Professional Development Final Report: Literacy and NGSS
NASA Endeavor
STEM Leadership Seminar
Valerie Pasdera

Professional Development Final Report: Literacy and NGSS

I. Topic of Project

Integrating NGSS with Benchmark Advanced

II. Curriculum Topics

The professional development presented focused on the implementation of NGSS standards with our language arts curriculum, Benchmark Advanced.

School name, number of educators and grade levels. Mariposa Elementary is a Title I school in Citrus Heights, California, servicing students in grades kindergarten through fifth grade. There are currently 325 students, 12 regular education teachers, 2 LH/CH Special Day classes, 1 Resource teacher, a Speech and Language Specialist, and 2 additional support staff. Students receive a comprehensive curriculum, including art, music, and physical education. Our school population is approximately 44% Caucasian, 38% Hispanic, 8% African American, 10% including Native American, Pacific Islanders, and Ukrainian/Russian. English Language learners account for 21.2% of the population in addition to 18.9% of the student population identified with learning disabilities.

There were 11 teachers and our administrator who participated in the professional development. Our school site is in the infancy stages of developing STEM/STEAM curriculum and a Maker Space Lab. The majority of the teachers attending were familiar with STEM/STEAM, but used them in isolation instead of integrating with core curriculum. Benchmark Advanced our ELA program, provides opportunities throughout all grade levels to implement NGSS Standards and learning activities.

III. Standards Addressed

The standards NGSS Performance Expectations addressed for the professional development and lesson are:

4-LS1.1 Construct an argument that plants and animals have internal and external structures that function to support survival, growth, behavior, and reproduction

4-LS1-2. Use a model to describe that animals receive different types of information through their senses, process the e information in their brain, and respond to the information in different ways.

4-PS3-2 Make observations to provide evidence that energy can be transferred from place to pace by sound, light, heat, and electric currents.

4-PS4-2 Develop a model to describe that light reflecting from objects and entering the eye allows objects to be seen.

4-PS4-3. Generate and compare multiple solutions that use patterns to transfer information (engineering focus)

Connections to other DCI's and California Common Core State Standards are listed in (*Appendix A)*

IV. Summary of Project

The intention of this professional development opportunity was to give my colleagues a better understanding of the NGSS standards and how the engineering practices could be integrated with their language arts curriculum. I furnished examples of engineering activities that could be used with specific units of study, as well as active participation during the professional development. I provided handouts as guides to assist them with the development of their own engineering design lesson. My goal for my colleagues is that they will be able to implement at least one engineering activity, using the basic knowledge of NGSS, with their ELA curriculum by the end of this school year.

V. Pre- Questions Survey List

The pre-question survey was distributed to the teachers 2 days prior to the professional development.

1.Shifts in teaching with the NGSS:

Rate your own understanding of this element of the NGSS.

_I am not yet aware of this.

_I am aware of this but do not yet incorporate this into my instructional planning.

_I am aware of this and do incorporate this into my instructional planning.

_I incorporate this into my instructional planning and could teach others about this.

2. Performance Expectations (PE) in the NGSS:

Rate your own understanding of Performance Expectations in the NGSS.

_I am not yet aware of this.

_I am aware of this but do not yet incorporate this into my instructional planning.

_I am aware of this and do incorporate this into my instructional planning.

_I incorporate this into my instructional planning and could teach others about this.

3. Disciplinary Core Ideas (DCIs) in the NGSS:

Rate your own understanding of DCIs in the NGSS.

_I am not yet aware of this.

_I am aware of this but do not yet incorporate this into my instructional planning.

_I am aware of this and do incorporate this into my instructional planning.

_I incorporate this into my instructional planning and could teach others about this.

4. Science and Engineering Practices (SEPs) in the NGSS:

Rate your own understanding of SEPs in the NGSS.

_I am not yet aware of this.

_I am aware of this but do not yet incorporate this into my instructional planning.

_I am aware of this and do incorporate this into my instructional planning

_I incorporate this into my instructional planning and could teach others about this.

5. **Shifts in teaching with the NGSS and connections to the shifts for Common Core Math and ELA:**

Rate your own understanding of this element of the NGSS.

_I am not yet aware of this.

_I am aware of this but do not yet incorporate this into my instructional planning.

_I am aware of this and do incorporate this into my instructional planning.

_I incorporate this into my instructional planning and could teach others about this.

6. Grade level performance expectations in the NGSS:

Rate your own understanding of grade level performance expectations in the NGSS.

_I am not yet aware of this.

_I am aware of this but do not yet incorporate this into my instructional planning.

_I am aware of this and do incorporate this into my instructional planning.

IV. Brief Description of the Actual Professional Development Training

The training began with three phenomenon posters displayed in the room that related to the activity the teachers would do later. The teachers were asked to walk around the room and write on the “I-Notice I-Wonder It-Reminds me of” posters. A group discussion ensued regarding the benefits of the noticing’s across the curriculum, they shared their thoughts and ideas with one another. The majority of the teachers were familiar with this process of investigation. The value of using this investigative process for their classrooms was recognized, and it could be used for all curriculum.

From the pre-survey administered earlier, it was discovered that most teachers were not familiar how to read the NGSS standards and where they could be embedded with the language arts curriculum. I introduced what topics of discussion would be for the presentation, which included NGSS standards and Benchmark Advanced alignment and then showed a short 3 minute You tube video on an introduction to NGSS. The biggest take away was the cross grade level DCI's.

I presented my PowerPoint (*Appendix B*) to my colleagues, allowing them time for reflection, discussion, and answering questions. We took a brief break and then reviewed the alignment of NGSS standards and Benchmark Advanced. Each grade level was given their specific alignment. The documents were retrieved from Los Angeles Unified School District.

I presented examples of engineering activities from the Benchmark unit that I have previously done with my own class, they are included in the unit lesson, (*Appendix Xl. C*) Due to the allotted time of the professional development, the participants did one engineering activity. We discussed the activity and they wrote on their handout about their findings. then shared with the whole group. One of the biggest take-aways from the activity was that it leads to the standards in language arts. When we reviewed language arts standards for the unit presented, it was easily recognized the integration of language arts and science. "Reading and writing can be used in advance scientific inquiry than substitute for it. When literacy activities are driven by inquiry, students simultaneously learn how to read and write science texts and do science" (Pearson, 2010, p. 459-460).

VII. Brief Outline of the Activities in the Pick-up Unit

1. Faculty presentation, introduction, task of completing 3 Noticing's, group discussion.
2. Power-point presentation and group discussion about NGSS
3. Discussion Benchmark Advanced and NGSS the intersections of standards.
   a. Participants explored the handout listing Benchmark units of study and NGSS standards.
   b. Participants viewed my shared google docs for specific grade level units that have been developed.
4. Participants looked at the cross-cutting concepts and matched with Benchmark units.
5. Shared different activities that could be developed with students. Participants did engineering activity. Question and Answer sessions, suggestions for adaptations to activity for different grade levels.
5. Post questionnaire survey handed out

Engage:

Active participation with Noticing's charts
YouTube video on Introduction to NGSS

Explore:

Benchmark Advanced and NGSS handouts. Participants viewed the google docs, and handouts for their grade level.

Explain and apply:

PowerPoint presentation
Links provided to websites for participants to view and use independently.

Evaluate:

The teachers from a pedagogical perspective, realized the engineering design has potential to be far-reaching for students who have struggled in the classroom. EL students as well as students with special needs develop vocabulary and make meaning of what they are being taught. Sharing their experiences is important as a reflection of their learning experience.

Extend:

Links were provided for online resources where teachers could explore and possibly use for their lessons. The NGSS lesson planning template was provided for the participants. *(Appendix D)*The participants completed a post survey questionnaire

VIII. What NASA Data Did You Include?

I did not specifically use NASA data, instead I chose to share The Nasa's Best Engineering Design Process. I chose this design process because the staff is familiar with PBL, GLAD, and Backwards Design lessons. Newsela, JPL, and 3D View Books which are for 4th grade and beyond, they integrate science, technology, and literacy were also shared.

IX. Follow Up Activities and Post Questions Survey List

The follow up activities will be during grade level collaboration, meeting with the other teachers and assisting them with lessons. Our leadership team is in the beginning phases of next year's professional development schedule, and they have already addressed me to do follow up lessons. In addition the teachers are excited creating cross-curricular activities and using the resources that have been shared with them.

<u>Post Survey Questions:</u>

1. Do you have a better understanding of the NGSS standards and how to read them and how they apply to cross curriculum?
   ____
2. Do you think the 5E lesson template will assist you in the organization of the lessons, and allow you to develop DOK's to meet the needs of all students?
   ____
3. Will the information provided through the websites assist you with your implementation of STEM lessons with other curriculum?
   ____
4. Do you believe the NGSS and Benchmark Advanced presentation was informative and gives enough resources and information for you to begin creating your STEM/STEAM lessons?
   ____

X. Outcomes: Final Data Collection and Analysis

Survey Results/Comments on the content included in the project. The post survey questions were open-ended and were asked to be submitted the day after the presentation, so a true reflective analysis could be submitted. All participants submitted their surveys. I am pleased to say there were overwhelming positive responses. There is a definite need for ongoing professional development for NGSS especially as we begin to adopt a new science program. In addition the participants would like assistance creating their units of study. 94% of the teachers stated they have a better understanding of NGSS and Benchmark Advanced alignment, but would like to wait to implement next year. 100% of the teachers answered positive to all post survey questions. A few notes were written on the post survey questionnaire, stating that they have a better understanding how NGSS and CCSS standards are similar, and how each grade level builds on the previous grade. They also were excited about the NGSS lesson plan.

