Implementing NGSS in Oakland & San Francisco

STEM Smart workshops are funded by the National Science Foundation grant #1449550. Any opinions, findings, and conclusions or recommendations at this event or in these materials are those of the author(s) and do not necessarily reflect the views of the National Science Foundation.

Caleb Cheung, Oakland USD
Sarah Delaney, San Francisco USD

February 1, 2016

Who are You?


HELLO
my name is
Caleb
Cheung
HELLO
my name is
Sarah
Delaney

Goals

1. Identify NGSS challenges
2. Share NGSS implementation efforts
3. Exchange NGSS tools & resources

NEXT GENERATION
SCIENCE
STANDARDS

Agenda

Introduction
NGSS Challenges
San Francisco
Oakland
Questions & Comments

Turn & Talk

What made you decide to attend this session?

Challenges

NEXT GENERATION

SCIENCE

STANDARDS

Conceptual Shifts

1. Real world science interconnections
2. Builds coherently across K-12
3. Focuses on deeper understanding and application of content
4. Integrates science and engineering
5. Aligns with Common Core State Standards
6. Focuses on 3 dimensional performance expectations
7. Prepare students for college, career, and citizenship


1
2
3
4
5
6
7
8
9
10-14
15-19
20+
Years Teaching


DEPARTMENT OF EDUCATION
STATE OF CALIFORNIA

CDE NGSS Timeline

2013	NGSS Adopted
2014	Framework Committee
2016	Framework Finalized Assessment Pilot
2017	Assessment Field Test
2018	Assessment Implementation Instructional Materials Adoption

