerings, it is critical that we
  - focus first on getting to know the NGSS and the NRC Framework
  - embrace the integration of the three dimensions
  - analyze our current programs through the lens of the standards and framework.
K–12 Science Education Should Reflect the Real World Interconnections in Science.

“The framework is designed to help realize a vision for education in the sciences and engineering in which students, over multiple years of school, actively engage in scientific and engineering practices and apply crosscutting concepts to deepen their understanding of the core ideas in these fields.”
## Principles of the Framework

- Children are born investigators
- Understanding builds over time
- Science and Engineering require both knowledge and practice
- Connecting to students’ interests and experiences is essential
- Focusing on core ideas and practices
- Promoting equity
Principles of the Framework

The vision represented in the *Framework* is new in that students must be engaged at the nexus of the three dimensions:

1. Science and Engineering Practices
2. Crosscutting Concepts
3. Disciplinary Core Ideas
# Framework Informing NGSS

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Core Ideas

- NGSS define performance expectations for High School Earth and Space Science, Biology, Physics, and Chemistry as essential for ALL students to be Career and College Ready.

- NGSS define a K-12 progression of knowledge, skills, and practices. Students will enter high school ready to meet the HS performance expectations.

- NGSS require application of literacy and mathematics practices
Practices – NGSS elevates the practices of science from the inquiry strand of the current content standards and introduces engineering practices not in prior standards.

- Asking questions (science) and defining problems (engineering)
- Developing and using models
- Planning and carrying out investigations
- Analyzing and interpreting data
- Using mathematical and computational thinking
- Constructing explanations (science) and designing solutions (engineering)
- Engaging in argument from evidence
- Obtaining, evaluating, and communicating information
Crosscutting Concepts

- **Patterns**
  - Recognize, classify, and record patterns

- **Cause and Effect: Mechanism and Explanation**
  - Look for and analyze patterns and relationships and what causes the patterns; design tests to confirm or deny

- **Scale, Proportion and Quantity**
  - Work with objects and space and explicit models

- **Energy and Matter**
  - Flows, cycles and conversion

- **Systems and System Models**
  - Describe things in terms of parts, roles of parts, and relationship among parts

- **Structure and Function**
  - Investigate accessible and visible systems in nature and human-built world

- **Stability and Change**
  - Explore building, climbing, growth

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NGSS Architecture

• The NGSS are written as **Performance Expectations**

• NGSS will require contextual application of the three dimensions by students.
Conceptual Focus of NGSS

1. K-12 science education should reflect the interconnected Nature of Science as it is practiced and experienced in the real world.

2. The Next Generation Science Standards are student performance expectations – NOT curriculum.

3. The science concepts build coherently from K-12.

4. The NGSS focus on deeper understanding of content as well as application of content.

5. Science and Engineering Standards and Practices are integrated in the NGSS from K–12.

6. The NGSS and Common Core State Standards - English Language Arts and Mathematics are aligned.
Present System

National Science Teachers Association – Preservice teacher education

- Subject matter aligns with existing standards (relates to core ideas in Framework)
- Authentic Inquiry Experience (2010)
- Safety
- Nature of Science
Brainstorm

- What is missing from the existing criteria? (Note: Content expectations for TEACHERS per NSTA align with, but are not the same as STUDENT expectations).
Potential Issue 1: Engineering

- Need to add for elementary curriculum
- Challenges – embedded in content – not in isolation
- Ideas?
Potential Issue 2: Learning Progressions

- How are these addressed?
- Where do these fit in the preservice preparation?
Potential Issue 3: Practices

- Where are these going to be taught?
- How do we emphasize practices in preservice teacher preparation?
- To what extent can these standards impact university instruction?
Potential Issue 3: Crosscutting Concepts

- Need to facilitate instructors identifying these in content classes
  - University content courses typically content specific with challenges for transfer.

- Provide opportunity for students to look at how activities are taught in other disciplines.
  - Capstone methods assignment?
  - How does this impact sequence of classes?
  - Maybe in NOS class?
Next Steps