Survey Results/Comment on the pedagogy in the project. The participants were able to participate in a learning experience which was inquiry- based, reflective, with the collaborative model of teaching being evident throughout the presentation, and strategies which are considered science base into a language arts program. The survey was reflective of the learning experience as teachers noted on their questionnaire.

Was your professional development successful? I believe the presentation was extremely successful, the professional development included, hands on activities, teacher collaboration, knowledgeable presentation, integrative learning, and was presented to meet the needs and experiences of all the participants. In addition, after the professional development there was ongoing discussion about the information presented, especially recognizing the cross curricular implementations with ELA. Our school is fortunate to have numerous educators who have participated in PBL and GLAD strategies, they were engaged with the lesson demonstrating the 5E lesson plan. I do believe that one hour is not enough to share the information, follow up will be during grade level planning for Benchmark Advanced and NGSS and will continue as needed by my colleagues.

How did this project relate to the readings? There have been similar themes throughout the articles we have read for this course. For example teacher engagement, active participation, collaboration, content focus, and preparing our students for the 21st Century careers. Daugherty stated, “The teachers across the five projects, who participated in the focus groups, largely agreed on three aspects that contributed to effective professional development experiences: (a) hands-on activities; (b) teacher collaboration, and (c) instructor credibility” (Daughtery, 2009, p.20). The engineering design process emphasizes active engagement as well as collaborative learning. I based my professional development on these the three aspects because I believe they enabled me to provide active engagement as well as an informational presentation to my colleagues.

I believe I also designed my professional development to include at least of four of the five core features of a quality presentation stated by DeSiimone. According to DeSimone (2011), a quality professional development must include five core features, those include, content focus, active learning, coherence, duration, and collective participation. I am not able at this time to decide on the duration of hours for a presentation, however, I was able to build my presentation with a distinct focus on content, the participants were actively involved through discovery, hands on activity, active discourse. The coherence of the professional development was evident because of our district’s involvement with NGSS, Benchmark Advanced, and the new science standards for California. The collective participation enabled the teachers to be with their same grade level partners, and develop activities for their learning environment.

Will the teacher do these activities again? I won’t be repeating the same professional development, but have been asked to do one next fall, when the teachers have had time to implement lessons. It is my hope that the teacher’s will be able to do at least one engineering lesson before the end of this school year. I have shared links, websites, examples of units, complete storytelling NGSS units on google docs with my colleagues. My belief is if they are able to access existing units they will see the value of continuing to implement additional engineering design lessons..

Reflection. This professional development experience allowed me the opportunity to gain additional leadership responsibility as well as confidence with presenting in front of my colleagues. The process of organizing and creating a presentation which would inspire my colleagues to integrate the sciences in other curriculum was a meaningful experience. Having read the numerous articles through this course as well as others, in addition to gaining knowledge from Endeavor professors and my colleagues, I have grown with my ability to be a more effective teacher. In turn, my students are excited about learning and being able to apply their learning to the real world. During my masters program I have reflected on my teaching practices and developed more engineering design lessons across all curriculum to share with my students, and in turn they are excited about learning and I about teaching. In addition, I have been asked to be involved with creating NGSS/STEAM professional developments for our school next year.

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Appendix A: Connections to other DCI's and California Common Core State Standards

Connections to other DCIs in this grade-level: N/A

Articulation of DCIs across grade-levels:

1.PS4.B (4-PS4-2); 1.LS1.A (4-LS1-1); 1.LS1.D (4-LS1-2); 3.LS3.B (4-LS1-1); MS.PS4.B (4-PS4-2); MS.LS1.A (4-LS1-1), (4-LS1-2); MS.LS1.D (4-PS4-2), (4-LS1-2)

California Common Core State Standards Connections:

ELA/Literacy –

RI.4.1 Refer to details and examples in a text when explaining what the text says explicitly and when drawing inferences from the text. (4-PS3-1)

RI.4.3 Explain events, procedures, ideas, or concepts in a historical, scientific, or technical text, including what happened and why, based on specific information in the text. (4-PS3-1)

RI.4.9 Integrate information from two texts on the same topic in order to write or speak about the subject knowledgeably. (4-PS3-1)

W.4.1 Write opinion pieces on topics or texts, supporting a point of view with reasons and information. (4-LS1-1)

W.4.2.a–d Write informative/explanatory texts to examine a topic and convey ideas and information clearly. (4-PS3-1)

W.4.7 Conduct short research projects that build knowledge through investigation of different aspects of a topic. (4-PS3-2,(4-PS3-3),(4-PS3-4),(4-ESS3-1)

W.4.8 Recall relevant information from experiences or gather relevant information from print and digital sources; take notes, paraphrase, and categorize information, and provide a list of sources. CA (4-PS3-1),(4-PS3-2),(4-PS3-3),(4-PS3-4),(4-ESS3-1)

W.4. Draw evidence from literary or informational texts to support analysis, reflection, and research. (4-PS3-1),(4-ESS3-1)

Speaking and Listening

SL.4.5 Add audio recordings and visual displays to presentations when appropriate to enhance the development of main ideas or themes. (4-PS4-2), (4-LS1-2)

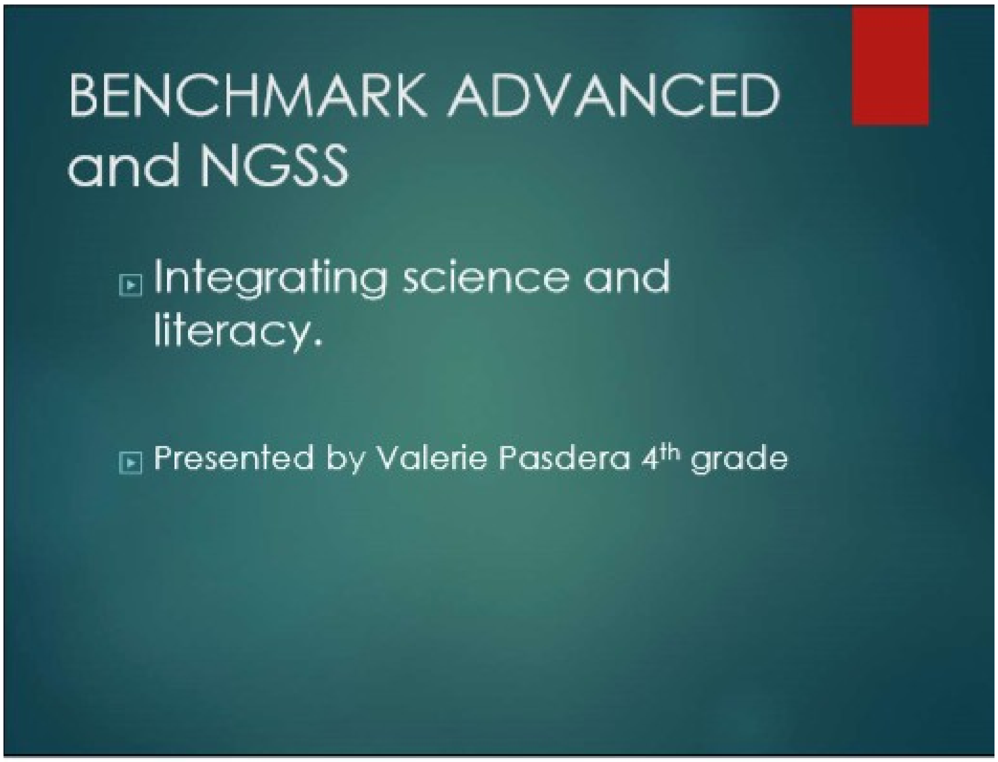
Mathematics

MP. 4 Model with mathematics. (4-PS4-2)

