NGSS Professional Development Implementation Plan
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Presentation URL: http://tinyurl.com/katieandchad
Measure the top of your table

- Use items you have in your bowl or bucket.
How much cloth would I need to make a tablecloth (that just covers the table top) for the table?
How will you communicate this to the fabric counter at JoAnn’s?
Do you agree?

- What made you think that?
- What made you decide that?
- But what about ________?
- How does that fit with your decision that ________?

**Remember questioning each other does not only challenge students to think deeper but also models that it is the nature of science to encourage researchers to be skeptical of one another’s findings**

**Questioning also allows students to become accustomed to defending their position with evidence**
"If you **tell** someone something, you've forever robbed them the opportunity to **discover** it for themselves."

~Frank Oppenheimer
"Education is not the learning of facts, but the training of the mind to think."

-Albert Einstein
The true strength in our classroom lies in the collaboration of learners, not in the knowledge of one expert.
CDE NGSS State Implementation Plan

Handout
<table>
<thead>
<tr>
<th>Stage 1</th>
<th>Stage 2</th>
<th>Stage 3</th>
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<tr>
<td>Initial Exposure to NGSS</td>
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<td>Teachers are beginning to learn and become familiar with the Conceptual Shifts (Innovations), the three dimensions of learning, and the performance expectations of the NGSS.</td>
<td>Teachers engage in on-going research and the building of personal understanding of the Conceptual Shifts (Innovations), the three dimensions of learning, and the performance expectations of the NGSS.</td>
<td>Teachers begin planning lessons and units aligned to the three dimensions and performance expectations of the NGSS, returning to the previous stage as needed to ensure coherence with the Conceptual Shifts (Innovations) of the NGSS.</td>
<td>Teachers design and plan instruction aligned to NGSS curriculum and assessment.</td>
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Outcomes might include:
- Describe the Conceptual Shifts (Innovations) of the NGSS and discuss implications for teaching and learning.
- Identify the three-dimensions of the NGSS.
- Explain the anatomy and architecture of a NGSS standard.
- Identify NGSS resources for further study and information.

Outcomes might include:
- Express how teaching and learning look in the NGSS.
- For any standard, identify each of the dimensions connected to the performance expectation.
- Describe what a Science and Engineering Practice and Crosscutting Concept would look like in their classroom, providing examples of how they might engage students in these dimensions.
- For a performance expectation, identify a possible performance task that would assess student learning around the performance expectation.

Outcomes might include:
- Review grade level or subject area performance expectations.
- Take a current lesson/unit and translate it to the NGSS.
- Using the BSCS 5E Instructional Model or similar model, plan a learning cycle that integrates the three dimensions of the NGSS.
- Identify and describe a performance task that could be used in the classroom to assess student performance and understanding around a performance expectation or multiple performance expectations.

Outcomes might include:
- Implement formative and summative assessments aligned to NGSS.
- Create curriculum maps of implement district curriculum guides.
- Implement NGSS adopted curriculum that is aligned to AIM, EQUIP, or similar rubrics.
5E Instructional Model

• Biological Science Curriculum Study (BSCS)
• Developed in 1987
• Rooted in research
• Rodger Bybee
  – Head of BSCS team
  – Writer for NGSS
Building on the Past; Preparing for the Future

Phase I:

1990s

1/2010 - 7/2011

1990s-2009

NEXT GENERATION SCIENCE STANDARDS
For States, By States
7/2011 – April 2013

Phase II:

A FRAMEWORK FOR K-12 SCIENCE EDUCATION
Practices, Crosscutting Concepts, and Core Ideas
www.apa.org
California: a Lead State in Adoption and Implementation

NGSS Adoption in California: September 2013

Ongoing Development:
- Curriculum Framework
- High School course Models
- Story lines (all grades)
- Assessments

Multi-year rollout of Professional Learning Model
Next Generation Science Standards: 3D Learning

Core ideas in the discipline

Science and engineering

Concepts across disciplines
NGSS Conceptual Shift

- SEP: Science and Engineering Practices
- CCC: Cross-Cutting Concepts
- DCI: Disciplinary Core Ideas - content shift
- Engineering Standards
- Human Impact

