What is so different about NGSS? - Biology

Activate Learning

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CREATE for STEM

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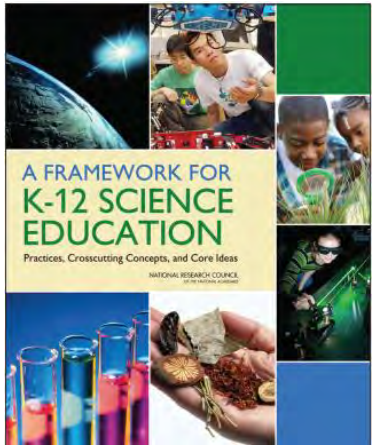
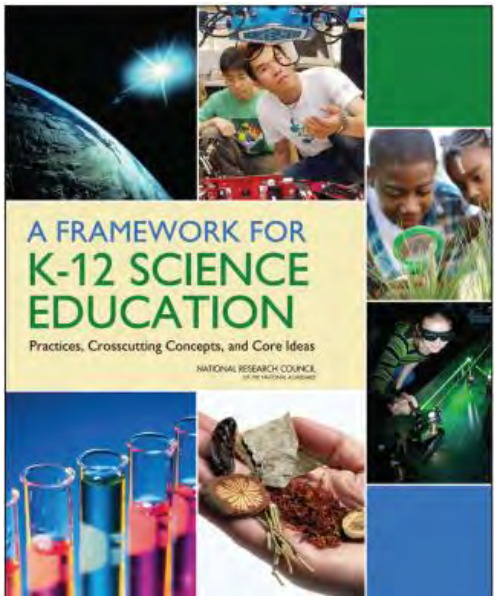


NEXT GENERATION SCIENCE STANDARDS
For States, By States

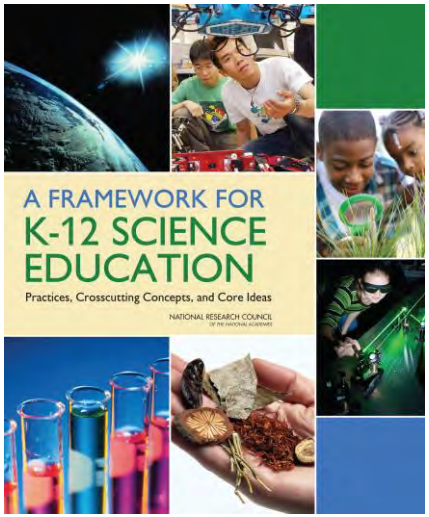
What will we do today?

- Learn a bit more about 3-Dimensiional learning
- Experience 3-Dimensional Learning
- Build understanding of Coherence
- Engage in doing a bit of science

NEXT GENERATION SCIENCE STANDARDS
For States, By States



What's new in the Framework and NGSS?



NEXT GENERATION SCIENCE STANDARDS

1. Focus on explaining phenomena or designing solutions to problems
2. 3-Dimensional Learning
    1. Organized around disciplinary core explanatory ideas
    2. Central role of scientific and engineering practices
    3. Use of crosscutting concepts
3. Instructions builds towards performance expectations
4. Coherence: building and applying ideas across time

What is three 3-Dimensional Learning Learning

- Three-dimensional learning shifts the focus of the science classroom to environments where students use disciplinary core ideas, crosscutting concepts with scientific practices to **explore, examine,** and **explain** how and why phenomena occur and to **design solutions** to problems

Overview of EQuIP

I. Alignment to the NGSS	II. Instructional Supports	III. Monitoring student progress
1. Three dimensional: Supports students in three dimensional learning to make sense of phenomena or design solutions	Supports learning for all students through meaningful scenarios, supporting practices, supports phenomena and representations	Assessments evaluate three-dimensional learning; include formative; are accessible and unbiased
2. Coherence: Lessons fit together coherently, develops connections	Provides guidance for teachers to build coherence across the unit	Pre, formative, and summative aligned to three-dimensional learning

What should we look for in designing or deciding on materials?