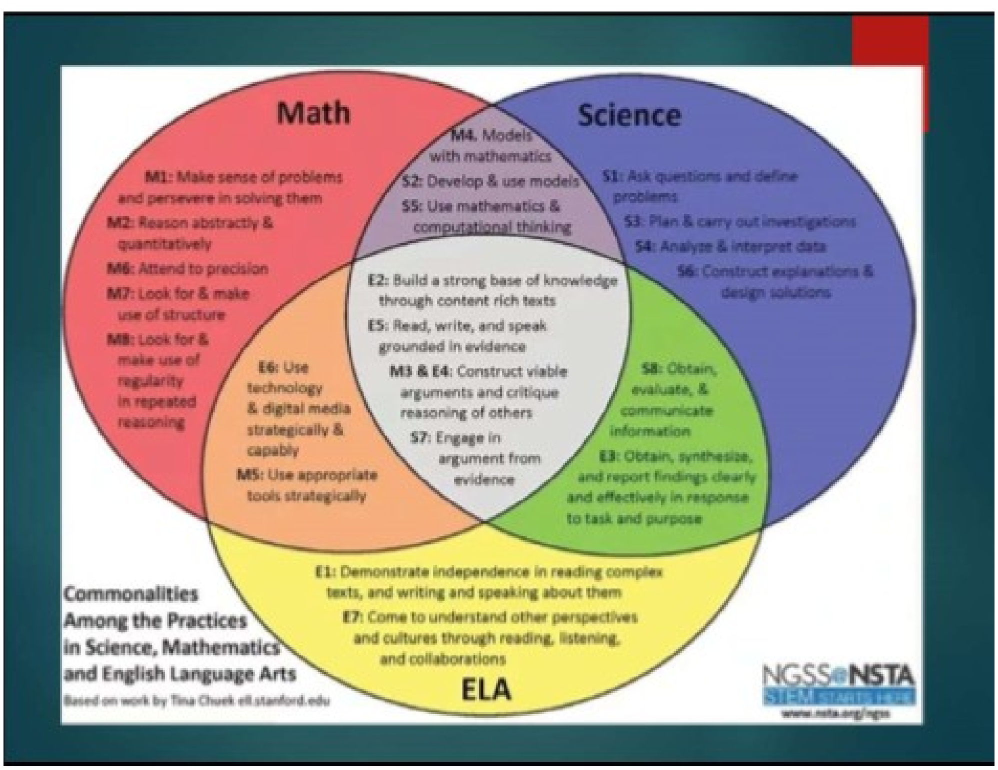
4.G.A.1 Draw points, lines, line segments, rays, angles (right, acute, obtuse), and perpendicular and parallel lines. Identify these in two-dimensional figures. (4-PS4-2)

4.G.A.3 Recognize a line of symmetry for a two-dimensional figure as a line across the figure such that the figure can be folded across the line into matching parts. Identify line symmetric figures and draw lines of symmetry. (4-LS1-1)

Appendix B: STEAM PD Presentation Powerpoint



1



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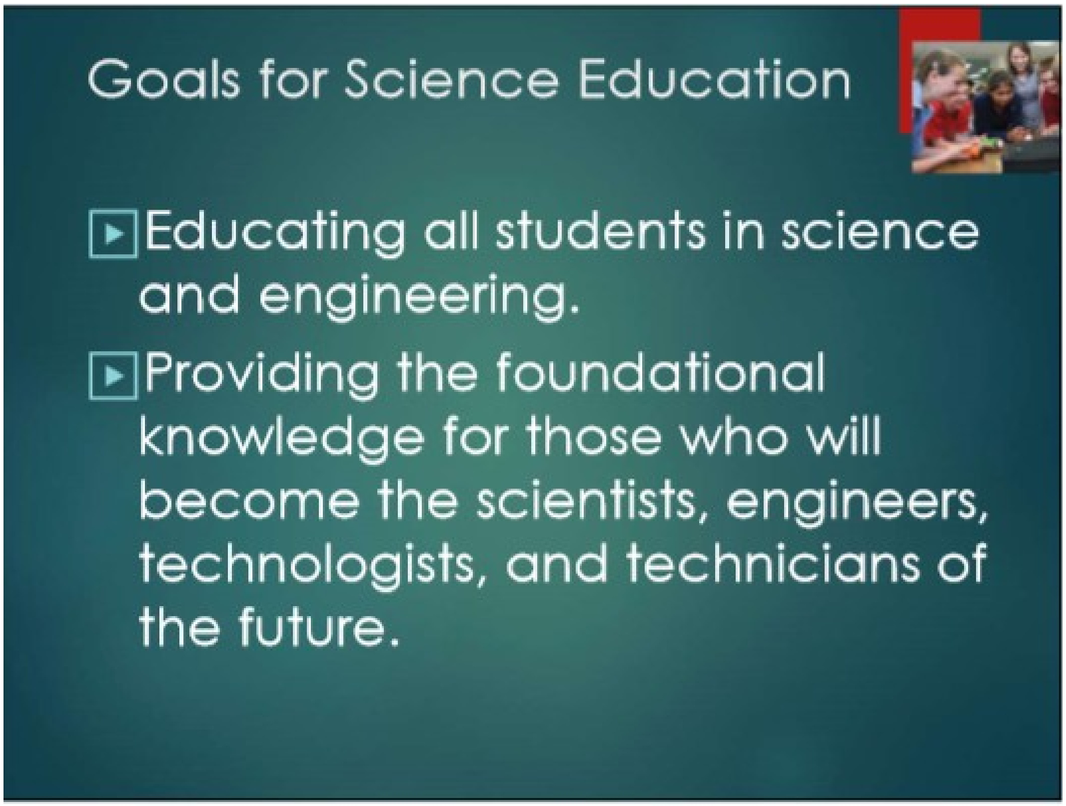
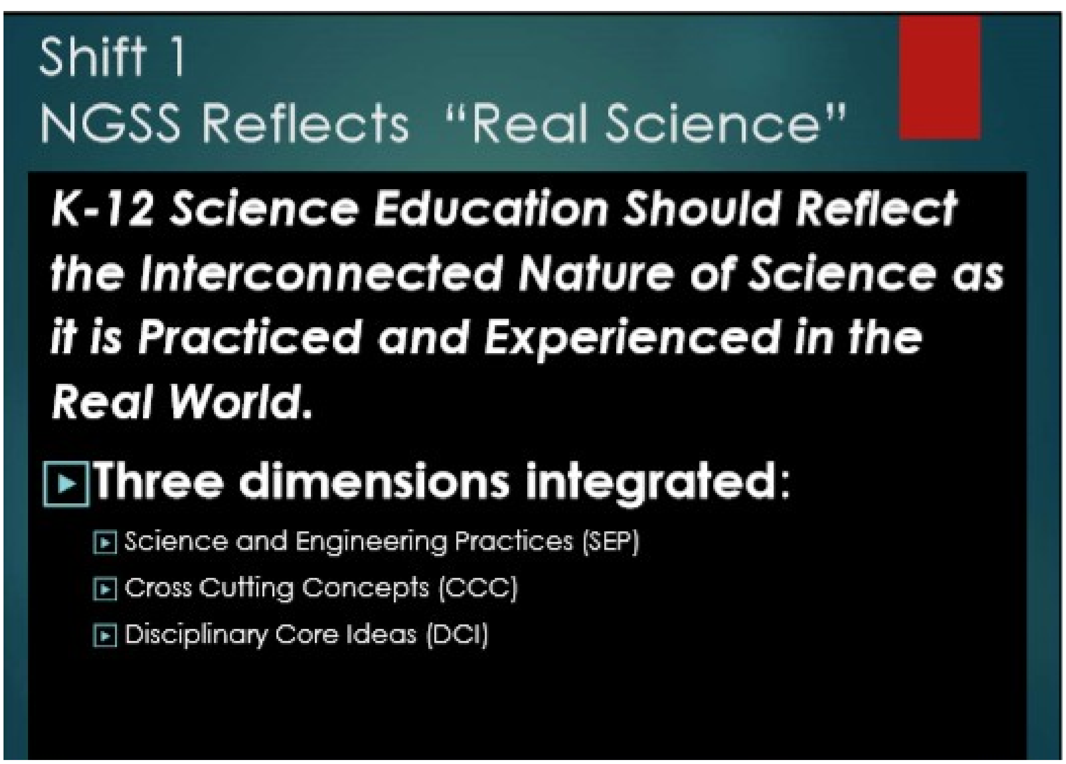
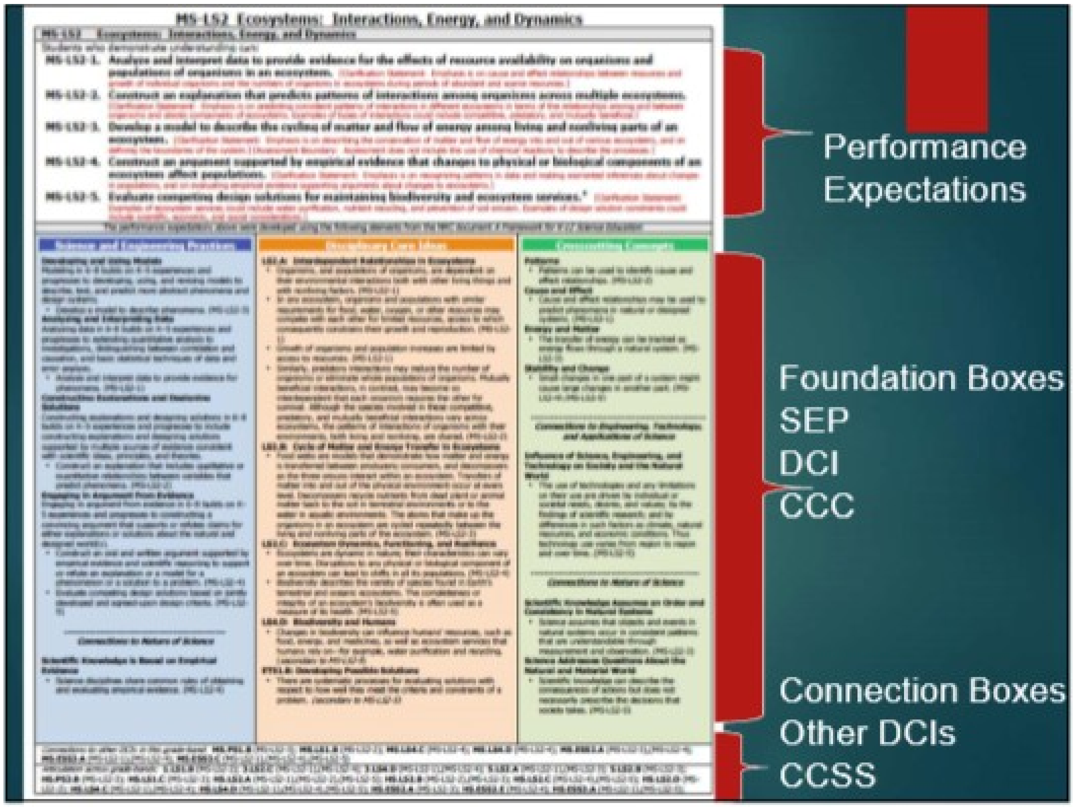
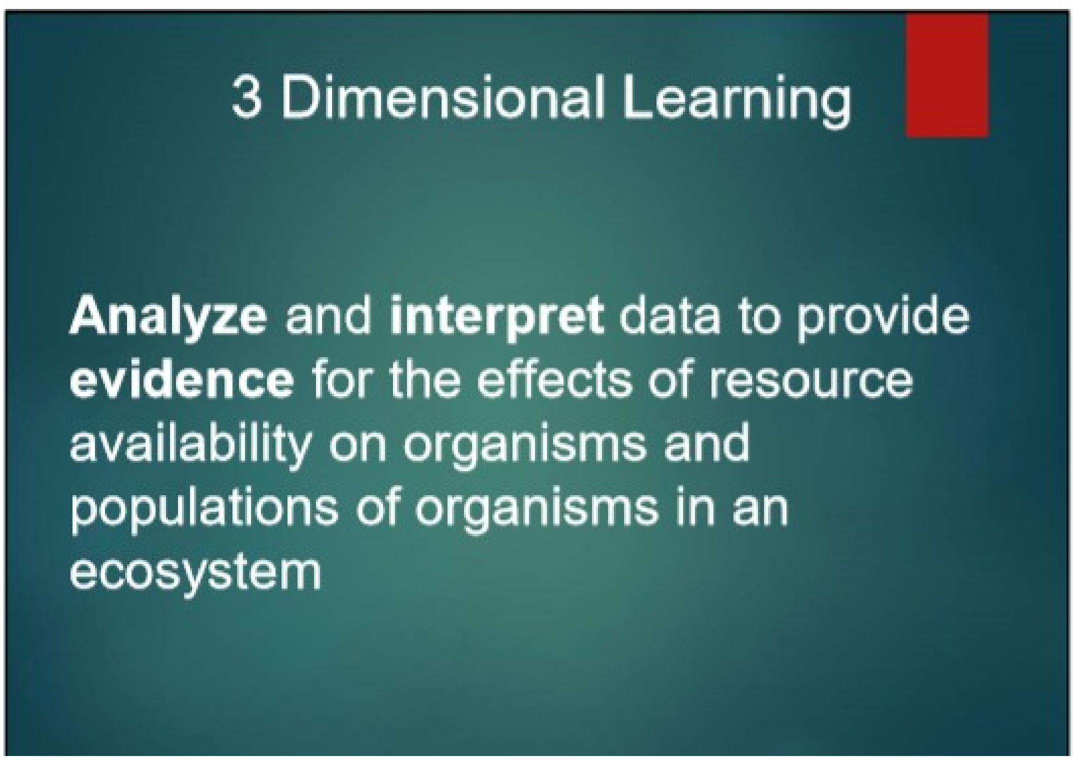