---what students know and are able to do
Science and Engineering Practices

- Asking questions (for science) and defining problems (for engineering)
- Developing and using models
- Planning and carrying out investigations
- Analyzing and interpreting data
- Using mathematics and computational thinking
- Constructing explanations (for science) and designing solutions (for engineering)
- Engaging in argument from evidence
- Obtaining, evaluating, and communicating information
Commonalities Among the Practices in Science, Mathematics, and English Language Arts

Based on work by Tina Chuek ell.stanford.edu

Math

M1: Make sense of problems and persevere in solving them
M2: Reason abstractly & quantitatively
M3: Use appropriate tools strategically
M4: Models with mathematics
M5: Use appropriate tools strategically
M6: Attend to precision
M7: Look for & make use of structure
M8: Look for & make use of regularity in repeated reasoning

Science

S1: Ask questions and define problems
S2: Develop & use models
S3: Plan & carry out investigations
S4: Analyze & interpret data
S5: Use mathematics & computational thinking
S6: Construct explanations & design solutions
S7: Engage in argument from evidence
S8: Obtain, evaluate, & communicate information

ELA

E1: Demonstrate independence in reading complex texts, and writing and speaking about them
E2: Build a strong base of knowledge through content rich texts
E3: Obtain, synthesize, and report findings clearly and effectively in response to task and purpose
E4: Construct viable arguments and critique reasoning of others
E5: Read, write, and speak grounded in evidence
E6: Use technology & digital media strategically & capably
E7: Come to understand other perspectives and cultures through reading, listening, and collaborations

NGSS@NSTA
STEM STARTS HERE
www.nsta.org/ngss
NGSS Leadership Team

K-12 Science Leadership Team

- 34 teachers (12 elementary, 11 middle school, 11 high school)
- 8 administrators

4 Meetings held in Spring 2015:

- March 17, March 31, April 22, May 4

Agenda:

- Vision for TUSD Science
- Implementation plan, questions, concerns
- Parent meeting for community input - June 2015
- Board proposal of recommendations for July 2015
Torrance Unified School District promotes and supports the development of science-literate citizens who demonstrate competence in science and engineering practices, concepts, content, and science-based habits of mind. By participating in authentic science experiences, students engage in relevant hands-on/minds-on, cross-curricular science, and collaborative real-world applications.
5 Year Goal

Fully support teachers in creating an NGSS-aligned, student-centered classroom in order to prepare students to be science literate citizens.

Formal Statewide Testing: anticipated pilot test is 2016-2017, field test is 2017-2018, and administration of operational NGSS Assessment is 2018-2019
NGSS Performance Expectations

**Elementary School:** State has determined the performance expectations to be taught by each grade level.

**Middle School:** State has determined the performance expectations to be taught between grades 6-8, leaving the order they are taught (two options) up to individual school districts.

**High School:** State has determined the performance expectations to be taught between grades 9-12, leaving the order they are taught up to individual school districts.
Support for Integrated Middle School Model

- It is the state preferred model
- Developmentally appropriate
- Progression of depth, builds from 6th grade to 8th grade (example: cells -> ecosystems -> heredity)
- Aligns with Common Core
- The change of topics will allow for more collaboration and require teachers to address the conceptual shift needed to teach NGSS
- Human Impact is in each of the grade levels (only in 6th grade in the Discipline specific specific model)
- Allows students to get a more real life experience (real science is integrated).
Preferences - Effective Professional Development

- Experiencing 5 E Model Lessons: 19 (73.1%)
- Collaboration time: 25 (96.2%)
- Examining student evidence: 10 (38.5%)
- Observing colleagues: 11 (42.3%)
- Designing authentic assessment: 11 (42.3%)
- Rubric design: 6 (23.1%)
Professional Development Frequency Preferences

- One time per month (10 total): 10 (38.5%)
- Every 6 weeks (8 total): 2 (7.7%)
- Every other month (6 total): 10 (38.5%)
- Every two months (3 total): 3 (11.5%)
- Once a semester (2 total): 1 (3.8%)
- None: 0 (0%)

Instructional Coach Preferences

- Yes: 9 (34.6%)
- No: 6 (23.1%)
- Maybe: 11 (42.3%)
Elementary

Stage 1: Initial Exposure to NGSS
Stage 2: Deepening Understanding of NGSS
Stage 3: Planning Instruction around NGSS
Stage 4: Full Alignment of Instruction to NGSS