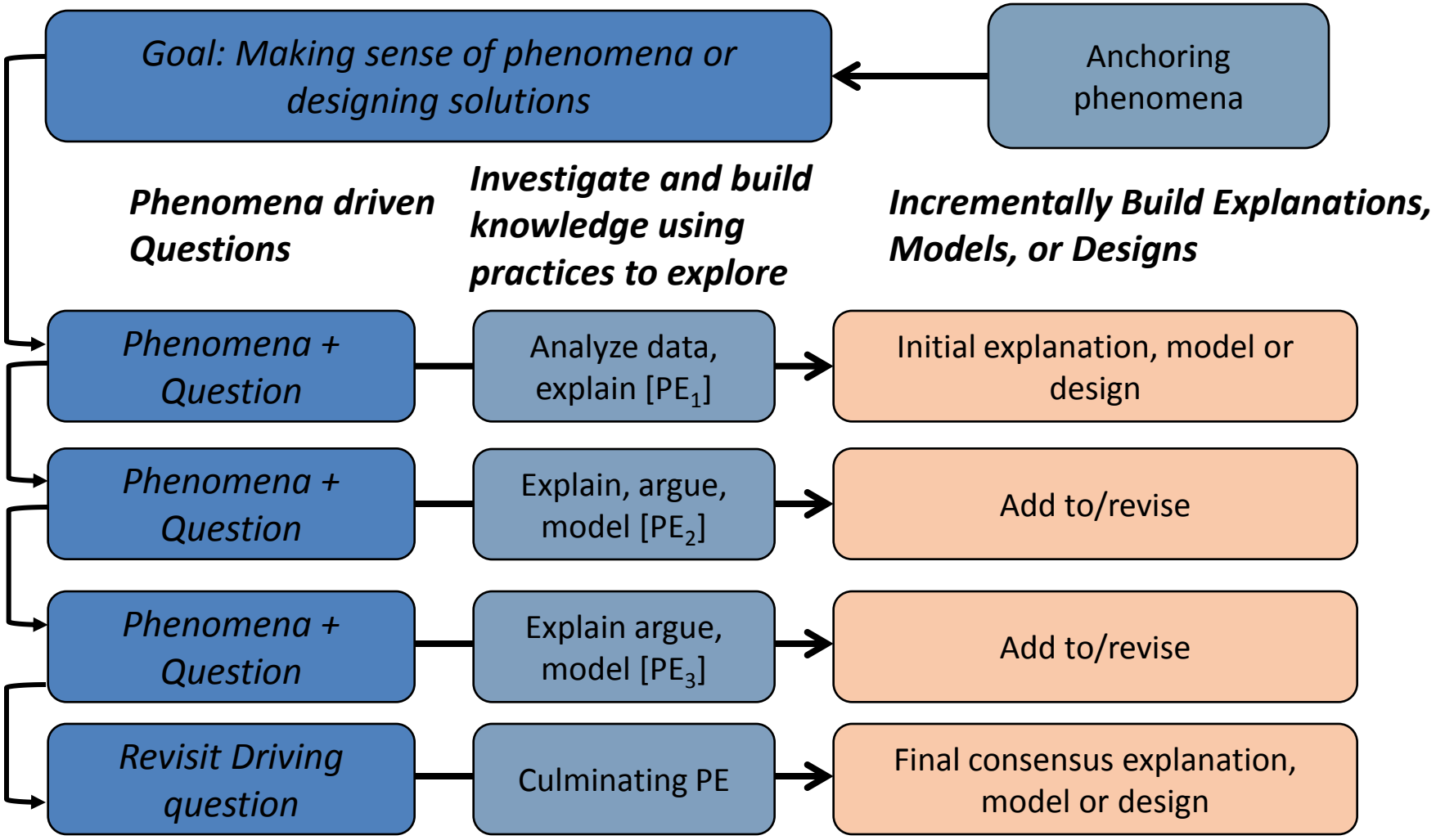
The lesson/unit aligns with the conceptual shifts of the NGSS:

1. Elements of the science and engineering practice(s), disciplinary core idea(s), and crosscutting concept(s), blend and work together to support students in three-dimensional learning to make sense of phenomena or design solutions.