Goals for Science Education
Educating all students in science and engineering.
Providing the foundational knowledge for those who will become the scientists, engineers, technologists, and technicians of the future.

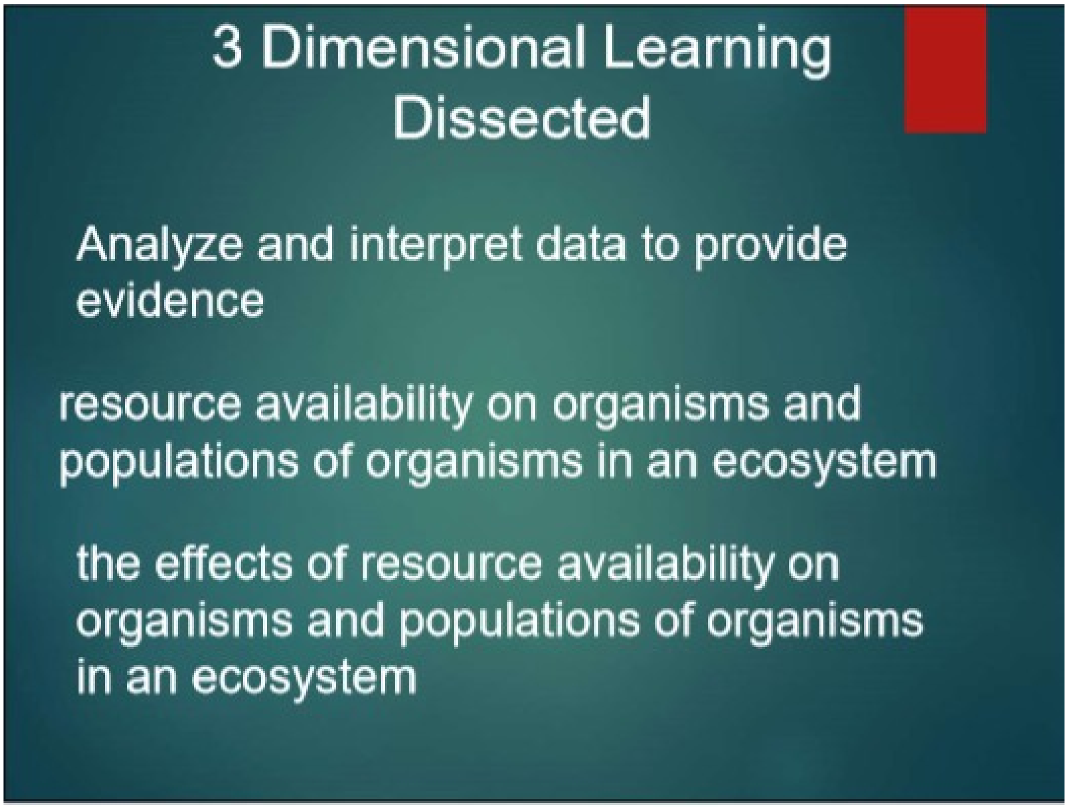
3


Shift 1
NGSS Reflects "Real Science"
K-12 Science Education Should Reflect the Interconnected Nature of Science as it is Practiced and Experienced in the Real World.
Three dimensions integrated:
Science and Engineering Practices (SEP)
Cross Cutting Concepts (CCC)
Disciplinary Core Ideas (DCI)

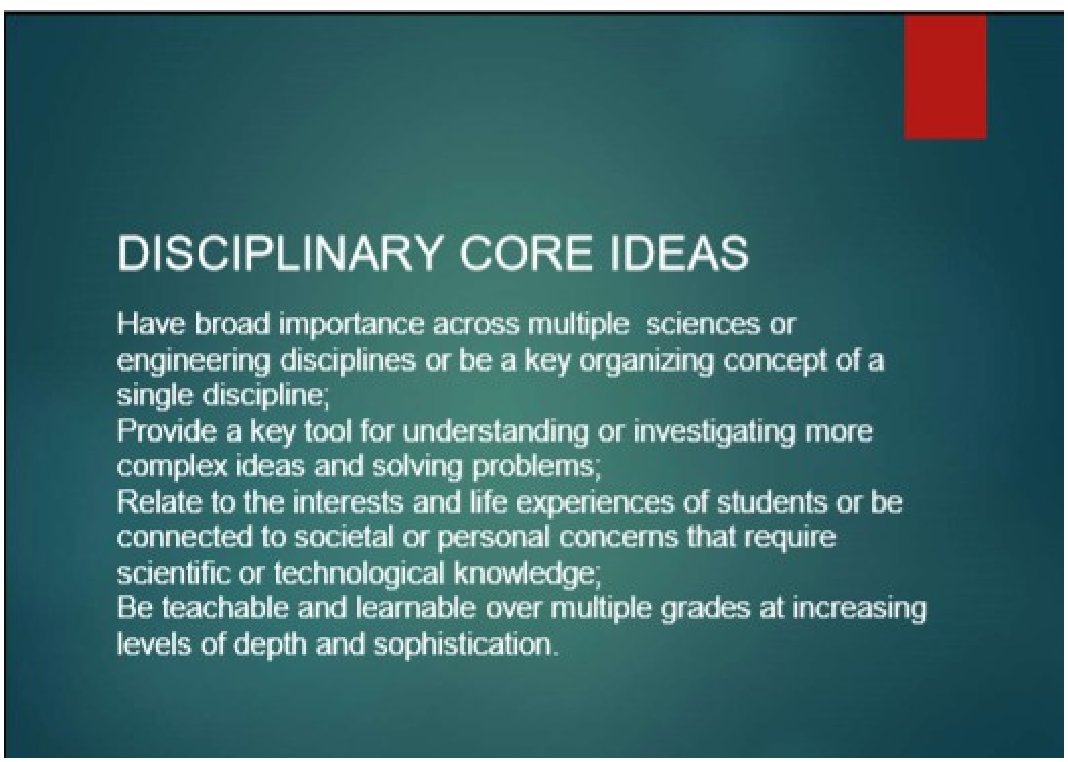

MS-LS2 Ecosystems: Interactions, Energy, and Dynamics
Performance Expectations
Foundation Boxes
SEP
DCI
CCC
Connection Boxes
Other DCIs
CCSS