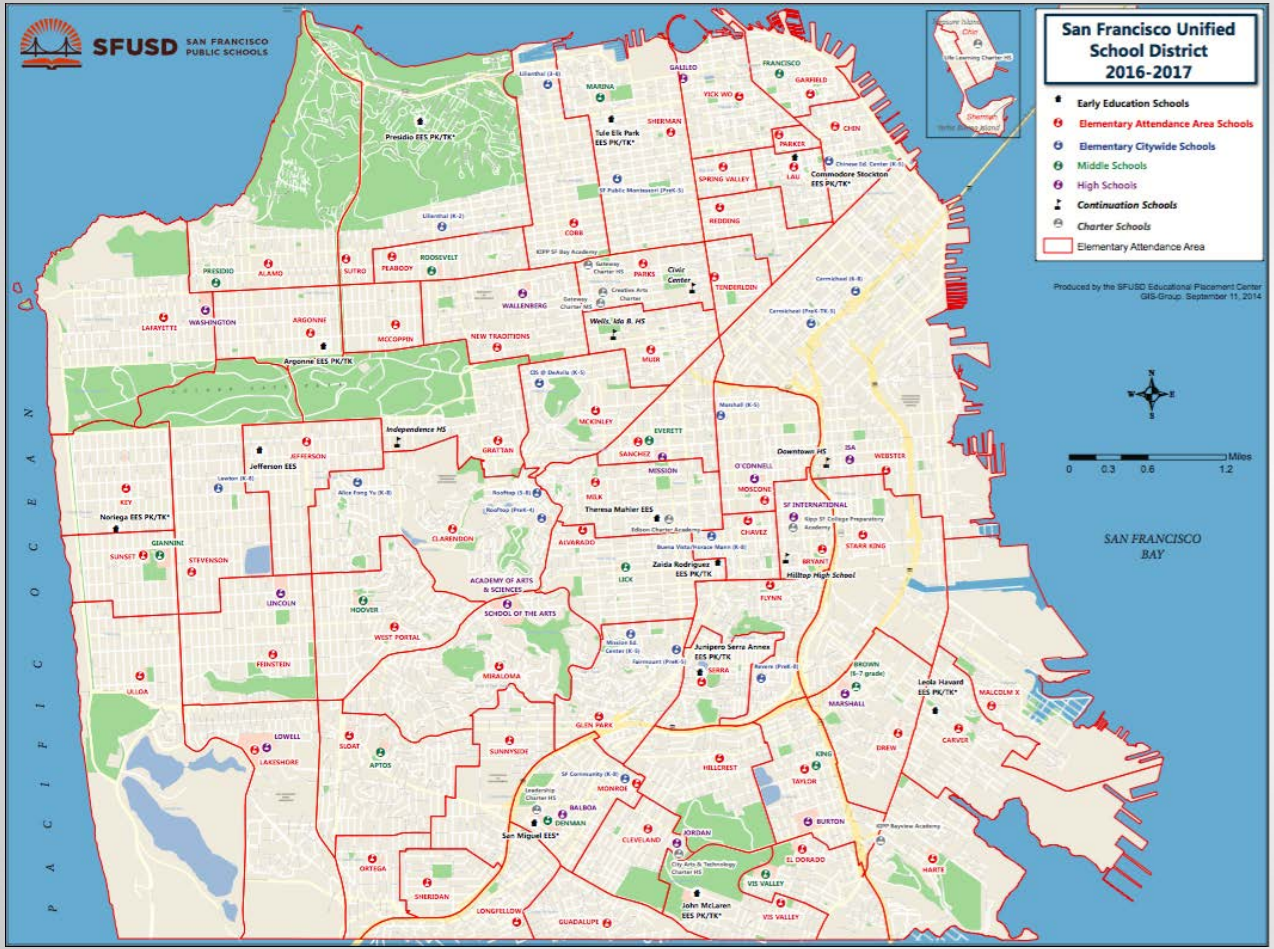
Structural Constraints

1. Instructional Time
2. Math/Science Coring
3. Coordination with Academies

Challenges

1. Conceptual Shifts
2. Heterogeneous Teaching Force
3. Funding
4. Timeline
5. Structural Constraints

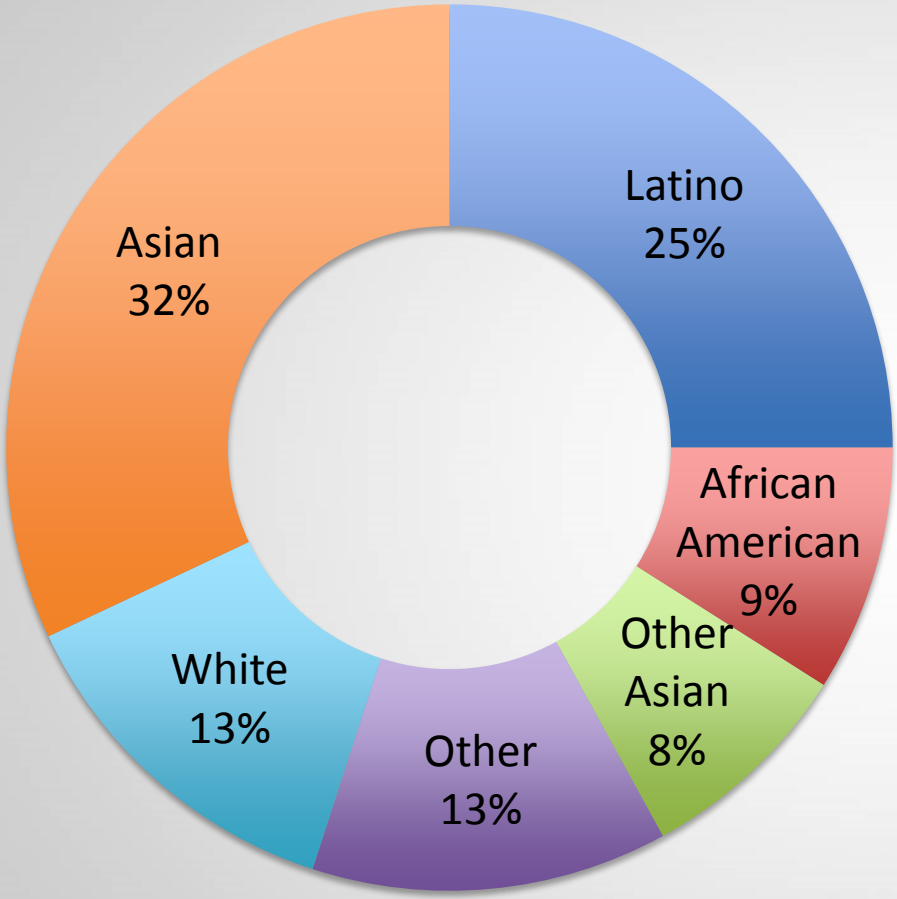
San Francisco



57,000 Students

131 Schools

- 12 Early Ed
- 71 K-5 & K-8
- 12 Middle
- 15 High
- 21 Alternative & Charter



27% English Learner

53% Free/Reduced Lunch

10 FTE supporting science district-wide

Strengthening Science Education in California's New Era Of Local Control: The Toolkit

Beta Version, May 2015

Strengthening STEM Education Through Local Control: A Toolkit to Help Develop Your District's Local Control Accountability Plan (LCAP)

This toolkit has been assembled by California STEM Learning Network (CSLNet), together with the Lawrence Hall of Science at the University of California, Berkeley, to help parents, students, educators, community partners and business leaders who are concerned about improving Science, Technology, Engineering and Math (STEM) education to participate in their local school district budget development process. As explained in our *LCAP Primer*, recent changes in California law have given school districts more control and flexibility over how to spend state education funds, while also requiring new levels of transparency and accountability through the creation of Local Control and Accountability Plans (LCAPs). This toolkit helps STEM advocates understand how the LCAP development process works and how to participate in it. More importantly, it guides stakeholders to identify specific recommendations for strengthening STEM within their district and translating those recommendations into the format of an LCAP.

High-quality STEM education encompasses both rigorous instruction in the individual disciplines of science, technology, engineering and mathematics, as well as integrated approaches that weave two or more of these subjects together – like they are in the real-world practice **of science and engineering. California's commitment to** implement new standards for math and science – the Common Core State Standards for Math (CCSS-M) and the Next Generation Science Standards (NGSS) – provides the biggest opportunity in decades to bring high-quality STEM education to all students.

Because there are more existing resources focused on implementation of the Common Core State Standards, and in an effort to get information into the field before the end of the 2015-16 LCAP development period, this beta version of the toolkit focuses largely on science education and implementation of the NGSS. It also aims to highlight new content and opportunities within the NGSS to strengthen STEM education through instruction in engineering design, environmental literacy and computational thinking, as well as linkages to informal education. A second version of the toolkit, scheduled for fall 2015 release, will contain additional tools and examples of promising practices, including greater focus on math.

NEXT GENERATION

SCIENCE

STANDARDS

SFUSD NGSS Implementation

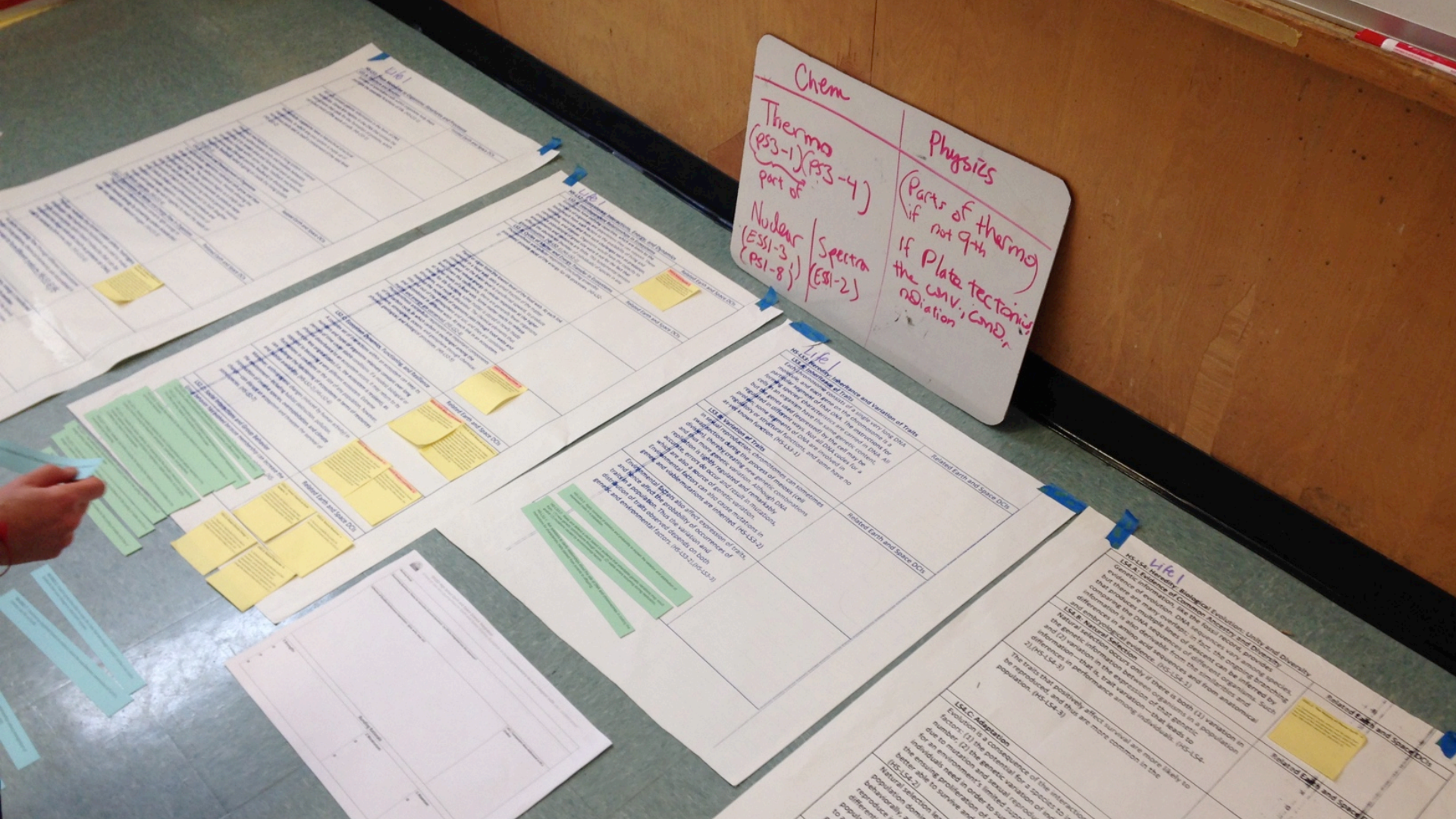
1. Teacher Leaders


Science Practices
Engineering Practices

SFUSD NGSS Implementation

1. Teacher Leaders
2. High School Course Decisions


ESS 1
Earth's Place In The Universe
PHYSICS
CHEMISTRY
BIOLOGY
ESS 1-1
ESS 1-2
ESS 1-3
ESS 1-4
ESS 1-5
ESS 1-6
ESS 2
Earth's System's
PHYSICS
CHEMISTRY
BIOLOGY
ESS 2-1
ESS 2-2
Albedo
Climate
eco
ESS 2-3
Thermo
ESS 2-4
Climate
Climate gases
ESS 2-5
ESS 2-6
carbon
ESS 2-7
ESS 3
Earth + Human Activity
PHYSICS
CHEMISTRY
BIOLOGY
ESS 3-1
ESS 3-2
ESS 3-3
ESS 3-4
ESS 3-5
ESS 3-6
ALL
E. Biogeology


