THE WINNETKA PUBLIC SCHOOLS DISTRICT 36

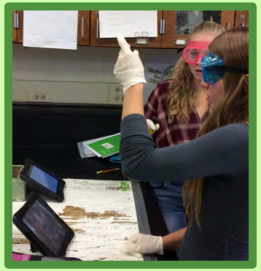



Science Curriculum

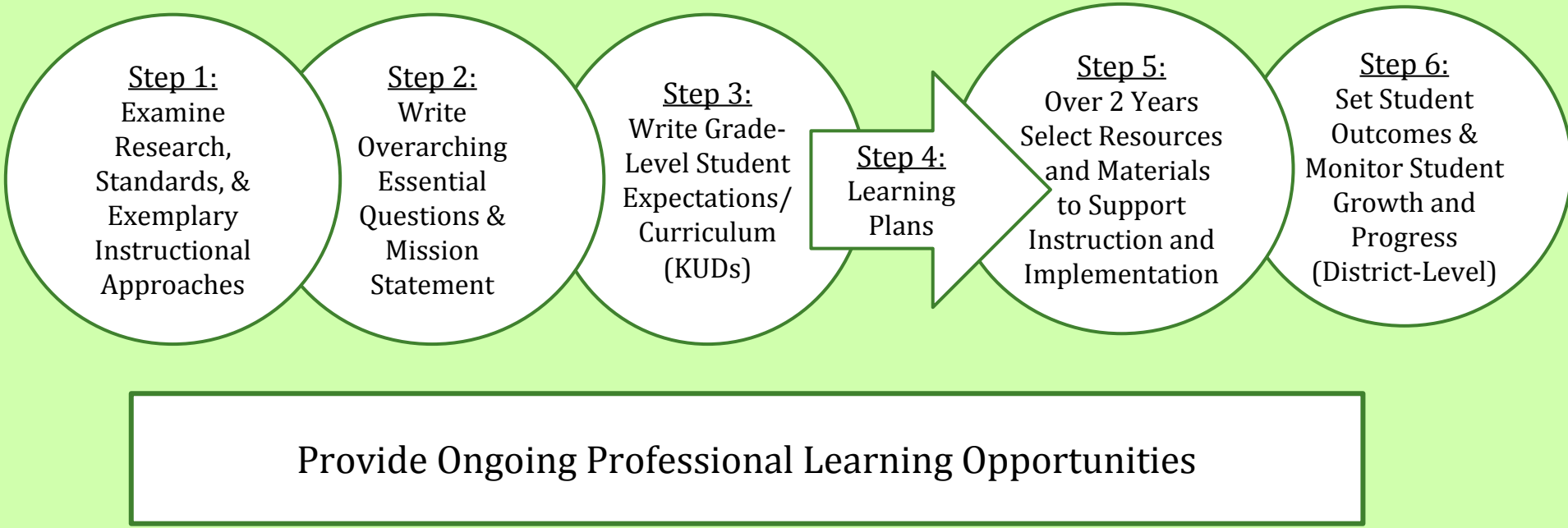
April 19, 2016








Curriculum Review Process - Science



Provide Ongoing Professional Learning Opportunities

Curriculum Review Process

<u>Step 1:</u>
Examine Research, Standards, & Exemplary Instructional Approaches

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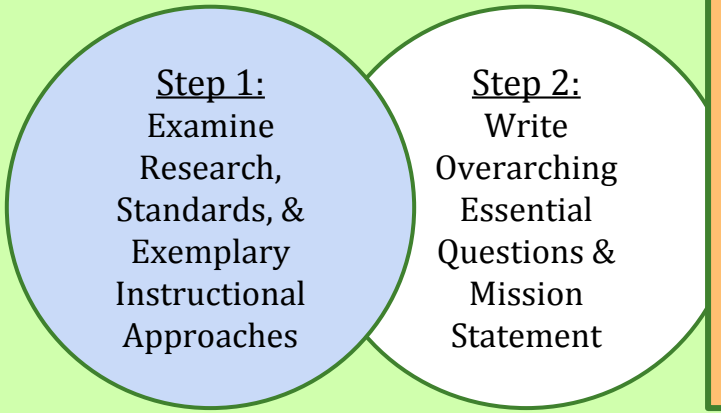

MISSION

The mission of the Winnetka Public Schools science program is to foster children's curiosity in the world around them and empower them with the knowledge needed to interact with the world as scientists and engineers. Our students are encouraged to pose questions, investigate solutions, and justify their thinking. Children will collaborate with each other, engage in scientific and engineering practices, persevere, and creatively investigate phenomena and solve problems.