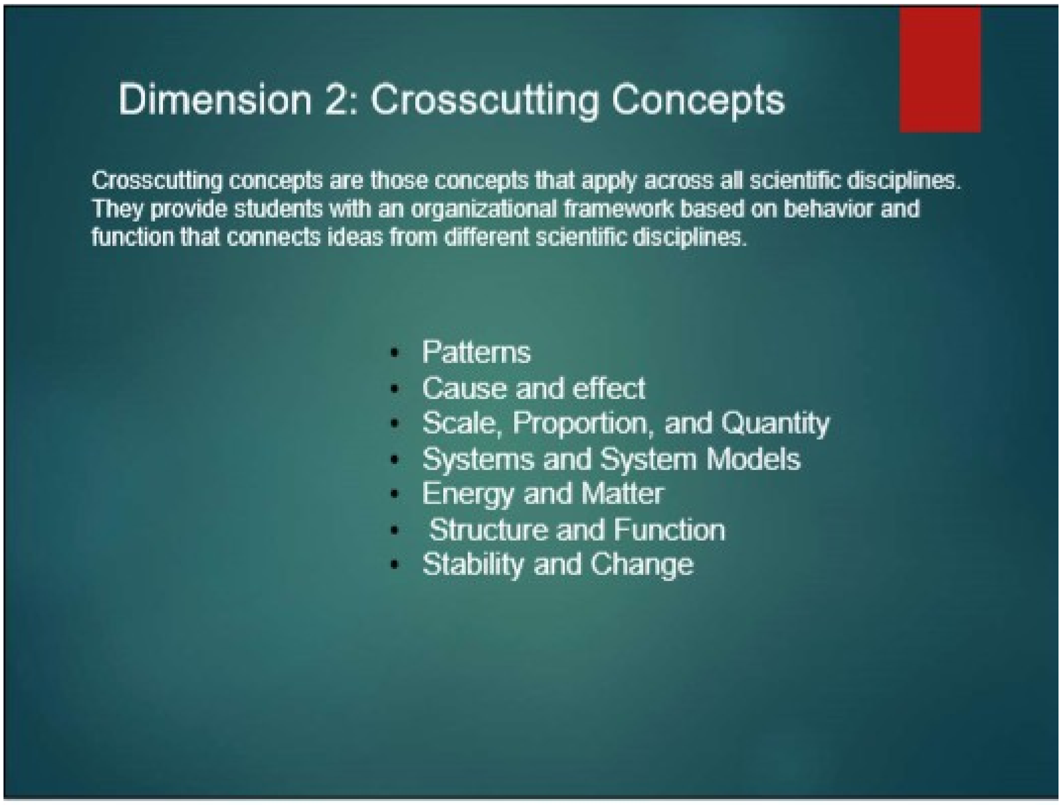
5


3 Dimensional Learning
Analyze and **interpret** data to provide **evidence** for the effects of resource availability on organisms and populations of organisms in an ecosystem

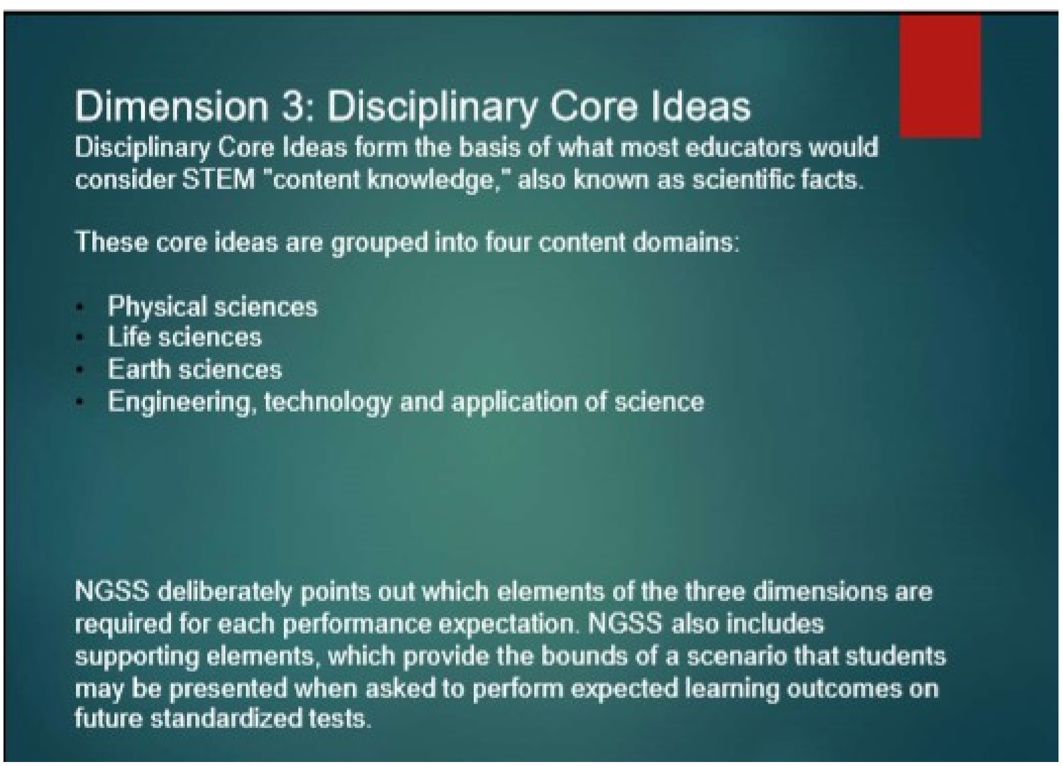

3 Dimensional Learning
Dissected
Analyze and interpret data to provide evidence
resource availability on organisms and populations of organisms in an ecosystem
the effects of resource availability on organisms and populations of organisms in an ecosystem

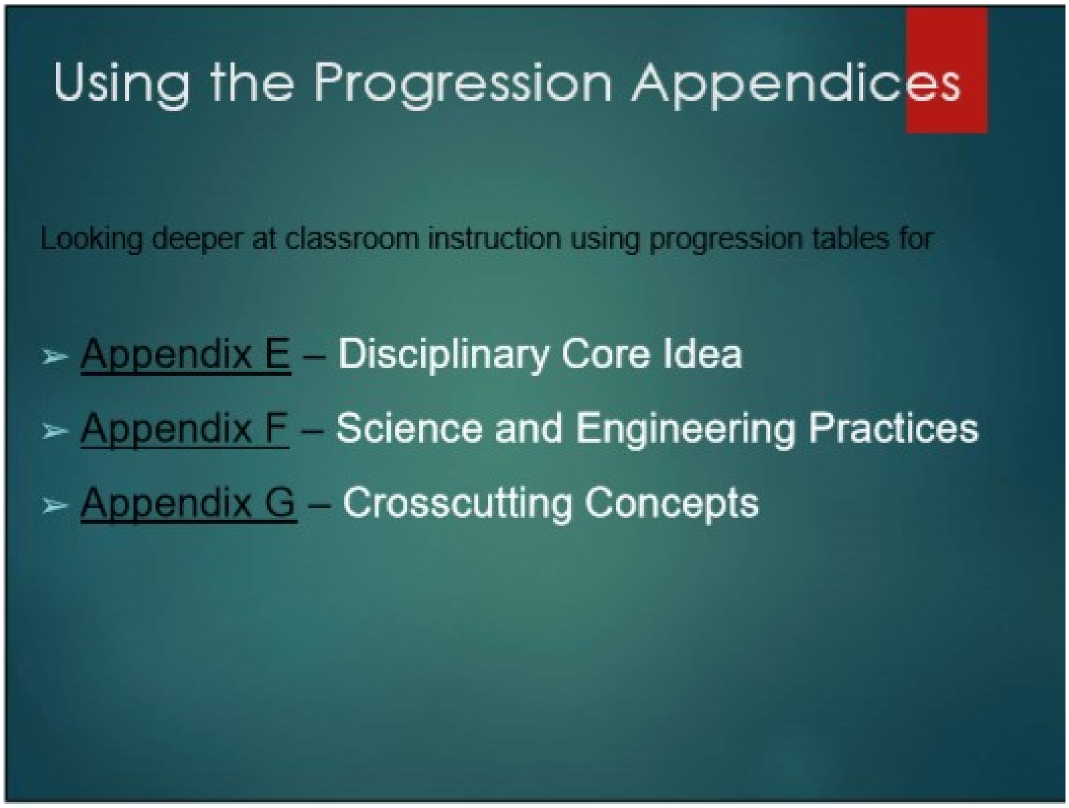
7


DISCIPLINARY CORE IDEAS
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.