Chem
Thermo
(PS3-1)(PS3-4)
part of
Nuclear
(ESS1-3
(PS1-8)
Spectra
(ESS1-2)
Physics
(Parts of thermo
if not q4th
If Plate tectonics
the conv., cond.,
radiation

Primary 9th Grade Course by School

Biology	Conceptual Physics	Biotech 1	Earth Science	Physiology	Field Biology
O'Connell (Marine Biology prior to 2014/15)	Academy	Marshall	Burton	International	June Jordan
Galileo	Balboa				
Independence	Mission				
Lincoln	ISA				
Lowell	SOTA				
Wallenberg					
Washington					

Number of Students 2014-2015		
Biology	Physics	Other
2395	796	533

High School Course Sequence

9th Grade Physics

9th/10th Grade Life Science

10th/11th Grade Chemistry

10th/11th Grade Physics

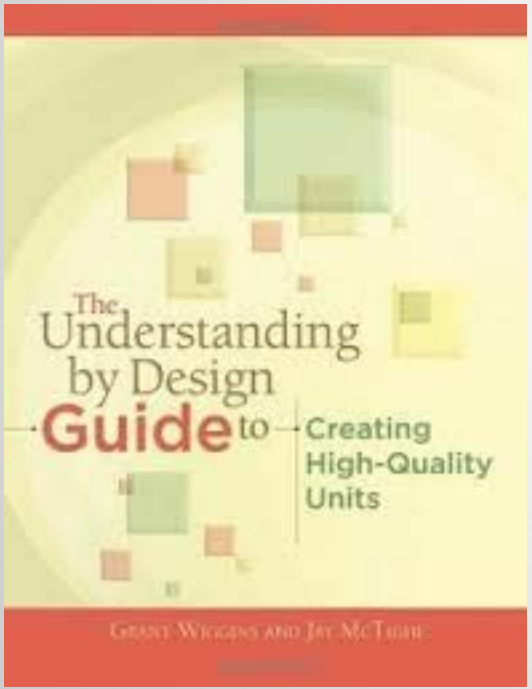
Earth Science, Space Science and Engineering Standards embedded in each course.

SFUSD NGSS Implementation

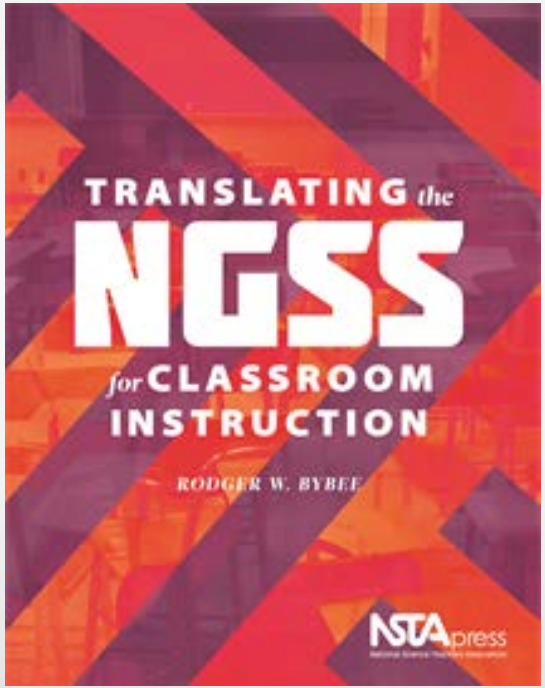
1. Teacher Leaders
2. High School Course Decisions
3. A Core Curriculum for Science