How do we move further? How do I support students in reaching a PE?

Performance Expectation

Storyline: Question and phenomena motivate each step in building a disciplinary core idea



Thanks to Brian Reiser and Michael Novak

Driving Question: What Is Going on Inside Me?

How does the body manages to do the complex things it does in everyday life? How do the different systems of the body work together to meet the body's needs.

Everyday activities that our bodies do.

Phenomena driven Questions

What we figured out

What Is Inside Me? *Similar microscopic structures when we looked at small samples of our skin*

Conduct an investigation, construct a model

All living things are made of cells, all living things made of many cells

What is Breaking Food Down Inside Me? Changes that occur when chewing a cracker; egg in stomach acid over night

Conduct an investigation. Analyze data

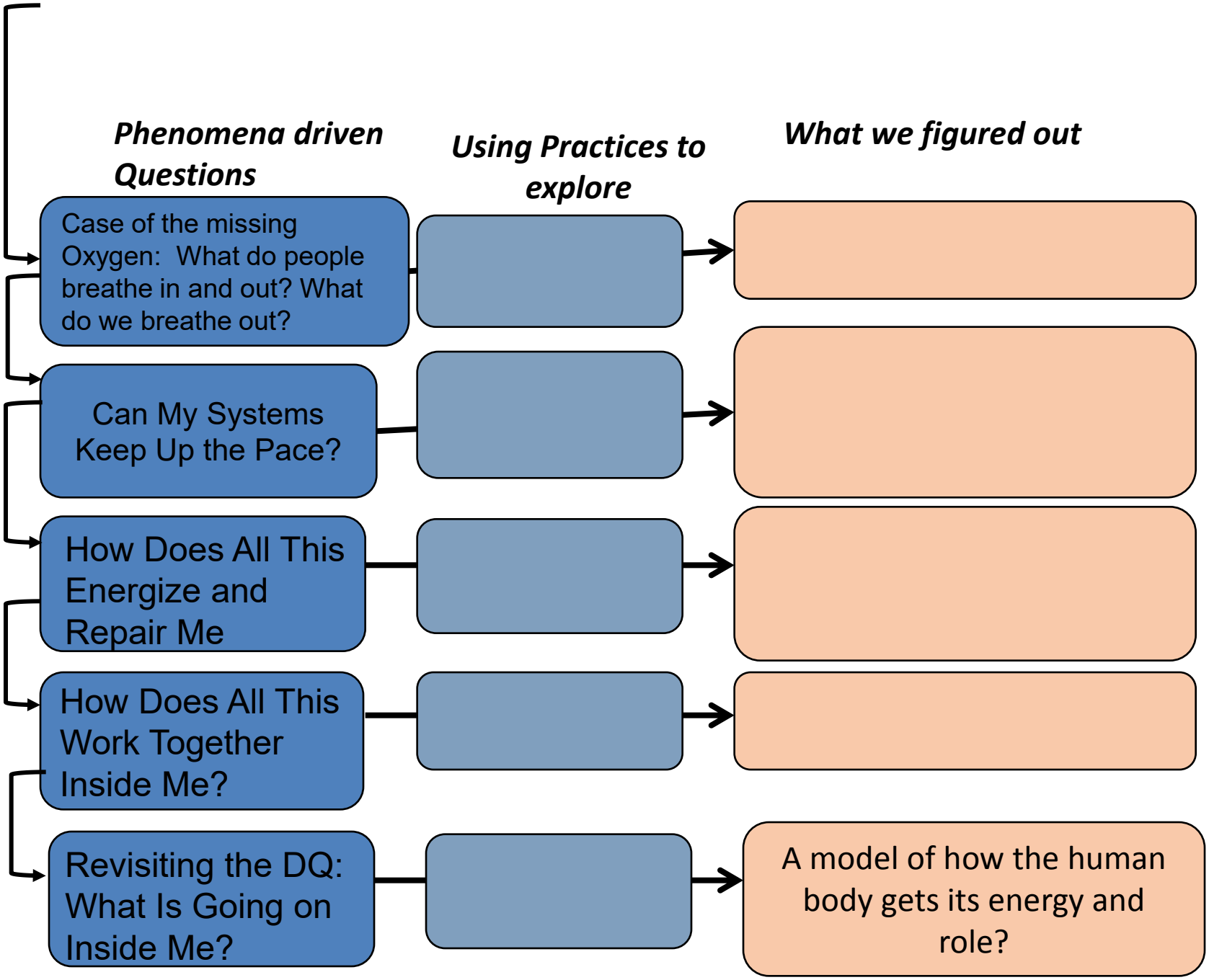
For the body to use food for energy and building materials, the food must be mechanically and chemically broken down into smaller particles