All 4th and 5th
Pilot 4th and 5th
Elementary School

Year 1

**Awareness**: 3 full days grade-specific PD for all teachers in grade level

Pilot Group (voluntary) 8 full days content specific PD

Year 2

**Transition**: 4 full days content specific PD for all teachers in grade level

Year 3

**Implementation**: 8 full days of content specific PD for all teachers in grade level

Year 4

**Support**: 3 full days of content specific outcome-based PD for all teachers in grade level
TUSD Science Professional Development Update

2013-2014

- Elementary Mickelson ExxonMobil 2013 Participants: Awareness (Stage 1)
  - Science & Engineering Practices (3 PD Days)
- Middle School: Awareness (Stage 1)
  - CMAST PLC and PD Days
TUSD Science Professional Development Update

2014-2015

- Elementary Mickelson ExxonMobil 2014 Participants: Awareness (Stage 1)
  - SEP/DCI - (PD Days)

- High School: Awareness (Stage 1)
  - SEP/DCI/CCC (PD Days)

- Middle School: Early Transition (Stage 2)
  - CMAST PLC and PD Days
  - Singleton 6th grade: Awareness
Middle School

Awareness
- Stage 1: Initial Exposure to NGSS

Transition
- Stage 2: Deepening Understanding of NGSS
- Stage 3: Planning Instruction around NGSS

Implementation
- Stage 4: Full Alignment of Instruction to NGSS

7th/8th Grade
6th Grade
Middle School

2015-2016

**Transition:** 8 days content-specific, differentiated PD for all 6th grade teachers

7th/8th: 4 full day content-specific PD for all teachers

2016-2017

**Implementation:**
6th/7th grade teachers
8 full days content-specific PD

8th: 4 full day content-specific PD for all teachers

2017-2018

**Support:** 6th/7th grade - 3 full days of content specific outcome-based PD for all teachers in grade level

**Implementation:** 8th grade teachers 8 full days content-specific PD

2018-2019

**Support:** 6th, 7th, 8th grade
3 full days of content specific outcome-based PD for all teachers in grade level
High School

Stage 1: Initial Exposure to NGSS
Stage 2: Deepening Understanding of NGSS
Stage 3: Planning Instruction around NGSS
Stage 4: Full Alignment of Instruction to NGSS

High School
High School

**Transition:** 4 days content-specific, differentiated PD for all content areas

**Implementation:** Based on released models from CDE
*8 full days of content specific PD

**Support:**
3 full days of content specific outcome-based PD for all teachers in grade level
2015-2106 NGSS PD

- DO the model 5E experience with your students
- 5E learner’s hat experience: Emphasis on “Engage” and “Explore” student Explanation
- Analyze student evidence brought to session (Claim Evidence Reasoning).
- Time to plan, resources/supplies
The best teachers are those who show you where to look - but don't tell you what to see. Alexandra K Trenfor
Summer Workshop Model
Sample 7th Grade PD Overview

Monday: Integrated Storyline - PE strips

Tuesday: Storyline Rationale/Curriculum Map

Wednesday: Evidence Statements & Learning Targets, Curriculum Map revision

Thursday: Cells Lesson Collaboration/Planning (helping 6th grade teachers with new content)

Friday: Ecosystems Lesson Planning - unit that teachers can start in integrated or discipline specific...
Example: Integrated Model PE Strip Activity
Sample High School PD Overview

Let’s Evaluate the (5E) Lesson

• Teachers participated in model lesson - Xtreme-O-phies

• Evaluated the lesson:
  1. How does the lesson demonstrate the 5E model?
  2. What SEP’s does the lesson focus on?
  3. What DOK level is the final assessment piece?
Developing a 5E Model Lesson

- Study the PE so you know exactly what each of the 3 dimensions is looking for:
  - Read the framework (content specific for each DCI)
  - Read the DCI/SEP/CCC
  - Read the evidence statements
Students who demonstrate understanding can:

**HS-LS1-1.** Construct an explanation based on evidence for how the structure of DNA determines the structure of proteins, which carry out the essential functions of life through systems of specialized cells. (Assessment Boundary: Assessment does not include identification of specific cell or tissue types, whole body systems, specific protein structures and functions, or the biochemistry of protein synthesis.)

