Creating a Truly Integrated Cross-Content Instructional Unit

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San Mateo County Office of Education
STEM Symposium, October 30, 2015
Session Agenda

1. Introduction - 5 min
2. CCSS-Math Lesson (4.G.A.3) - 15 min
3. NGSS Lesson (4-LS1-1) - 20 min
4. CCSS-ELA Lesson (W.4.1) - 15 min
5. Reflections and Questions - 20 min
   ● The lesson-creation experience
   ● Building bridges between standards-aligned content areas
   ● Tools that can help teachers create integrated content units
WHY ARE WE HERE?
4-LS1 From Molecules to Organisms: Structures and Processes

Students who demonstrate understanding can:

4-LS1-1. Construct an argument that plants and animals have internal and external structures that function to support survival, growth, behavior, and reproduction. [Clarification Statement: Examples of structures could include thorns, stems, roots, colored petals, heart, stomach, lung, brain, and skin.] [Assessment Boundary: Assessment is limited to macroscopic structures within plant and animal systems.]

4-LS1-2. Use a model to describe that animals receive different types of information through their senses, process the information in their brain, and respond to the information in different ways. [Clarification Statement: Emphasis is on systems of information transfer.] [Assessment Boundary: Assessment does not include the mechanisms by which the brain stores and recalls information or the mechanisms of how sensory receptors function.]

The performance expectations above were developed using the following elements from the NRC document A Framework for K-12 Science Education.

Science and Engineering Practices
Developing and Using Models
Modeling in 3–5 builds on K–2 experiences and progresses to building and revising simple models and using models to represent events and design solutions.
- Use a model to test interactions concerning the functioning of a natural system. (4-LS1-2)

Engaging in Argument from Evidence
Engaging in argument from evidence in 3–5 builds on K–2 experiences and progresses to critiquing the scientific explanations or solutions proposed by peers by citing relevant evidence about the natural and designed world(s).
- Construct an argument with evidence, data, and/or a model. (4-LS1-1)

Disciplinary Core Ideas
LS1.A: Structure and Function
- Plants and animals have both internal and external structures that serve various functions in growth, survival, behavior, and reproduction. (4-LS1-1)

LS1.D: Information Processing
- Different sense receptors are specialized for particular kinds of information, which may be then processed by the animal’s brain. Animals are able to use their perceptions and memories to guide their actions. (4-LS1-2)

Crosscutting Concepts
Systems and System Models
- A system can be described in terms of its components and their interactions. (4-LS1-1, 4-LS1-2)

Articulation of DCIs across grade-levels: 1.LS1.A (4-LS1-1); 1.LS1.D (4-LS1-2); 3.LS3.B (4-LS1-1); MS.LS1.A (4-LS1-1, 4-LS1-2); MS.LS1.D (4-LS1-2)

Common Core State Standards Connections:
ELA/Literacy —
W.4.1 Write opinion pieces on topics or texts, supporting a point of view with reasons and information. (4-LS1-1)
SL.4.5 Add audio recordings and visual displays to presentations when appropriate to enhance the development of main ideas or themes. (4-LS1-2)
Mathematics —
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)
Symmetry in our World
Grade 4 » Geometry » Draw and identify lines and angles, and classify shapes by properties of their lines and angles. » 3

Recognize a line of symmetry for a two-dimensional figure as a line across the figure such that the figure can be folded along the line into matching parts. Identify line-symmetric figures and draw lines of symmetry.
Alphabet Symmetry

A B C D E F G H I J K L M N O P

Q R S T U V W X Y Z
So, What is Symmetry?
Why is Symmetry Important?

THE ACCIDENTAL UNIVERSE
The World You Thought You Knew
ALAN LIGHTMAN
Bestselling Author of EINSTEIN'S DREAMS
Students who demonstrate understanding can:

4-LS1-1. Construct an argument that plants and animals have internal and external structures that function to support survival, growth, behavior, and reproduction. [Clarification Statement: Examples of structures could include thorns, stems, roots, colored petals, heart, stomach, lung, brain, and skin.] [Assessment Boundary: Assessment is limited to macroscopic structures within plant and animal systems.]
What do these organisms have in common?

For each organism above: (1) draw the line of symmetry, and (2) name the individual structures that are distributed symmetrically.
Almost all animals are symmetrical.