How Does Food Move in My Body? Blood sugar graphs show spikes in sugar levels after meals and decreases in between.

Analyze data Argue from evidence

For the body to use food for energy and building materials, it must be absorbed into the blood and transported to the cells of the body Add to/revise

Case of the missing Oxygen: What do people breathe in and out? What do we breathe out?


Phenomena driven Questions
Using Practices to explore
What we figured out
Case of the missing Oxygen: What do people breathe in and out? What do we breathe out?
Can My Systems Keep Up the Pace?
How Does All This Energize and Repair Me
How Does All This Work Together Inside Me?
Revisiting the DQ: What Is Going on Inside Me?
A model of how the human body gets its energy and role?

Build toward the following PE

MS Structure, Function, and Information Processing

Students who demonstrate understanding can:

MS-LS1-2. Develop and use a model to describe the function of a cell as a whole and ways parts of cells contribute to the function.[Clarification Statement: Emphasis is on the cell functioning as a whole system and the primary role of identified parts of the cell, specifically the nucleus, chloroplasts, mitochondria, cell membrane, and cell wall.] [*Assessment Boundary: Assessment of organelle structure/function relationships is limited to the cell wall and cell membrane. Assessment of the function of the other organelles is limited to their relationship to the whole cell. Assessment does not include the biochemical function of cells or cell parts.*]

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

Scientific and Engineering Practices

Developing and Using Models

Modeling in 6–8 builds on K–5 experiences and progresses to developing, using, and revising models to describe, test, and predict more abstract phenomena and design systems.

- Develop and use a model to describe phenomena.

Disciplinary Core Idea

LS1.A: Structure and Function

- Within cells, special structures are responsible for particular functions, and the cell membrane forms the boundary that controls what enters and leaves the cell.

Crosscutting Concepts

Structure and Function

- Complex and microscopic structures and systems can be visualized, modeled, and used to describe how their function depends on the relationships among its parts, therefore complex natural structures/systems can be analyzed to determine how they function.

Build toward the following PE

MS Structure, Function, and Information Processing

Students who demonstrate understanding can:

MS-LS1-3. Use argument supported by evidence for how the body is a system of interacting subsystems composed of groups of cells. [Clarification Statement: Emphasis is on the conceptual understanding that cells form tissues and tissues form organs specialized for particular body functions. Examples could include the interaction of subsystems within a system and the normal functioning of those systems.] [*Assessment Boundary: Assessment does not include the mechanism of one body system independent of others. Assessment is limited to the circulatory, excretory, digestive, respiratory, muscular, and nervous systems.*]

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Scientific and Engineering Practices

Engaging in Argument from Evidence
Engaging in argument from evidence in 6–8 builds on K–5 experiences and progresses to constructing a convincing argument that supports or refutes claims for either explanations or solutions about the natural and designed world(s).