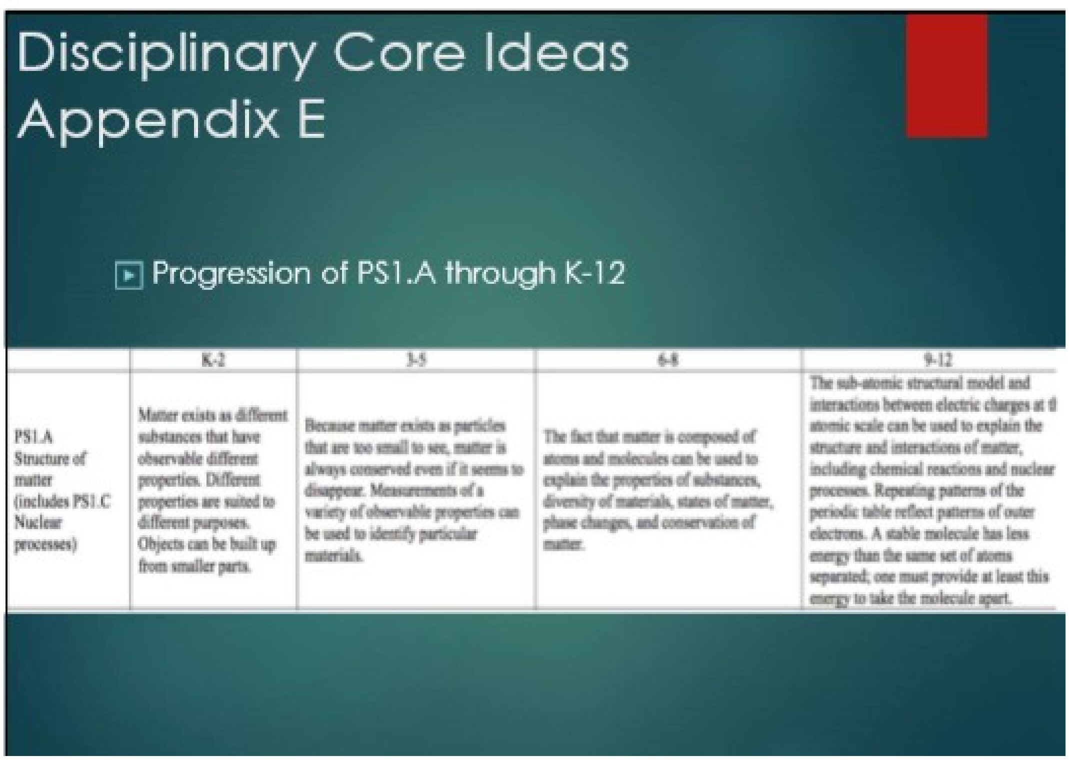

Dimension 2: Crosscutting Concepts
Crosscutting concepts are those concepts that apply across all scientific disciplines. They provide students with an organizational framework based on behavior and function that connects ideas from different scientific disciplines.
• Patterns
• Cause and effect
• Scale, Proportion, and Quantity
• Systems and System Models
• Energy and Matter
• Structure and Function
• Stability and Change

11

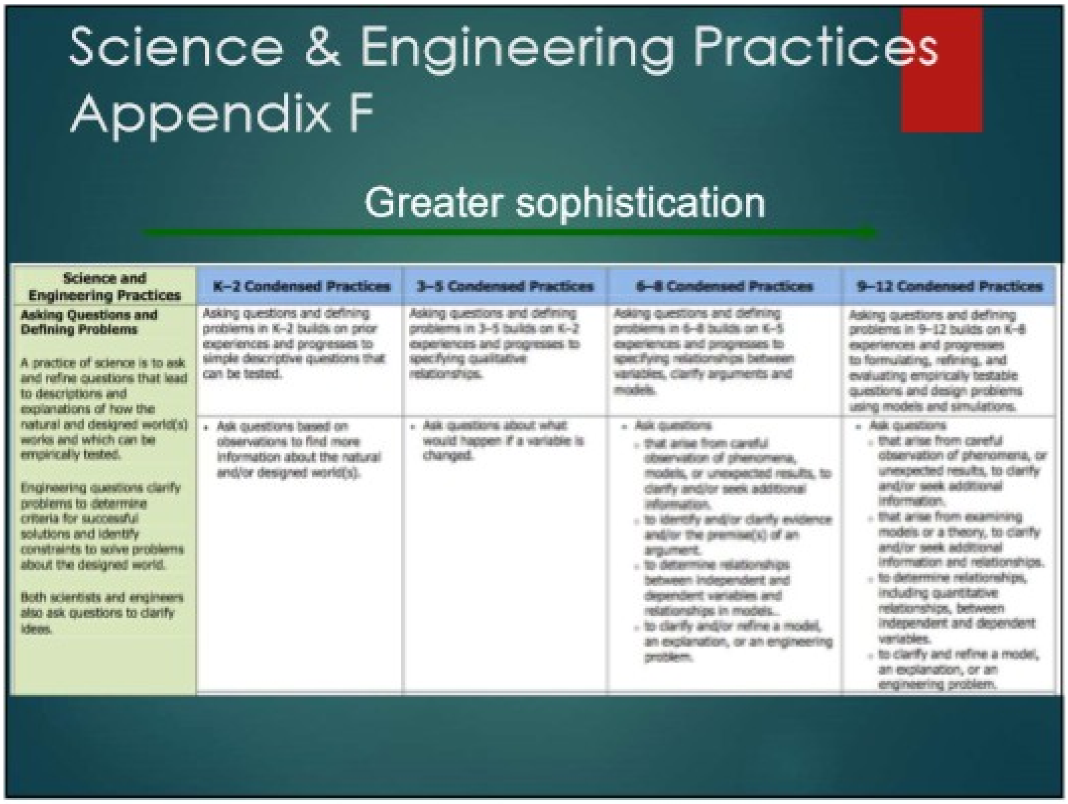

Dimension 3: Disciplinary Core Ideas
Disciplinary Core Ideas form the basis of what most educators would consider STEM "content knowledge," also known as scientific facts.
These core ideas are grouped into four content domains:
• Physical sciences
• Life sciences
• Earth sciences
• Engineering, technology and application of science
NGSS deliberately points out which elements of the three dimensions are required for each performance expectation. NGSS also includes supporting elements, which provide the bounds of a scenario that students may be presented when asked to perform expected learning outcomes on future standardized tests.