**Symmetry** in biology is the balanced distribution of duplicate body parts or shapes.
How do organisms benefit from having symmetrical internal and external structures?
Using only the materials found in the plastic bag, you have **5 minutes** to create a fictitious animal or plant that has at least one internal or external structure that supports your organism’s survival

AND

outcompetes the other organisms in the classroom.

PROJECT CRITERIA:

Your organism lives in a redwood forest.
Your organism exhibits symmetry.
Your organism has a scientific name and a common name.
Construct an argument that animals and plants have internal and external structures that function to support survival, growth, behavior and reproduction.
English Language Arts Standards » Writing
» Grade 4 » 1

1. Write opinion pieces on topics or texts, supporting a point of view with reasons and information.
   a. Introduce a topic or text clearly, state an opinion, and create an organizational structure in which related ideas are grouped to support the writer’s purpose.
   b. Provide reasons that are supported by facts and details.
   c. Link opinion and reasons using words and phrases (e.g., for instance, in order to, in addition).
   d. Provide a concluding statement or section related to the opinion presented.
Leveraging Writing Workshop

Mini-lesson (15 min)
- **Connection** (Teacher connects the new work to past work and states teaching point)
- **Teaching** (Teacher tells students what she’s going to teach and then shows them how and why)
- **Active Engagement** (Students practice the strategy -- often with a partner)
- **Link** (Reinforce the teaching point and send writers off to work)

Workshop (30 mins)
- Teachers confer with students, run small strategy groups
- Students write
- Mid-workshop teaching point **(2 minute teach)**

Share (5 minutes)
- Students share writing, assess their progress, etc.
Teaching Point (What/How/Why): Today I’m going to teach you that one of the greatest responsibilities of writing like a scientist is to convince people that their ideas have a solid foundation. One way that scientists do this is to make sure that they include their reasons for their ideas in their writing.
If there were “Symposians” -- like people -- on Planet Symposia, what internal and external structures would they need to have in order to survive?
Writing Like a Scientist?

Symposians would have many different structures that would help them live on their bright and windy planet with yucky food. Symposians would need to have sensors instead of eyes. They would need to be able to eat food without tasting it. They would need to have long and strong legs. Symposians would need a long tongue too. They would need to have claws or something to grab on to the earth.

Teaching
Science writers support their ideas with reasons!

Just like humans on Earth, Symposians need internal and external structures that will allow them to survive on their strange planet. Symposians need to have sensors that are not sensitive to the constant light. If they had eyes like humans, they would have to cover their eyes and wouldn’t be able to find their food. Symposians need a mouth that has no taste buds. If they were able to taste the very sweet liquid and the yucky insects, they wouldn’t want to eat and would starve to death. ...
Science writers support their ideas with reasons!

...Symposians need to have strong legs that allowed them to run fast because their main source of food is fast moving insects. Symposians also need to have a very long tongue. Symposians also need to have claws that grip into the planet.
Science writers support their ideas with reasons!

...Symposians need to have strong legs that allowed them to run fast because their main source of food is fast moving insects. Symposians also need to have a very long tongue. They would use this long tongue to quickly reach out and catch the fast-moving insects just like frogs and lizards do. Symposians also need to have claws that grip into the planet. This is because there is a strong wind that would knock them down when they were trying to hunt insects.
Science writers use academic words and phrases to connect ideas

Just like humans on Earth, Symposians need internal and external structures that will allow them to survive on their strange planet. In order to move around their bright planet, Symposians need to have sensors that are not sensitive to the constant light. Due to the very sweet liquid and a diet of plants and insects, Symposians need to be able to eat food without tasting it. Symposians need to have strong legs in order to chase after the fast-moving insects. Symposians also need to have a very long tongue in order to catch the high-jumping insects. There is strong wind that is always blowing on Planet Symposia. As a result of this, Symposians need to have claws that grip into the planet to keep them from being blown over.

Mid-Workshop Teaching
Reflections + Questions

LaRita Williams
Doron Markus
Patrick Hurley

The Experience
How to Build Bridges Between Content Areas
Tools to Facilitate Unit/Lesson Plan Creation:
  - KWHLAQ Chart, NGSS-Aligned Lesson Planning Tool
THANK YOU!
KWHLAQ
FOR THE 21ST CENTURY

FORMERLY KNOWN AS A KWL CHART

based on John Barell's inquiry strategy: "Why are School Buses Always Yellow?"

K
WHAT DO YOU KNOW?

WHAT DO YOU WANT TO KNOW?

