Pacifica School District Science Update
April 20, 2016

Pacifica School District Science Plan

I. Introduction

II. Science Plan

III. 2015-2016 Year in Review

IV. Middle School

- A. Course Pathways
- B. Computer Science

V. Questions

Science Committee

2014-2016 Science Committee:

Comprised of two representatives from each site
Reviewed Next Generation Science Standards
Collaboratively developed a vision for science learning and a 5 year implementation plan to achieve that vision and transition to the NGSS

2016 and Beyond:

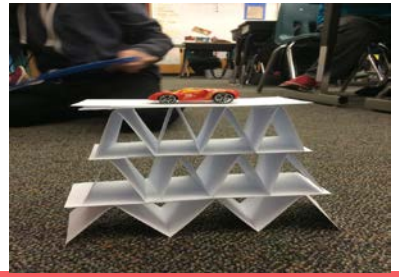
Science committee will meet tri-annually to revise the science plan and make recommendations to achieve our shared vision

PACIFICA
SCHOOL DISTRICT

Pacifica School District Vision For Science Learning

We envision a community of student scientists whose curiosity and engagement drives them to wonder, explore, experiment, and think critically about 21st century concepts in science, technology, engineering, and the environment. Through the inquiry process students will make real world connections and become scientifically literate, responsible citizens able to effectively communicate across curricula.





Science Instruction and Assessment

Goals:

1. Align science instruction to meet the Next Generation Science Standards (NGSS) and support ELA Anchor Standards and ELD Standards
2. Research and purchase NGSS aligned instructional materials

Standards:

- Next Generation Science Standards (NGSS)- Science and engineering content and practice standards

Instructional Materials We Use:

- District Adopted Texts: K-5 FOSS, 6-8 CPO Science
- Supplemental Resources for Support and Enhancement:
- Mystery Science, Defined STEM, OUSD Science, Environmental Education Initiative(EEI), PSD Computer Science STARLogo Units

Assessment: How We Know Students Are Learning

- Text based summative assessments
- Formative assessments
- NGSS aligned rubrics for projects
- NGSS Standardized Tests (2019)
- Daily checks for student understanding

Strategic Areas of Science Focus:

The table below provides an overview of nine strategic areas of focus identified by the district science committee that will enable us to teach our vision for student learning of science. These areas of focus address the three interrelated components of the district strategic plan that recognize our students' right to learning that is rigorous, differentiated, and holistic.

I. Learning that is Rigorous

I.A. Plan and implement transition to the Next Generation Science Standards	I.B - Provide professional development related to Science and Engineering Practices, 21st century skills, NGSS content shifts, active and inquiry-based learning, and integration of other disciplines in science	I.C - Provide resources to develop and implement formative and summative assessments to measure depth and application of knowledge	I.D - Implement curriculum and projects that are NGSS aligned, hands-on, inquiry based, and incorporate 21st century skills

II. Learning that is Differentiated

II.A - Implement multiple research-based strategies to support diverse learners	II.B - Utilize formative and summative assessments to offer students opportunities to demonstrate individual growth

III. Learning that is Holistic

III.A - Provide and promote teacher collaboration opportunities for grade-alike, cross-curricular planning and vertical articulation	III.B - Encourage school- and district-wide Science events that foster family involvement	III.C - Reach out to community members and organizations to partner with schools, teachers, and students to support science learning

NGSS Transition Timeline

2013	2014–2015	2015–2016	2016–2017	2017–2018	2018–2019
K–5 NGSS Adopted		Awareness Phase	Transition to Science and Engineering Practice Standards (SEPs)	Transition to Cross Cutting Concepts (CCC)	Begin Transition to Disciplinary Core Ideas (DCI) *Instructional Materials *NGSS Assessment
6–8 NGSS Adopted	Awareness Phase	Transition to Science and Engineering Practice Standards	Transition to Cross Cutting Concepts (CCCs) ---------- 6th Grade: Begin Transition to Integrated Disciplinary Core Ideas (DCIs)	6th Grade: Continue Transition to DCIs ---------- 7th Grade: Begin Transition to Integrated DCIs	6th and 7th Grade: Continue transition to DCIs ---------- 8th Grade: Begin Transition to Integrated DCIs *Instructional Materials *NGSS Assessment

Pacifica 2015-2106

Teacher Leaders to participate in Professional Learning Communities

- San Mateo Science Leadership Network
- Project Based Learning Network (PBLz)

Beginning of Awareness Phase (TK-5)

- Introduction to NGSS
- Overview of state and district Implementation Timeline
- Overview of the new content and practice standards

Professional development on NGSS Science and Engineering Practice Standards

- How to modify current lessons and labs to embed SEPs
- Assessment of SEPs

Teacher Leader from each site attended NSTA conference

- NGSS units available to pilot

Pacifica 2015-2016 (cont'd)

- Beginning of Transition Phase (6-8th)
  - Apply Science and Engineering Practice Standards
  - 7/8th Science teachers attended NSTA conference
  - Development and piloting of Computer Science units (6/7th)
  - NGSS Instructional materials available to pilot
  - Professional development with Defined STEM (6-8th grade)
- Instructional pilot material and programs
  - Mystery Science (2nd-5th)- Web based curriculum
  - Education and the Environment Initiative (K-8)- Free online curriculum
  - Teacher Institute on Science and Sustainability (TISS)- Academy of Sciences
  - Amplify Science- Lawrence Hall of Science
  - Defined STEM (6th-8th)
  - FOSS- Lawrence Hall of Science (Review Process using modified Equip Rubric)