- Use an oral and written argument supported by evidence to support or refute an explanation or a model for a phenomenon.

Disciplinary Core Idea

LS1.A: Structure and Function

- In multicellular organisms, the body is a system of multiple interacting subsystems. These subsystems are groups of cells that work together to form tissues and organs that are specialized for particular body functions.

Crosscutting Concepts

Systems and System Models

- Systems may interact with other systems; they may have sub-systems and be a part of larger complex systems.

Build toward the following PE

MS Matter and Energy in Organisms and Ecosystems

Students who demonstrate understanding can:

MS-LS1-7. Develop a model to describe how food is rearranged through chemical reactions forming new molecules that support growth and/or release energy as this matter moves through an organism. [Clarification Statement: Emphasis is on describing that molecules are broken apart and put back together and that in this process, energy is released.] [*Assessment Boundary: Assessment does not include details of the chemical reactions for photosynthesis or respiration.*]

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- Develop a model to describe unobservable mechanisms.

Disciplinary Core Idea

LS1.C: Organization for Matter and Energy Flow in Organisms

- Within individual organisms, food moves through a series of chemical reactions in which it is broken down and rearranged to form new molecules, to support growth, or to release energy. (MS-LS1-7)

PS3.D: Energy in Chemical Processes and Everyday Life

- Cellular respiration in plants and animals involve chemical reactions with oxygen that release stored energy. In these processes, complex molecules containing carbon react with oxygen to produce carbon dioxide and other materials.*(secondary to MS-LS1-7)*

Crosscutting Concepts

Energy and Matter

- Matter is conserved because atoms are conserved in physical and chemical processes.

Driving question:

What Is Going on Inside Me?

- What happens to food and oxygen to enable the body to meet our energy needs.
- Students track what happens to food as it goes through the digestive system to the circulatory system and is delivered to the cells all over the body. Tracing the transformation of food to energy raises questions about how this happens, leading to the coordination of systems.
- Students pursue an explanatory account that provides a reason to understand each of the systems and the role it plays.

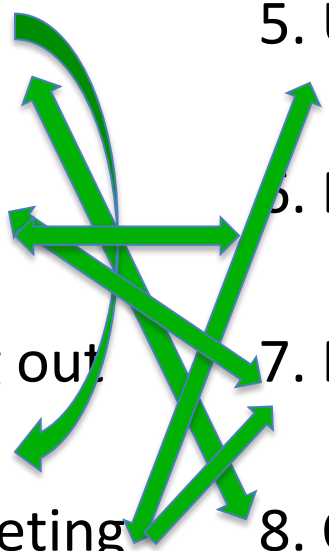
Let’s engage in some phenomena!

What are Scientific and Engineering Practices?

The multiple ways of knowing and doing that scientists and engineers use to study the natural world and design world.

The practices work together – they are not separated!

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. Developing explanations and designing solutions
7. Engaging in argument from evidence
8. Obtaining, evaluating, and communicating information



Why Use Crosscutting Concepts?

Ideas that cut across and are important to all the science disciplines

Provide different lenses to examine phenomena

1. Patterns
2. Cause and effect
3. Scale, proportion and quantity
4. Systems and system models
5. Energy and matter
6. Structure and function
7. Stability and change

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Energy and Matter

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How would EQuIP evaluate this lesson on three dimensional learning?

1. Elements of the science and engineering practice(s), disciplinary core idea(s), and crosscutting concept(s), blend and work together to support students in three-dimensional learning to make sense of phenomena or design solutions.
   a. Provides opportunities to use specific elements of the scientific or engineering practices(s) to make sense of phenomena or design solutions

Do the materials clearly point out how students use elements of the practice to make sense of phenomena or design solutions?

Poll
- Yes
- No

How would EQuIP evaluate this lesson on three dimensional learning?