THE URINARY TRACT

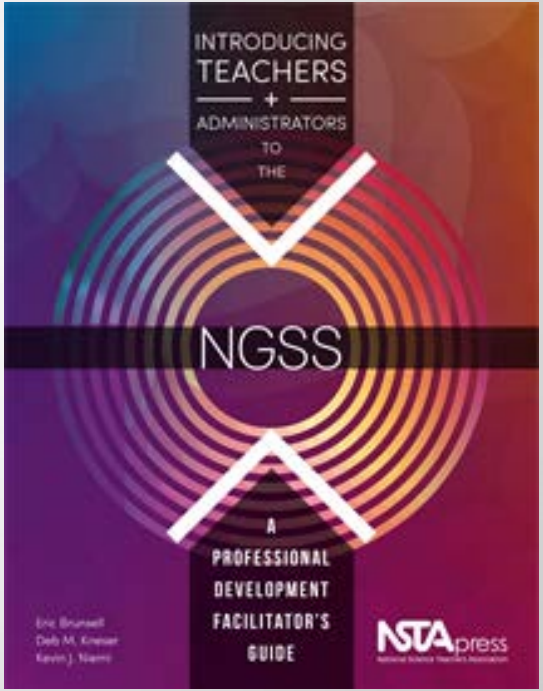
UBD


The Understanding by Design Guide to Creating High-Quality Units

5Es


TRANSLATING the NGSS for CLASSROOM INSTRUCTION
RODGER W. BYBEE
NSTApress

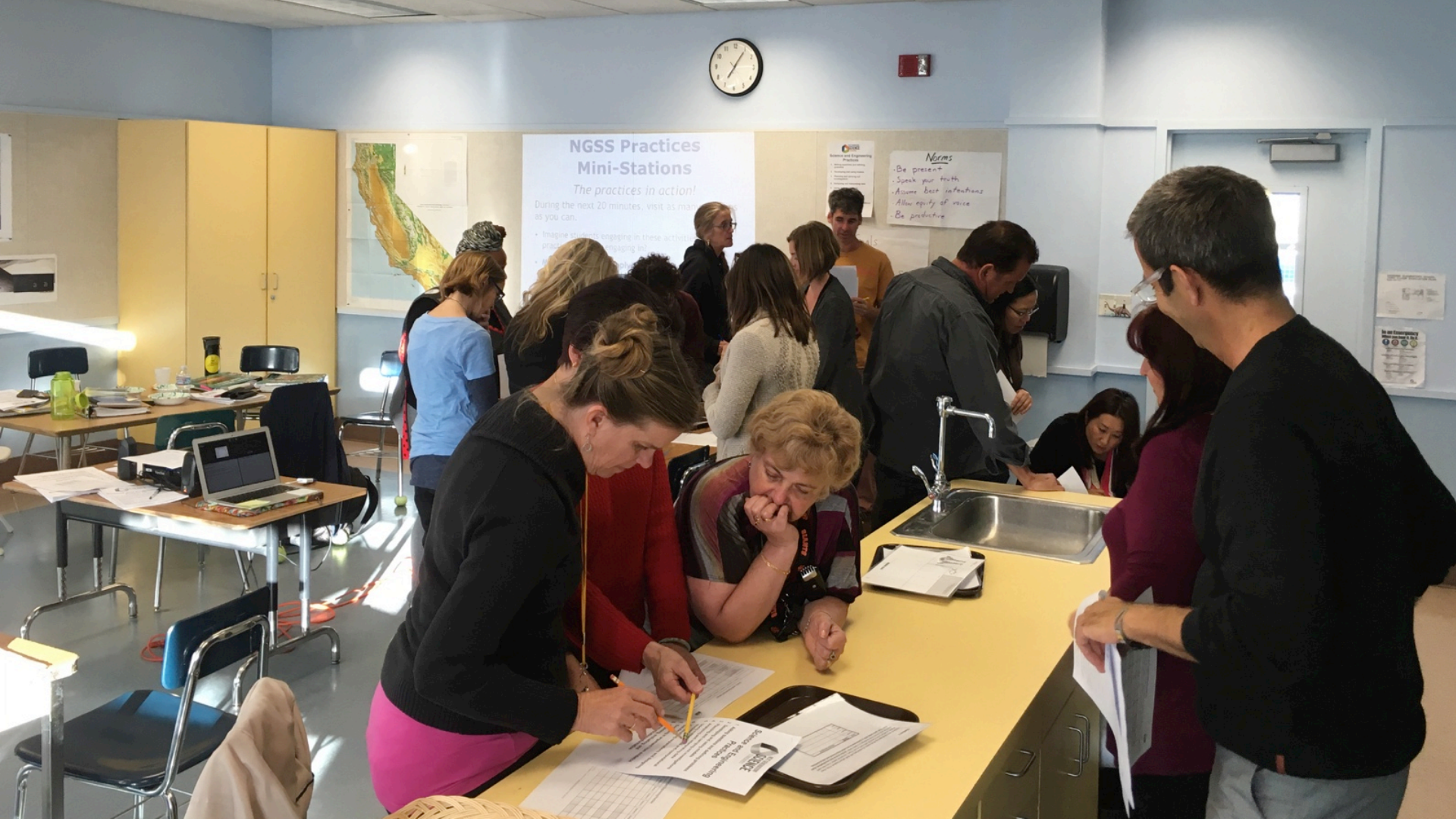
UDL


INTRODUCING TEACHERS + ADMINISTRATORS TO THE NGSS
A PROFESSIONAL DEVELOPMENT FACILITATOR'S GUIDE
NSTApress

SFUSD NGSS Implementation

1. Teacher Leaders
2. High School Course Decisions
3. A Core Curriculum for Science
4. Professional Development


Read Every Day!
What is a Model?
Please work in gr 2 - 4 to sort
your e s.


NGSS Practices
Mini-Stations
The practices in action!
Norms
Be present
Speak your truth
Assume best intentions
Allow equity of voice
Be productive

SFUSD NGSS Implementation

1. Teacher Leaders
2. High School Course Decisions
3. A Core Curriculum for Science
4. Professional Development
5. Science Resource Center & Material Management System


FOSS
Grade 1
SFUSD Science
Resource Center
FOSS
Grade 2


GLASSWARE
CHINAWARE & PORCELAIN WARE
PLASTICWARE
METALWARE
LAB EQUIPMENTS
LAB MANAGEMENT & SAFETY
RUBBER TUBING
LAB MEASURING INSTRUMENTS
GENERAL LABORATORY TOOLS
CHEMISTRY LAB MODELS
CHARTS
MISCELLANEOUS LABWARE

SFUSD NGSS Implementation

1. Teacher Leaders
2. High School Course Decisions
3. A Core Curriculum for Science
4. Professional Development
5. Science Resource Center & Material Management System
6. Access & Equity

Vision 2025 - The City as Classroom

San Francisco is a fully networked ecosystem of learning where education happens everywhere, in both formal and informal learning environments.

SCIENCE ENRICHMENT PATHWAY

PK K 1 2 3 4 5 6 7 8 9 10 11 12

Science Core Curriculum

Oakland

OAKLAND UNIFIED
SCHOOL DISTRICT

86

50%

25%

37147

31%

125

39% 30% 14% 12%

73%

NEXT GENERATION

SCIENCE

STANDARDS


SUUNTO
W Decl.
E Decl.
A-10
1 inch
0.5 mile
0.5 mile

Support

Teachers

Elem Site-Based PD

Introductory Series	Notebooking Series	Literacy Series
Nuts & Bolts of FOSS	Introduction to Notebooking	Science Writing
Fitting In FOSS: Science & Classroom Management	Notebooking Next Steps: Applied, with FOSS	Developing Language through Science Instruction
	Advanced Notebooking	Oral Discourse in Science

Science Fair Series	Assessment Series
Introduction to Science Fair	Assessment in Science: An Overview
Honing the Research Question	FOSS Assessment Tools
Organizing Science Fairs (for the Planning Team)	Looking at Student Work

Nurture Leadership

Nurture Leadership

1. Teacher Leaders
2. Principals
3. Central District

OUSD

Principal Science Professional Development


THINK

OUSD Science Vision

All Oakland students will graduate science literate with the skills needed to succeed in college, career and community.

Science Department
INSTRUCTIONAL SERVICES

OAKLAND UNIFIED SCHOOL DISTRICT
expect Success
every student. every classroom. every day.

Improving Elementary Science Instruction In the Oakland Unified School District

Improving education in math and science is… about expanding opportunity for all Americans in a world where an education is the key to success. It's about an informed citizenry in an era where many of the problems we face as a nation are, at root, scientific problems. And it's about the power of science to not only unlock new discoveries, but to unlock in the minds of our young people a sense of promise, a sense that with some hard work -- with effort -- they have the potential to achieve extraordinary things.

- President Barack Obama, remarks on the Education to Innovate campaign on November 23, 2009

All students will graduate as caring, competent and critical thinkers, fully informed, engaged and contributing citizens, prepared to succeed in college and career.