NGSS Middle School Courses:
Integrated vs. Discipline Specific

Integrated (Conceptual Progression) Model:

The Integrated Model for grades 6-8 was developed and recommended to the State Board by the state's Science Expert Panel, which consisted of 27 top K-12 science teachers as well as university and industry scientists and engineers. Three nationally recognized California scientists served as advisers. K-5 Integrated, 6-8 Integrated

Discipline-Specific (Science Domain) Model:

"The SBE approved a recommendation to reconvene the Science Expert Panel (SEP) in order "to develop … as an alternative model … a discipline specific model" for the grade span of six through eight. This course is aligned with the cognitive demands of the Common Core State Standards and contains the CA NGSS for grades six through eight organized into content-specific courses that match three science domains.In addition to the arrangement of the domain specific content, the SEP also considered what content, if any, from the other science domains would need to be introduced in order to facilitate student's full understanding of each performance expectation. Therefore, the Alternative Discipline Specific Course standards contain supplemental Disciplinary Core Ideas from other domains." K-5 Integrated, 6th Earth Science, 7th Life Science, 8th Physics

1998 California Science Standards

6th	7th	8th
Plate Tectonics and Earth's Structure Earth's Topography Heat Energy Ecology and Earth's Resources	Cells Genetics Evolution Earth and Life History Structure and Function in Living Systems (A&P) Light	Physics Structure of Matter Earth in the Solar System Chemical Reactions Chemistry in Living Systems Periodic Table Density and Buoyancy

NGSS Discipline Specific Model

6th Grade	7th Grade	8th Grade
Weather and Climate	Cells and Organisms	Physics-Heat
Natural Resources/Geology	Ecosystems	Physics
Earth History	Evolution	Chemistry
Astronomy	Engineering	Engineering
Human Impacts		
Engineering		

NGSS Integrated Model

6th Grade	7th grade	8th Grade
Energy – Heat	Chemistry	Physics
Cells and Organisms	Ecosystems	Evolution
Weather and Climate	Natural Resources/Geology	Astronomy
Human Impacts	Earth History	Human Impacts
Engineering	Human Impacts	Engineering
	Engineering	
Systems, Patterns,	Energy and Matter	Stability and Change
Structure and Function	Cause and Effect	Scale

NGSS Middle School Courses:
Integrated vs. Discipline Specific

A brief history…..

2014-2015

- Middle School Teachers attended NGSS Rollout Symposium
- NGSS resources shared
- Presentation from SMCOE science and engineering coordinator on middle school course progression
- Half day and after school meetings to discuss course progression
- Teacher survey

2015-2016

- M.S. teachers attended NSTA Reno conference
- After school meetings
- Follow up presentation with SMCOE science and engineering coordinator
- Teacher feedback
- Teacher survey

NGSS Middle School Courses:

Integrated vs. Discipline Specific Pros and Cons (February 2016)

Strengths of Discipline-Specific Model	Challenges for Discipline-Specific Model
• Complete picture of subject in one year • Conceptual progression is logical • Teachers educated in the discipline • Discipline specific already integrates	• Teachers may not work on changing curriculum under the assumption that they have already been teaching the standards for a while • Assessments based on integrated model • Fewer large district partners to collaborate or share resources with • Assignment of topics to grade isn't necessarily appropriate– random • May have to wait longer for publishers to create curriculum

NGSS Middle School Courses:

Integrated vs. Discipline: Specific Pros and Cons (February 2016)

Strengths of Integrated Model	Challenges for Integrated Model
• Big-picture science; not just physics, etc. in an isolated box • Older standards nod at connections between science areas, but doesn't go deeply-- this does • Real world broad vision of science, not compartmentalized • Integrated sciences matches program of leading international science education pathways • Connections to integrated CCSS math • Final assessment will be integrated • More emphasis on practices and cross-cutting concepts • Increasing complexity is developmentally appropriate	• Volume of complex concepts at 6th grade level • Potential shifts in teacher expertise or lack of… • Lack of breadth and cohesion • Time constraints without block period • Credential issues • Teachers teaching from the textbook only - no prior knowledge • A lot of pressure on 6th grade science curriculum to set a foundation for all areas

NGSS Middle School Courses

Integrated vs. Discipline Specific: Pros and Cons (February 2016)

6-8th Grade Teacher Responses (February 2016):

	Total agreement and support	Agreement and support	Willing to support	Have concerns but will not sabotage	Will openly resist
Integrated	41.67% 5	16.67% 2	8.33% 1	16.67% 2	16.67% 2
Discipline Specific	41.67% 5	8.33% 1	25% 3	25% 3	0% 0

Integrated vs. Discipline Specific (cont’d)

March 2016

- Teacher surveys and feedback were shared with middle school teachers, principals, and vice principals
- Principals and vice principals discussed teacher feedback and options at Leadership C ouncil
- Principals and vice principals came to consensus to support the Integrated Courses for middle school

Middle School Computer Science

Starlogo Nova: 6-8th Grade

Computer simulation & coding experience aligned to
Next Generation Science Standards

- Piloted by all 6th grade (2015-2016)
- Cole Westbrook piloted StarLogo computer science curriculum for 7th grade (2015-2016)
- StarLogo computer science curriculum to be piloted by all 7th grade teachers (2016-2017)
- Plan for 8th grade implementation of computer science (2016-2017)

Pacifica School District & Pacifica Education Foundation: Computer Science in Middle School