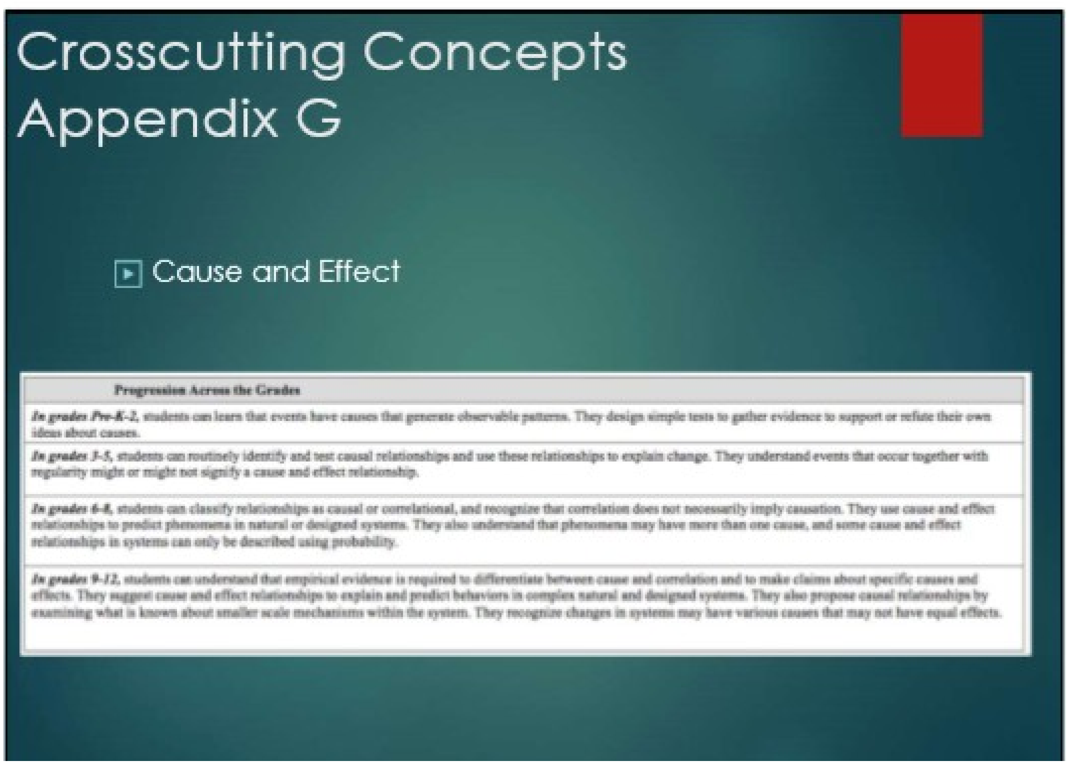
13

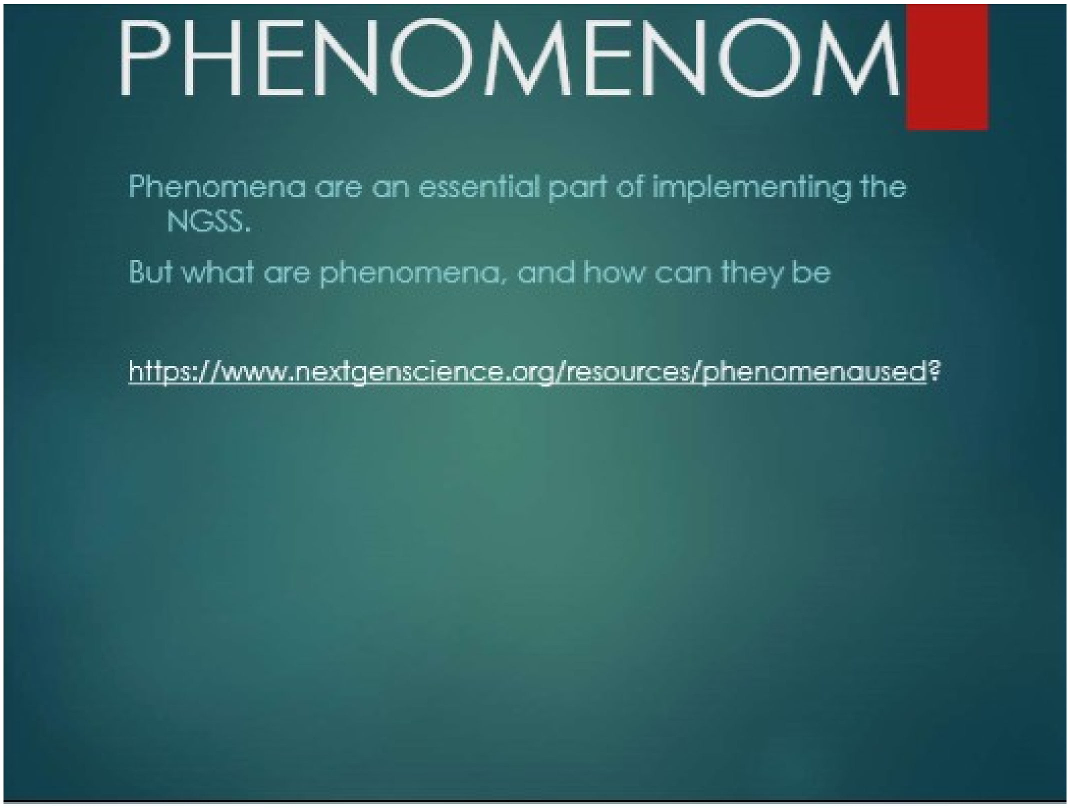


	K-2	3-5	6-8	9-12
PS1.A Structure of matter (includes PS1.C Nuclear processes)	Matter exists as different substances that have observable different properties. Different properties are suited to different purposes. Objects can be built up from smaller parts.	Because matter exists as particles that are too small to see, matter is always conserved even if it seems to disappear. Measurements of a variety of observable properties can be used to identify particular materials.	The fact that matter is composed of atoms and molecules can be used to explain the properties of substances, diversity of materials, states of matter, phase changes, and conservation of matter.	The sub-atomic structural model and interactions between electric charges at tl atomic scale can be used to explain the structure and interactions of matter, including chemical reactions and nuclear processes. Repeating patterns of the periodic table reflect patterns of outer electrons. A stable molecule has less energy than the same set of atoms separated; one must provide at least this energy to take the molecule apart.


Science & Engineering Practices
Appendix F
Greater sophistication
Science and Engineering Practices
K–2 Condensed Practices
3–5 Condensed Practices
6–8 Condensed Practices
9–12 Condensed Practices
Asking Questions and Defining Problems
A practice of science is to ask and refine questions that lead to descriptions and explanations of how the natural and designed world(s) works and which can be empirically tested.
Engineering questions clarify problems to determine criteria for successful solutions and identify constraints to solve problems about the designed world.
Both scientists and engineers also ask questions to clarify ideas.
Asking questions and defining problems in K–2 builds on prior experiences and progresses to simple descriptive questions that can be tested.
Asking questions and defining problems in 3–5 builds on K–2 experiences and progresses to specifying qualitative relationships.
Asking questions and defining problems in 6–8 builds on K–5 experiences and progresses to specifying relationships between variables, clarify arguments and models.
Asking questions and defining problems in 9–12 builds on K–8 experiences and progresses to formulating, refining, and evaluating empirically testable questions and design problems using models and simulations.
• Ask questions based on observations to find more information about the natural and/or designed world(s).
• Ask questions about what would happen if a variable is changed.
• Ask questions
◦ that arise from careful observation of phenomena, models, or unexpected results, to clarify and/or seek additional information.
◦ to identify and/or clarify evidence and/or the premise(s) of an argument.
◦ to determine relationships between independent and dependent variables and relationships in models.
◦ to clarify and/or refine a model, an explanation, or an engineering problem.
• Ask questions
◦ that arise from careful observation of phenomena, or unexpected results, to clarify and/or seek additional information.
◦ that arise from examining models or a theory, to clarify and/or seek additional information and relationships.
◦ to determine relationships, including quantitative relationships, between independent and dependent variables.
◦ to clarify and refine a model, an explanation, or an engineering problem.

15


Crosscutting Concepts
Appendix G
Cause and Effect
Progression Across the Grades
In grades Pre-K-2, students can learn that events have causes that generate observable patterns. They design simple tests to gather evidence to support or refute their own ideas about causes.
In grades 3-5, students can routinely identify and test causal relationships and use these relationships to explain change. They understand events that occur together with regularity might or might not signify a cause and effect relationship.
In grades 6-8, students can classify relationships as causal or correlational, and recognize that correlation does not necessarily imply causation. They use cause and effect relationships to predict phenomena in natural or designed systems. They also understand that phenomena may have more than one cause, and some cause and effect relationships in systems can only be described using probability.
In grades 9-12, students can understand that empirical evidence is required to differentiate between cause and correlation and to make claims about specific causes and effects. They suggest cause and effect relationships to explain and predict behaviors in complex natural and designed systems. They also propose causal relationships by examining what is known about smaller scale mechanisms within the system. They recognize changes in systems may have various causes that may not have equal effects.


PHENOMENOM
Phenomena are an essential part of implementing the NGSS.
But what are phenomena, and how can they be
https://www.nextgenscience.org/resources/phenomenaused?

17


NGSS web addresses
http://www.crscience.org/pdf/JournalComponents.pdf
http://www.crscience.org/pdf/SentenceFrameExamples.pdf
https://betterlesson.com/browse/next_gen_science
https://docs.google.com/document/d/14AzlodZPrFvMLJNZw
fN_IzGiFLKsZQfJ0CK0zs_0310/edit
https://www.cde.ca.gov/pd/ca/sc/ngssstandards.asp
https://www.nasa.gov/pdf/630753main_NASAsBESTActivityGuide3-5.pdf
https://www.nextgenscience.org/understanding-standards/understanding-standards

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Appendix C: Lesson Segment 5 Animal Senses

Instruction Segment 5 Animal Senses
Created by: Valerie Pasdera, 4th grade

Animal Senses Instructional Segment 5	Students develop a model of how animals see that included their external body structures, internal body systems, and light, and informational processing.

NGSS instructional Sequences and Suggestion for activities	**NGSS Science and Engineering Practices (SEPs)**	**Benchmark Advanced Alignment**

NGSS Performance Expectations: 4-LS!.1 Construct an argument that plants and animals have internal and external structures that function to support survival, growth, behavior, and reproduction 4-LS1-2. Use a model to describe that animals receive different types of information through their senses, process the e information in their brain, and respond to the information in different ways. 4-PS3-2 Make observations to provide evidence that energy can be transferred from place to pace by sound, light, heat, and electric currents. 4-PS4-2 Develop a model to describe that light reflecting from objects and entering the eye allows objects to be seen. 4-PS4-3. Generate and compare multiple solutions that use patterns to transfer information (engineering focus)
ENGAGE: **I Notice, I Wonder, It Reminds Me of** **Guiding Questions:** How do the internal and external structures of animals help them sense and interpret their environment? How do sense help animals survive, grow, and reproduce? What role does light play in how we see? How do humans encode information and transmit it across the world?