1. Elements of the science and engineering practice(s), disciplinary core idea(s), and crosscutting concept(s), blend and work together to support students in three-dimensional learning to make sense of phenomena or design solutions.

   b. Provides opportunities to construct and use specific elements of the disciplinary core idea(s) to make sense of phenomena or design solutions

Do the materials clearly point out how students use elements of the DCIs to make sense of phenomena or

Poll

- Yes
- No

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   c. Provides opportunities to construct and use specific elements of the crosscutting concept(s) to make sense of phenomena or design solutions

Do the materials clearly point out how students use elements of the crosscutting concepts to make sense of phenomena or design solutions?

Poll

- Yes
- No

Summary: Evaluating the focus on 3-dimensional learning

1. Elements of the science and engineering practice(s), disciplinary core idea(s), and crosscutting concept(s), blend and work together to support students in three-dimensional learning to make sense of phenomena or design solutions.

Poll
- Yes
- No

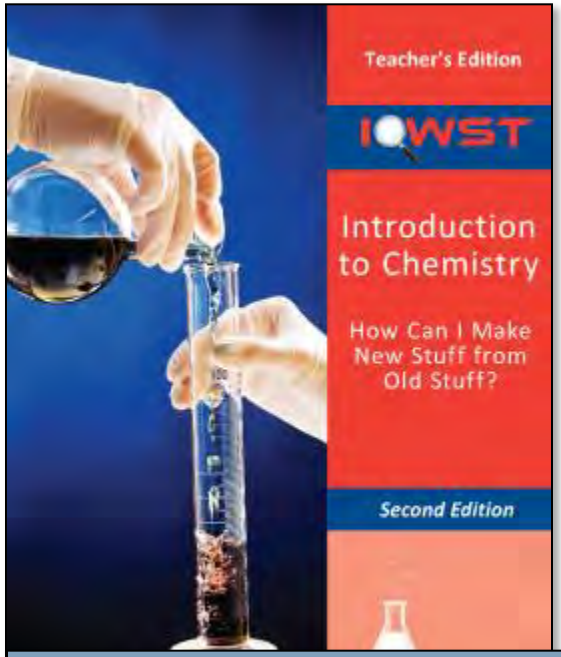
- Business is not the same!
- NGSS is different!
- Revolution and not evolution

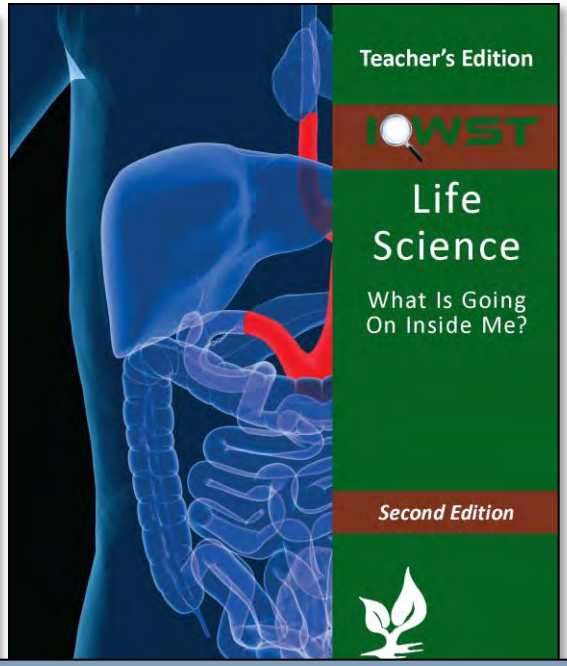
A concluding message

- By focusing on core ideas integrated with practices and crosscutting concepts, classrooms become learning environments where teachers and students have time to engage in science by designing and carrying-out investigations and making and debating claims supported by evidence and reasoning.

Thanks to!

Activate Learning





Middle school curriculum materials supporting students using science practices to construct and apply disciplinary core ideas

IQWST: Investigating and Questioning our World through Science and Technology (Krajcik, Reiser, Sutherland, & Fortus, 2013)