-Oakland Unified School District Vision 2009

Elementary Science Continuum

Key Dimensions	Area	Beginning	Implementing	Integrating	Innovating
I. Vision & Reality	Communication	Lead Science Teacher (LST) misses meetings and fails to communicate with Science Department and colleagues.	LST attends all meetings and communicates regularly with staff and principal.	LST has a system for direct communication with teachers.	Teachers and principals seek out communication with LST.
II. Leadership	Principal Leadership	Science is de-prioritized, principal does not take ownership of the science program, and/or does not include science on the master schedule.	Principal remains informed and involved with the science program. Site leadership team addresses science. Science is a part of the master schedule and site plan.	Grade level meetings focus on science once a month (PLCs).	Science is a major focus area for the school. Examples include school science events, fundraisers, field trips, regular PD.
	Teacher Leadership	Only the Lead Science Teacher is responsible for science implementation.	Instructional leadership team is responsible for science implementation and PD	Science leadership occurs each grade level/PLC.	Teachers peer-coach and present PD.
III. Instructional Improvement Capacities	Systems (FOSS Kits)	Inconsistent kit distribution to classrooms, materials inventories, preparedness for rotation, and communication to all teachers about science opportunities.	Consistent FOSS kit distribution, inventory, and rotation. Reliance on LST for all work and regular communication to teachers at site.	All teachers take responsibility for kit preparedness. Principal supports time for kit inventory and science communication.	Volunteers and community members assist with rotation and kit inventory.
	Professional Development	Little or no science professional development (PD).	All teachers have completed Intro to FOSS or Nuts and Bolts PD. Teachers are working on improving group management and materials.	Teachers are focusing on Science Notebooks and other more advanced practices (Academic Language, English Language Learners).	Teachers are building site capacity for leading professional development and sharing work with other sites.
IV. District & School Policies & Priorities	District Science Instructional Time	Inconsistent time and quality of science instruction.	Hands-on FOSS science is taught weekly for 60 minutes (K-2) and 90 minutes (3-5) per Board policy.	Science instruction exceeds Board policy.	Science instruction exceeds Board policy and science program includes out-of-school time.

OAKLAND UNIFIED SCHOOL DISTRICT
Community Schools, Thriving Students

ACADEMICS DIVISION

To: K-12 Principals and Teachers
From: Devin Dillon, Chief Academic Officer
David Chambliss, Deputy Chief of Teaching and Learning
Caleb Cheung, Manager of Science
CC: Allen Smith, Chief of Schools
Network Superintendents
Date: September 2, 2015

Re: Science CST Context

This memo addresses the changing context of Science education in Oakland and deemphasizes the role of Science California Standards Tests (CST) at grades 5, 8, and 10.

In 2013, the California Department of Education (CDE) adopted the Next Generation Science Standards (NGSS) as the new state science standards. NGSS are radically different from the previous California Science Standards, requiring a different set of practices, skills, and pedagogical strategies. The scope and sequence of content has drastically changed throughout K-12 compared to the previous standards over the K-12 instructional sequence.

OUSD started a transition to NGSS two years ago and has a goal of full implementation for the 2017-18 school year. There are now districtwide expectations to begin instructional and resource alignment. During the 2015-16 school year, all 3rd and 4th grade teachers are implementing the Science Instructional Reflection and Assessment (SIRA) with their FOSS kits. Additionally, the 5th grade SIRA's are being piloted at interested sites. The three middle school grades and 9th grade Biology are using NGSS aligned lessons and summative tasks.

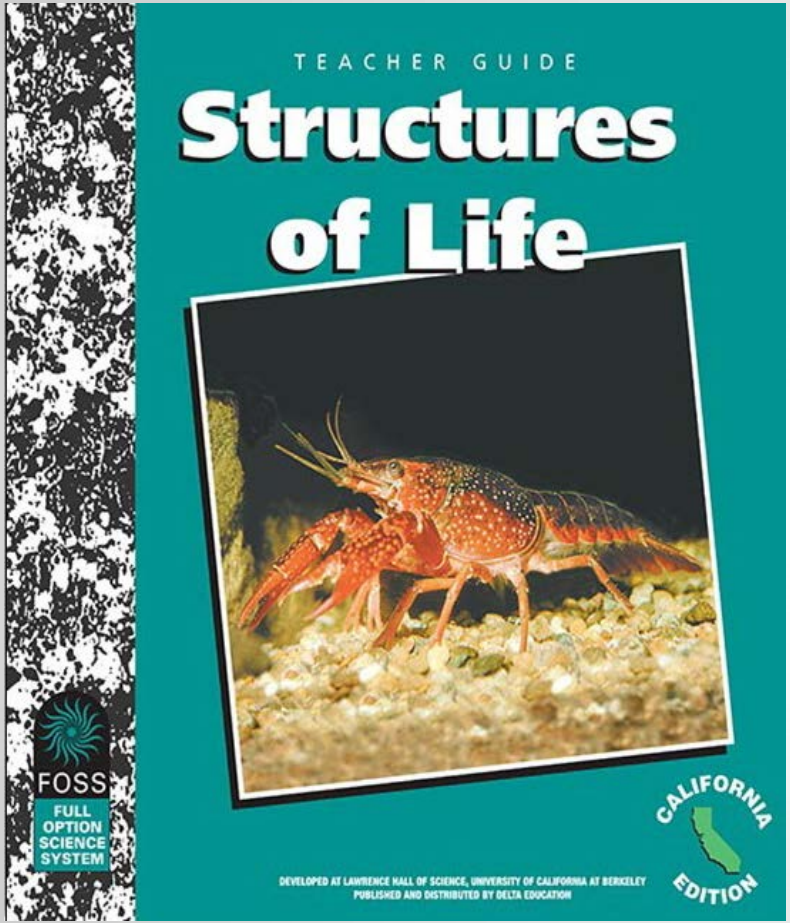
However, due to federal regulations, California is still mandated to administer the CSTs in science at grades 5, 8, and 10. These assessments are developed from the previous standards and not aligned to NGSS. According to the CDE, "because the current science tests are not aligned with the new CA NGSS, the results will not be used in any accountability reports; however, the scores will be publicly available.

Develop Resources


FOSS
PLANTS AND ANIMALS
Sweetheart drinking straws
Sweetheart drinking straws
COTTON

SIRA

Science Instructional Reflection & Assessment



&

OUSD Science

Science Instructional

Reflection & Assessment

(SIRA)