EXPLORE: **Instructional sequence 5:** **Animal Senses**	**Science and Engineering practices (SEPS)**	**Benchmark Unit 3: Observing Nature and Unit 10: The Power of Electricity**
Structures for survival in a healthy ecosystem Vignette, P. 96-108 from CA SCIENCE FRAMEWORK, Chapter 4 Foss Living Systems, Inv.1. Inv. 2 Part 1 (from 5th grade)	SEP2: Developing and Using Models. SEP 3: Planning and Carrying out investigations SEP 4: Analyzing and interpreting data SEP 7: Engaging in Argument from Evidence	Unit 3: Small group texts: Doomed to Disappear? Endangered Species, Milton the Mole (Reader's Theater). Whale of a tail, Animal Migration, Ocean Health, The Dodo's Last

	SEP 8: Obtaining, Evaluating, and Communicating Information.	Stand (Reader's Theater)
Structure and Function in Vision ● Students observe pictures of different kinds of animals and compare their eyes. ● Students look at field of view by drawing protractor on the floor and measuring when they can see friends sneaking up behind them. ● Students use their data to think about animals with eyes on the side of their head and construct an argument about their field of view https://mysteryscience.com/body/mystery-3/how-eyes-work/61 ● Students try depth perception tasks with one yet closed (drop a penny in a bucket, toss a small ball into a target, e.g.) They compare how much of the room they can see with each eye and identify the portion of the overlap. ● Students with a partner will look at each other's eyes making noticing of the pupil, with lights on and then with lights off. Students will share their finding with one another on what happens to the pupils. Why would it be important for animals to have different shapes of pupils?	SEP 2. Developing and Using Models SEP 4. Analyzing and Interpreting Data SEP 7: Engaging in Argument from Evidence SEP 8 Obtaining Evaluating, and Communicating Information	

EXPLAIN Developing a model for sight and light. ● Students draw their initial ideas of how light helps us see, showing the path of light. (Science Notebook) https://www.calacademy.org/educators/science-notebook-corner ● Students use battery and led to create light ● Students will investigate electricity and circuits Students do Page Keeley probes https://ps21pd.weebly.com/uploads/1/2/0/6/12065719/lesson_probe_batteries_bulbs_and_wires.pdf ● "Apple in the Dark" https://www.wsfcs.k12.nc.us/cms/lib/NC01001395/Centricity/Domain/3333/Probe_Apple%20In%20the%20Dark.pdf ● or Seeing the Light to consider different models of how light lets us see. ● Using a flashlights and mirrors in a darkened room, students conduct investigations. They can bounce light off the mirror sand find where they can see it, then draw pictures of their findings. (light leaves the light source, bounces off objects, and enters the eye, allowing the eye to see the object)	SEP 1: Asking Questions SEP 2: Developing and Using Models SEP 3: Planning and Carrying Out Investigations SEP 6: constructing Explanations and Solving Problems	Unit 10: Small group text: Looking at Light (to inform and revise models)
ELABORATE Investigating Sensory systems: ● Vignette, p.114-117, from https://www.cde.ca.gov/ci/sc/cf/, chapter 4 ● Students will draw and label a model of the circuits they created	SEP 2: Developing and Using Models SEP 4: analyzing and Interpreting Data SEP: 7 Engaging in Argument from Evidence	

Engineering Connection: Use Patterns to Communicate Information, page 119 from the https://www.cde.ca.gov/ci/sc/cf/	SEP 1: Asking questions SEP 2: Developing and Using Models SEP3: Planning and Carrying out investigations SEP 7: Engaging in Argument from Evidence SEP 8 Obtaining, Evaluating and Communicating Information.	
EVALUATE To assess the student's understandings of a how light affects what can be seen. Students will demonstrate an understanding of simple closed circuits as well as evaluate the electrical conductivity using various materials.	**Assessment Instrument** Oral assessment Written quiz Power point slide, model of how conductors and insulators work.	**Additional Assessments** Notebook: For understanding concepts presented. Understanding the relationship and crosscutting concepts the sense of eyesight and light
EXTENDING APPLICATION Students will create conductors to help them see what different sources will create light. Comparing eyes of different animals, and why they are shaped the way they are. "Does this help their vision? Further extension would be does the environment an animal lives in, affect the shape of their eye? Further extensions could include Learning about NASA's X-57 which uses battery power instead of aviation fuel. https://www.nasa.gov/aeroresearch/stem/X57		

Connections to other DCIs in this grade-level: N/A

Articulation of DCIs across grade-levels:

1.PS4.B (4-PS4-2); 1.LS1.A (4-LS1-1); 1.LS1.D (4-LS1-2); 3.LS3.B (4-LS1-1); MS.PS4.B (4-PS4-2); MS.LS1.A (4-LS1-1), (4-LS1-2); MS.LS1.D (4-PS4-2), (4-LS1-2)

California Common Core State Standards Connections:

ELA/Literacy –

RI.4.1 Refer to details and examples in a text when explaining what the text says explicitly and when drawing inferences from the text. (4-PS3-1)

RI.4.3 Explain events, procedures, ideas, or concepts in a historical, scientific, or technical text, including what happened and why, based on specific information in the text. (4-PS3-1)
RI.4.9 Integrate information from two texts on the same topic in order to write or speak about the subject knowledgeably. (4-PS3-1)
W.4.1 Write opinion pieces on topics or texts, supporting a point of view with reasons and information. (4-LS1-1)
W.4.2.a–d Write informative/explanatory texts to examine a topic and convey ideas and information clearly. (4-PS3-1)
W.4.7 Conduct short research projects that build knowledge through investigation of different aspects of a topic. (4-PS3-2,(4-PS3-3),(4-PS3-4),(4-ESS3-1)
W.4.8 Recall relevant information from experiences or gather relevant information from print and digital sources; take notes, paraphrase, and categorize information, and provide a list of sources. CA (4-PS3-1),(4-PS3-2),(4-PS3-3),(4-PS3-4),(4-ESS3-1)
W.4.9 Draw evidence from literary or informational texts to support analysis, reflection, and research. (4-PS3-1),(4-ESS3-1)

Speaking and Listening

SL.4.5 Add audio recordings and visual displays to presentations when appropriate to enhance the development of main ideas or themes. (4-PS4-2), (4-LS1-2)

Mathematics

MP. 4 Model with mathematics. (4-PS4-2)
4.G.A.1 Draw points, lines, line segments, rays, angles (right, acute, obtuse), and perpendicular and parallel lines. Identify these in two-dimensional figures. (4-PS4-2)
4.G.A.3 Recognize a line of symmetry for a two-dimensional figure as a line across the figure such that the figure can be folded across the line into matching parts. Identify line symmetric figures and draw lines of symmetry. (4-LS1-1

Resources Not listed in lesson:
https://www.nasa.gov/sites/default/files/atoms/files/x-57-maxwell-educator-guide.pdf
https://www.grc.nasa.gov/www/k-12/aeroact.htm
http://www.nasa.gov/pdf/630753main_NASAsBESTActivityGuide3-5.pdf
http://www.iteea.org/Publications/STEMconnections/STEMconnections.htm
http://pbskids.org/designsquad/parentseducators/lesson-plans/electricity_and_circuits.html

Appendix D: 5E NGSS Lesson Planning Template

NGSS Lesson Planning Template

Grade/ Grade Band:	**Topic:**	**Lesson # _____ in a series of _____ lessons**
Brief Lesson Description:		
Performance Expectation(s):		
Specific Learning Outcomes:		
Narrative / Background Information		
Prior Student Knowledge:		
Science & Engineering Practices:	**Disciplinary Core Ideas:**	**Crosscutting Concepts:**
Possible Preconceptions/Misconceptions:		
LESSON PLAN – 5-E Model		
ENGAGE: Opening Activity – Access Prior Learning / Stimulate Interest / Generate Questions:		
EXPLORE: Lesson Description – Materials Needed / Probing or Clarifying Questions:		
EXPLAIN: Concepts Explained and Vocabulary Defined: **Vocabulary:**		
ELABORATE: Applications and Extensions:		
EVALUATE:		

Formative Monitoring (Questioning / Discussion):

Summative Assessment (Quiz / Project / Report):

Elaborate Further / Reflect: Enrichment:

Materials Required for This Lesson/Activity			
Quantity	**Description**	**Potential Supplier (item #)**	**Estimated Price**

Retrieved from: https://www.resa.net/curriculum/curriculum/science/professionaldevelopment/ngss-pd/demension1/5-e-learning-cycle-model-resources/

Appendix E: Names and Contact Information of Attendees

Names and contact information of four educators who attended the PD

Michael Doerr (4th grade) mdoerr@sanjuan.edu

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