The performance expectation above was developed using the following elements from *A Framework for K–12 Science Education*:

**Science and Engineering Practices**
- Constructing Explanations and Designing Solutions
  - Constructing explanations and designing solutions in 9–12 builds on K–8 experiences and progresses to explanations and designs that are supported by multiple and independent student-generated sources of evidence consistent with scientific ideas, principles, and theories.
  - Construct an explanation based on valid and reliable evidence obtained from a variety of sources (including students' own investigations, models, theories, simulations, peer review) and the assumption that theories and laws that describe the natural world operate today as they did in the past and will continue to do so in the future.

**Disciplinary Core Ideas**

- **LS1.A: Structure and Function**
  - Systems of specialized cells within organisms help them perform the essential functions of life.
  - All cells contain genetic information in the form of DNA molecules. Genes are regions in the DNA that contain the instructions that code for the formation of proteins, which carry out most of the work of cells. (Note: This Disciplinary Core Idea is also addressed by HS-LS3-1.)

**Crosscutting Concepts**
- Structure and Function
  - Investigating or designing new systems or structures requires a detailed examination of the properties of different materials, the structures of different components, and connections of components to reveal its function and/or solve a problem.

**Observable features of the student performance by the end of the course:**

1. **Articulating the explanation of phenomena**
   - a. Students construct an explanation that includes the idea that regions of DNA called genes determine the structure of proteins, which carry out the essential functions of life through systems of specialized cells.

2. **Evidence**
   - a. Students identify and describe the evidence to construct their explanation, including that:
     i. All cells contain DNA;
     ii. DNA contains regions that are called genes;
     iii. The sequence of genes contains instructions that code for proteins; and
     iv. Groups of specialized cells (tissues) use proteins to carry out functions that are essential to the organism.
   - b. Students use a variety of valid and reliable sources for the evidence (e.g., theories, simulations, peer review, data, models, and assessing design solutions) to support their explanation.
Sample High School PD Overview

**Developing a 5E Model Lesson**

- Generate learning targets “Students will be able to…” or “I can…” that support the PE
- Follow the UbD backwards planning by developing your assessment (evaluate) first:
  - What SEP does the PE ask the students to perform?
  - What evidence do the students need to demonstrate?
  - How can you make your assessment a DOK level 3?
- Find/create activities for the remaining 5E’s that will allow your students to meet the learning targets and gain the knowledge/skills necessary to be successful on the assessment.
## 5E Lesson Overview

<table>
<thead>
<tr>
<th>Teacher:</th>
<th>Topic:</th>
<th>Subject:</th>
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</thead>
<tbody>
<tr>
<td>Performance Expectation(s):</td>
<td></td>
<td></td>
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<tr>
<td>Learning Targets (Students will be able to...):</td>
<td></td>
<td></td>
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<tr>
<td>Student Evidence:</td>
<td></td>
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<tr>
<td>Materials:</td>
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</tbody>
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### Engage

<table>
<thead>
<tr>
<th>Teacher Will:</th>
<th>Students Will:</th>
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### Explore

<table>
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<th>Students Will:</th>
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### Explain

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Follow Up, & Coaching, & Accountability

😊  Work Time  😊

End of Day Goal:
• Develop learning targets
• Fully developed assessment (Evaluate) with handouts, rubric, etc.
• Start creating activities for 5E lesson

Looking Ahead:
• Tomorrow we will begin by peer reviewing your assessment (evaluate).
Follow Up, & Coaching, & Accountability

Homework

• Choose a performance expectation
  – Teach in September/October
  – Create a 5E model lesson
  – Be observed (by Science TOSA) teaching this lesson
  – Get stipend!
NSTA Learning Center

- Resources for teachers
- Ideas, books, lessons, etc
- Professional development
- Webinars
- Sci Packs

//learningcenter.nsta.org
Welcome to your collection of professional development resources. Select from the links and tabs below to access your NSTA resources, your uploaded items, organize them into collections, and then share your collections with others.
Additional Resources

- Khan Academy Videos
- Bozeman Science Videos
- Achieve 3000 and/or NewsELA
- Science Buddies- http://www.sciencebuddies.org/
- Sally Ride Science
- Picture Perfect Science
• Trial period until the end of the school year.
• NGSS Aligned lessons
• Easy to use!
• Student ready materials
"Take chances, make mistakes, get messy!"

- Ms. Frizzle
SUCCESS
WHAT PEOPLE THINK IT LOOKS LIKE
SUCCESS
WHAT IT REALLY LOOKS LIKE
Please take our PD Evaluation/Feedback Survey!

http://tinyurl.com/NGSSImplementation