WHAT WILL YOU FIND OUT?

WHAT HAVE YOU LEARNED?

WHAT ACTION WILL YOU TAKE?

WHAT FURTHER QUESTIONS DO YOU HAVE?

WH
BRAINSTORM
MINDMAP
THINK >PAIR>SHADE (VTR)
BLOG POST
VIDEO POST
COLLABORATIVE PINWALL
STICKY NOTES

W
BRAINSTORM
DO INITIAL RESEARCH
SEE > THINK > WONDER (VTR)
THINK > PUZZLE > EXPLORE (VTR)
VIDEO JOURNAL

H
ONLINE SEARCH
LEARNING NETWORK SEARCH
BOOKS
JOURNALS
FACE2FACE INTERVIEWS
GET IN CONTACT W/ EXPERTS & AUTHORS

W
I USED TO THINK... NOW I THINK...(VTR)
REFLECTIVE, HYPERLINKED BLOG POST
CREATE AN ARTIFACT AS EVIDENCE
VISUALLY REPRESENT YOUR LEARNING
SKETCHNOTE

A
APPLY WHAT WAS LEARNED
TEACH SOMEONE ELSE
SHARE FINDINGS ON LOCAL -> GLOBAL SCALE
CREATE SOMETHING NEW

Q
REFLECT ON PROCESS OF LEARNING
CONNECT -> EXTEND CHALLENGE (VTR)
CREATE A GOOGLE SITE TO CONTINUE EXPLORING QUESTIONS COLLABORATIVELY

(VTR)= VISIBLE THINKING ROUTINES BY PROJECT ZERO
SILVIA ROSENTHAL TOLISANO - @LANGWITCHES - GLOBALLYCONNECTEDLEARNING.COM
<table>
<thead>
<tr>
<th>K</th>
<th>W</th>
<th>H</th>
<th>L</th>
<th>A</th>
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**K W L Chart**

*For the 21st Century*
### NGSS Lesson Planning Tool

| Teacher Name: |  |
| Grade Level (select): |  |
| Course: |  |
| Name of Instructional Unit: |  |
| Name of Lesson: |  |
| Time (minutes): |  |

**Which Performance Expectation (PE) is being addressed during this lesson?**

<table>
<thead>
<tr>
<th>PE Code</th>
<th>PE Text</th>
<th>Engineering Connection (*) (Y/N)</th>
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**The Three Dimensions of this Performance Expectation**

**Science and Engineering Practice (PE) (Check One)**

1. Asking Questions (Science) and Defining Problems (Engineering)
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 (Science) and Designing Solutions (Engineering)
7. Engaging in Argument from Evidence
8. Obtaining, Evaluating and Communicating Information

**Disciplinary Core Idea (DCI)**

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<th>DCI Text</th>
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Crosscutting Concept

<table>
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<th>Patterns</th>
<th>Energy and Matter</th>
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<td>Systems and System Model</td>
<td>Structure and Function</td>
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<td>Scale and Proportion</td>
<td>Stability and Change</td>
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<td>Cause and Effect</td>
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_Identify other PEs that are bundled with this lesson’s PE (for the purpose of unit planning):_

Which PE immediately preceded this lesson? ________________

Which PE will follow this lesson? ________________

_Identify DCIs connected to this lesson’s DCI at this grade level (for the purpose of drawing connections across an academic year):_

_Identify DCIs that are articulated at other grade levels (for the purpose of differentiating instruction):_

_Identify other academic standards related to this PE (for the purpose of integration and collaboration):_

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<th>CCSS-ELA</th>
<th>CCSS-Math</th>
<th>ELD</th>
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The Lesson

Describe how this lesson transitions from the previous lesson:

Briefly describe what students will be doing during this lesson that will ultimately demonstrate their mastery of the performance expectation:

Describe the pre-assessment activity (to establish a baseline):

Describe this lesson’s entry event:

What types of questions should the students ask themselves during and after experiencing the entry event?
Describe the hands-on, minds-on activity students will be doing during the lesson to engage the science and engineering practice:

Describe the differentiation strategies that you will deploy to meet the diverse learning needs of your students:

What questions or techniques will the teacher use to help students connect their exploration to the concept under exploration?

What vocabulary will be introduced and how will it connect to students’ observations?

How is this knowledge applied in our daily lives?

Describe how you will assess that the students have achieved mastery of the performance expectation (to demonstrate growth):