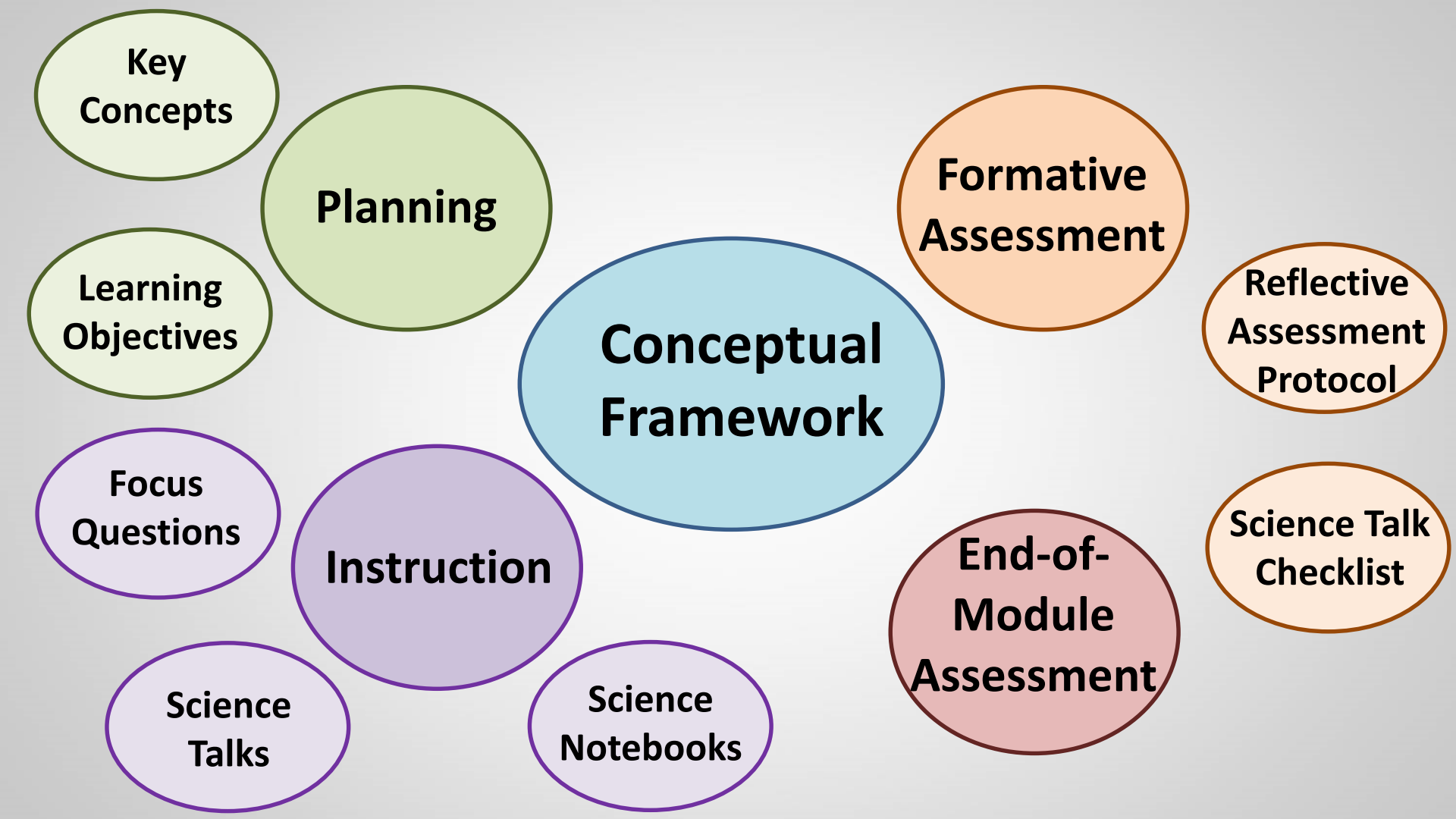
3rd Grade FOSS:

Structures of Life

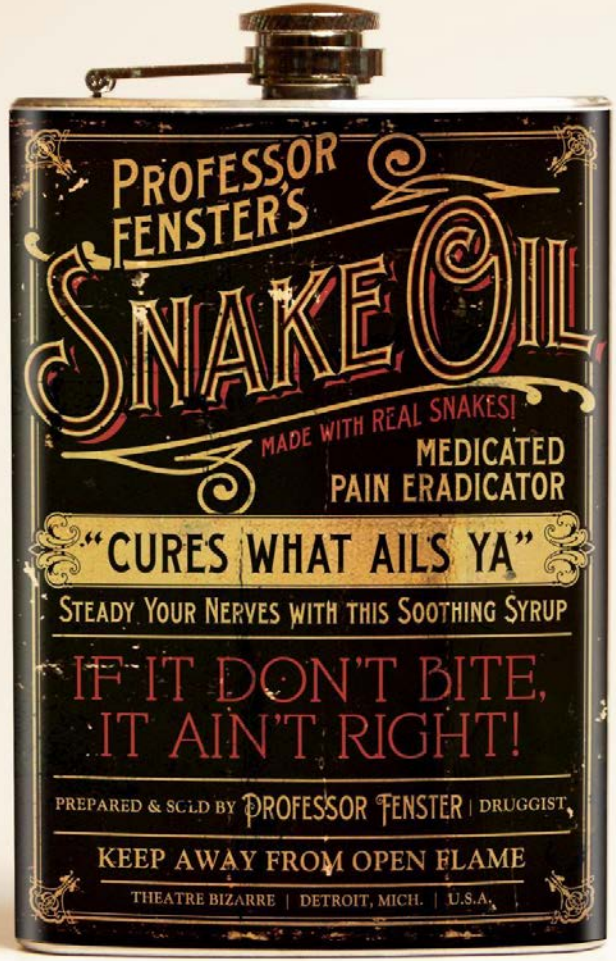
Elementary Science

Oakland Unified School District

Winter 2014 PILOT

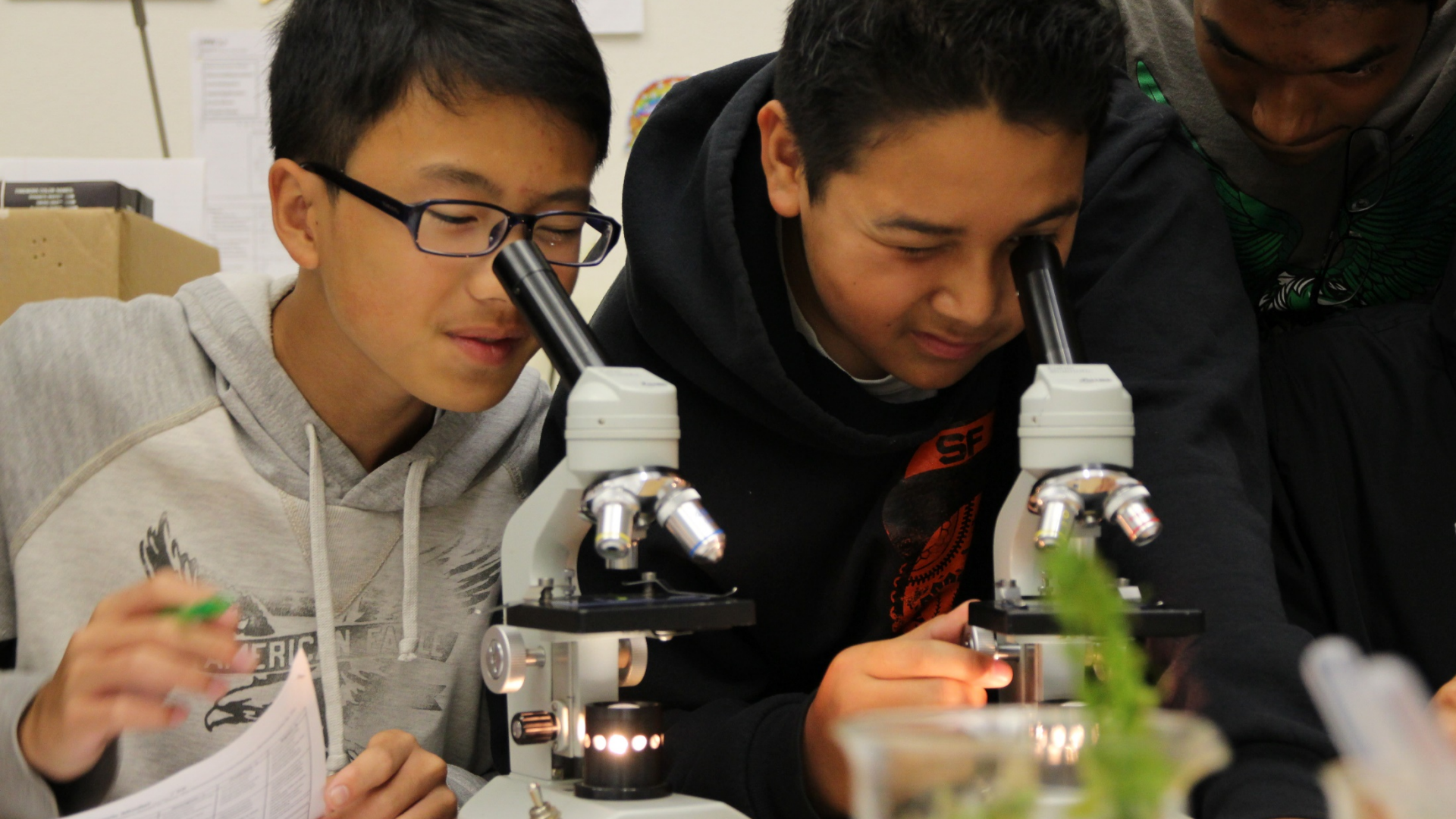

Key Concepts
Planning
Learning Objectives
Conceptual Framework
Formative Assessment
Reflective Assessment Protocol
Focus Questions
Instruction
Science Talks
Science Notebooks
End-of-Module Assessment
Science Talk Checklist


6th Grade
7th Grade
Oakland
NGSS
Curriculum
Project
8th Grade
HS Biology



NGSS ALIGNED CURRICULUM


ESTHER
Patricia Calloway




ELMER'S
Clear

California Integrated MS Sequence

Grade	Cross cutting concepts	Life	Earth and Space	Physical	Human Impact	Engineering
8	Stability and change; scale, proportion and quantity	Natural Selection	History of the Earth Space systems	Waves and Electromagnetic Radiation Energy Forces and Interactions	Human Impact	ETS
7	Energy and Matter: flows, cycles, and conservation; cause and effect	Ecosystems	Natural resources	Structure and Property of Matter	Human Impact	ETS
6	Patterns; structure and function; systems and system models	Cells and Organisms	Weather and climate	Energy	Human Impact	ETS
5	Energy and Matter: flows, cycles and conservation; Scale, proportion and quantity	Matter cycles through living and non living things	Earth in space, interactions of earth systems	Properties and structure of matter	Human Impact	ETS

OUSD Secondary Curriculum Design

OUSD Science

Construction Theory

Primary Drivers:

- 3D Learning
- Relevancy
- Disciplinary Literacy

Secondary Drivers:

- Inquiry
- Classroom Culture
- Social Emotional Learning

- Co-constructed and piloted by collaborative teacher teams
- Evaluated and refined through teacher feedback, observations, and student work analysis
- Pedagogical support through professional learning
- On-site support facilitated by teacher leaders

Development Phases

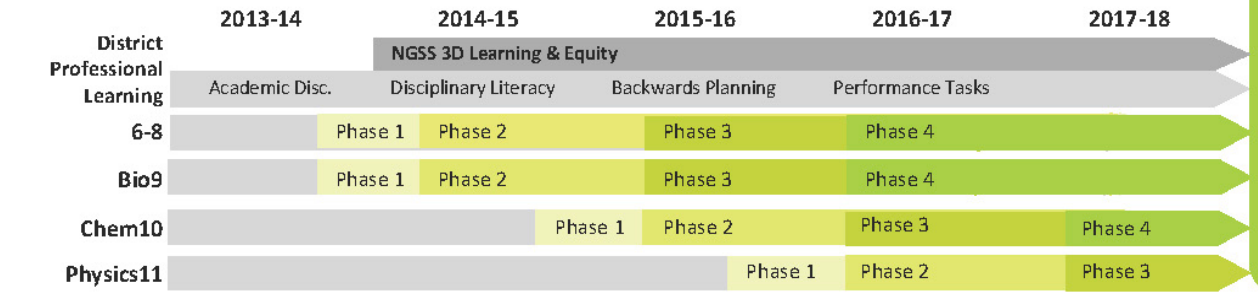
PHASE 1
Curriculum Institute: Unpack PEs, draft Scope & Sequence & design Pilot Units

PHASE 2
Curriculum Design Team: Write tasks & student work analysis
Pilot Curriculum Units
Curriculum Institute: Revise Scope & Sequence & Summative Tasks

PHASE 3
Curriculum Design Team: Revise tasks, student work analysis & collaborate w/ community partners
Pilot Curriculum
Curriculum Institute: Revise Learning Tasks & Summative Tasks

PHASE 4
Curriculum Design Team: Lesson Study & student work analysis
Pilot Curriculum
School Board Adoption of Curriculum

NGSS Curriculum



Curriculum Anatomy

Semester 1																								Semester 2																	
Launch Unit			Unit 1						Unit 2						Unit 3							Unit 4						Unit 5							Unit 6						
ET	LT	ST	ET	LT	LT	LT	LT	ST	ET	LT	LT	LT	LT	ST	ET	LT	LT	LT	LT	ST		ET	LT	LT	LT	LT	ST	ET	LT	LT	LT	LT	LT	ST	ET	LT	LT	LT	LT	LT	ST

ET = Entry Task	**LT = Learning Task**	**ST = Summative Task**
Students engage in Unit Theme and Storyline and are introduced to the Summative Task	Students participate in formative learning experiences that scaffold up to the **ST**	Students demonstrate understandings with a cumulative Authentic Performance Task

Task Components								
Teacher Information			**Student Handouts**				**Shared Resources**	
Teacher Overview	Multimedia	References	Task Cards	Output Sheets	Resource Pages	Rubrics	Supplementary Materials	Student Work Samples

Curriculum Examples

Grade	Unit	Entry Task	Sample Learning Task	Summative Task
6	Launch Unit: Like an Engineer *How can failure lead to innovation?*	ET: Building a Tower *How do we talk and work together like engineers?*	LT 1: What Happened Here? *What caused structures to fail and how can they be fixed?*	ST: Building a Bridge *How does failure lead to innovation?*
7	Unit 1: Global Water Crisis *How does understanding states of matter help me purify water?*	ET: Time of Drought *How are scientists cleaning our water to address the drought?*	LT 3: Desalination Engineering *How can we convert seawater to potable fresh water using solar energy?*	ST: Engineers Without Borders *How does science enable communities to gather clean water?*
8	Unit 3: Space & Gravity *How might we design and power a one way flight plan to the moon?*	ET: Packing for Space *How do the laws of space determine what a human needs?*	LT 2: The Law of Gravity *What is gravity and how does impact life?*	ST: To The Moon! *How might we design and power a one way flight plan to the moon?*
Bio9	Unit 2: Food for Thought *How do our food choices impact our health and the environment?*	ET: Food Log *Can a nutrition label change a teenager's eating habits?*	LT 2: Macromolecules *What does it mean to say "you are what you eat"?*	ST: Food Choices Infographic *How do our food choices impact our health and the environment?*
Chem10	Launch Unit: Magic or Science? *How can we explain things we can't see?*	ET: Foiled Again *What types of observations help us explain things we can't see?*	LT 4: Spare Change *How can we distinguish between physical and chemical changes?*	ST: The Science of Alchemy *How has science increased our ability to explain things we can't see?*

Science 5x8 Card

Practices for High Quality K-12 Science Education

The Next Generation Science Standards (NGSS) define eight scientific and engineering practices for students as they engage in science learning. Not all practices will be evident every time, in every activity. Evidence of the practices exists through student activities and interactions. See reverse for student behaviors.

Scientific and Engineering Practices

1. Asking questions and defining problems
2. Developing and using models
3. Planning and carrying out investigations
4. Analyzing and interpreting data
5. Using mathematics and computational thinking
6. Constructing explanations and designing solutions
7. Engaging in argument from evidence
8. Obtaining, evaluating, and communicating information

Next Generation Science Standards (2013). Achieve, Inc.
http://www.nextgenscience.org

K-12 Science Learning Principles and Actions

Principles (Practices)	Vital Student Actions
1. Questions guide inquiry *(1, 4, 8)*	Students **ask** meaningful **questions** relevant to the science topic or lesson.
2. Learning occurs through investigations *(1, 2, 3, 4, 5)*	Students use materials, tools, and texts to **explore**, **gather data**, and **answer questions**.
3. Explanations are evidence-based *(2, 4, 5, 6, 7, 8)*	Students use evidence to **interpret** observations**, support** ideas, and **construct** explanations.
4. Science is a community endeavor that evolves with new evidence *(4, 5, 6, 7, 8)*	Students **collaborate** to build understanding and **revise** their thinking when presented with new evidence.
5. Application is essential for building understanding *(1, 2, 3, 6)*	Students **apply** science knowledge *and* practices to respond to open-ended and novel problems.
6. Academic success depends on academic language	Students use discipline-specific **academic language**, **models**, and **mathematics** to communicate understanding **orally** and in **writing**.
7. ELs develop language through content	English learners produce language that **communicates** ideas and reasoning, even when that language is imperfect.
8. Equitable participation	All students are **engaged** in learning and **choose** appropriate **scaffolds** for learning.


OUSD
NGSS
VIDEO
PROJECT


audio-technica


Micaela Morse
Kindergarten Teacher
International Community School, OUSD

OUSD Science Department

Elementary | Secondary | Resources | Events | Staff

Elementary Science

The OUSD elementary science program centers around the FOSS curriculum. FOSS kits are provided to all elementary school sites on a rotational basis every trimester. Live organisms and consumable materials will also be fully supplied. Below for details and resources related to the program.

Key Documents

- FOSS Kit Rotation Schedule 2013-14
- FOSS Implementation Guide/FAQ
- Elementary Science Calendar 2013-14 (deadlines, trainings and events)
- Live Organisms
- Professional Development
- Assessment
- Standards
- Safety & Equipment Maintenance

FOSS Curricular Resources

Teacher Guides

Electronic versions of the FOSS Teacher Guides are available from Lead Science Teachers

FOSS Kit Rotation

- 2013 Fall FOSS Kit Drop Off Schedule (the rotation schedule for the rest of the year will be posted here in September)

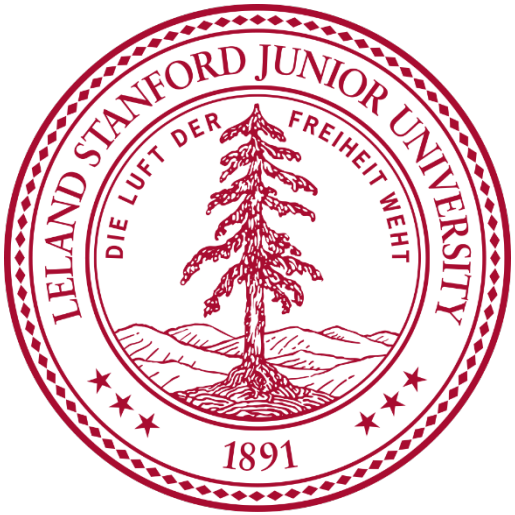
Lead Science Teachers

Each school has a designate Lead Science Teacher (LST) to assist with the coordination and implementation of FOSS.

Google drive


Cultivate
Partners

OaklandSciencePartners



CALIFORNIA STATE UNIVERSITY

EAST BAY


BODEGA BAY
East Side (Horseshoe Bay side)
West Side (Ocean Side) Plant Samples
Above and Below Investi
Hypothesis #1: The ratio of above
biomass to root biomass
differs in plants from
site #1 (East) and
Hypothesis #2: The plant roots on the
(site 1) will have deeper
less biomass, the plants
west side (site 2) will
biomass and be less
Results:
Hypothesis #1 → Yes, there
between the
Hypothesis #2 →

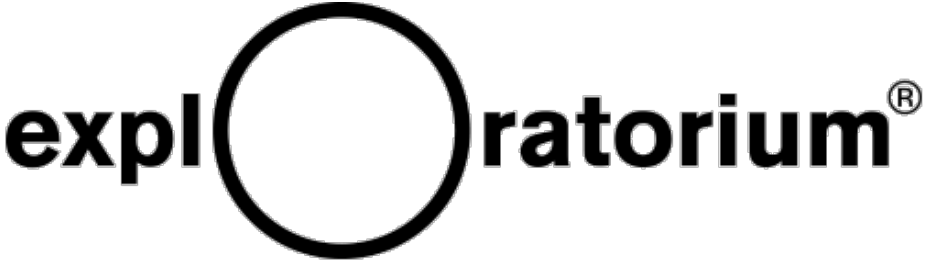

chabot
space & science center

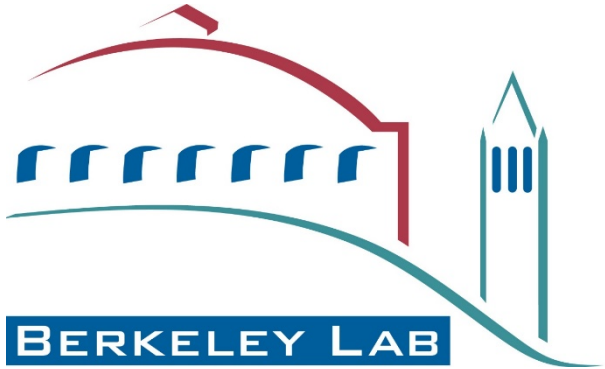

CONSERVATION & EDUCATION
OAKLAND ZOO


OAKLAND MUSEUM OF CA


THE LAWRENCE
HALL OF SCIENCE
UNIVERSITY OF CALIFORNIA, BERKELEY


CALIFORNIA
ACADEMY OF
SCIENCES


exploratorium®


BERKELEY LAB


Chevron


Caltrans®


THE CLOROX COMPANY

WestEd

NGSS Early Implementation Initiative

California Math Science Partnership Grant

Oakland Language Immersion
Advancement in Science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0.5 mile
0.5 mile

Thank You!

Questions & Comments

tinyurl.com/stemsmartngss

science.ousd.org

sfusdscience.org

nextgenscience.org


Science & Engineering Practices
Disciplinary Core Ideas Engineering Technology & Applications of Science
Crosscutting Concepts
Disciplinary Core Ideas Life Sciences
Disciplinary Core Ideas Physical Sciences
Disciplinary Core Ideas Earth & Space Sciences
Next Generation Science Standards
Oakland Unified School District

Thank You!