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Step 1: Examine Research, Standards, & Exemplary Instructional Approaches

Step 2: Write Overarching Essential Questions & Mission Statement

Step 3: Write Grade-Level Student Expectations/ Curriculum (KUDs)

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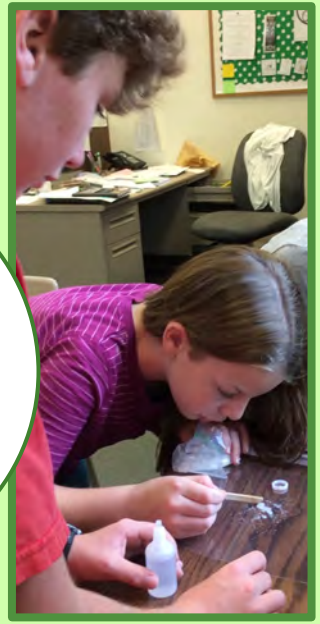
Step 5: Over 2 Years Select Resources and Materials to Support Instruction and Implementation



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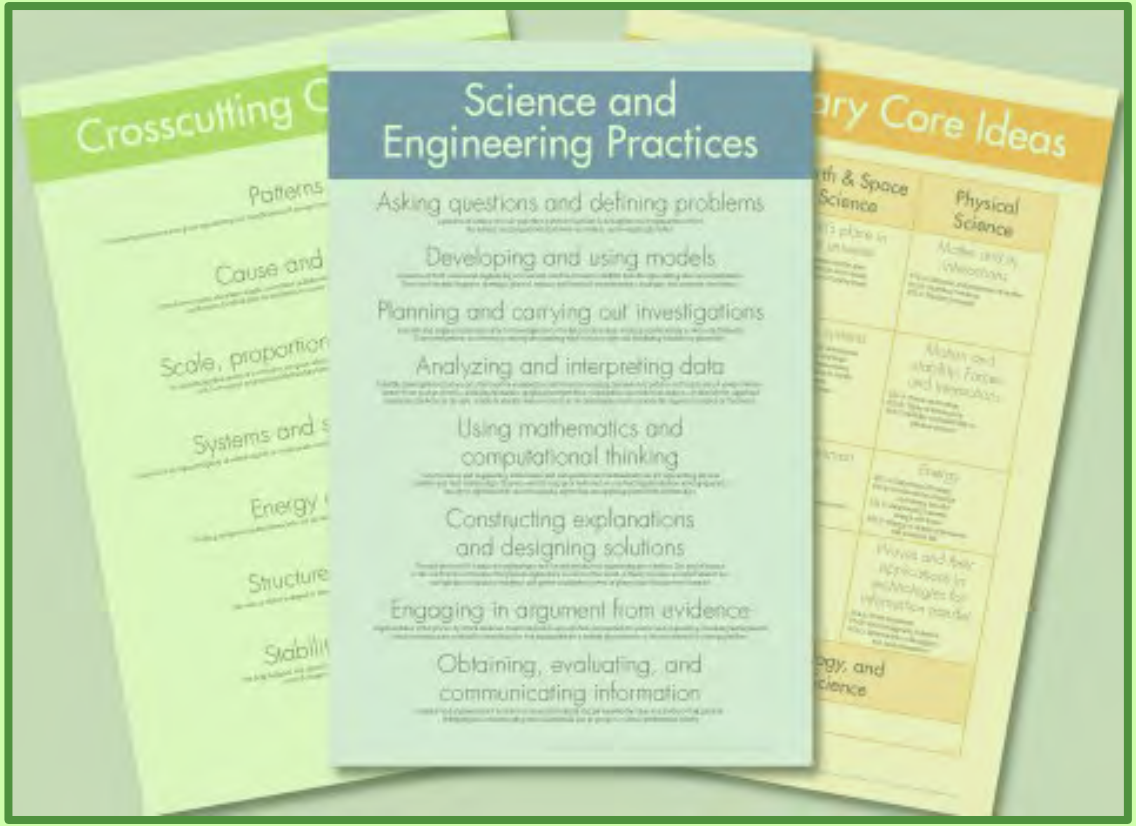
Step 4: Learning Plans

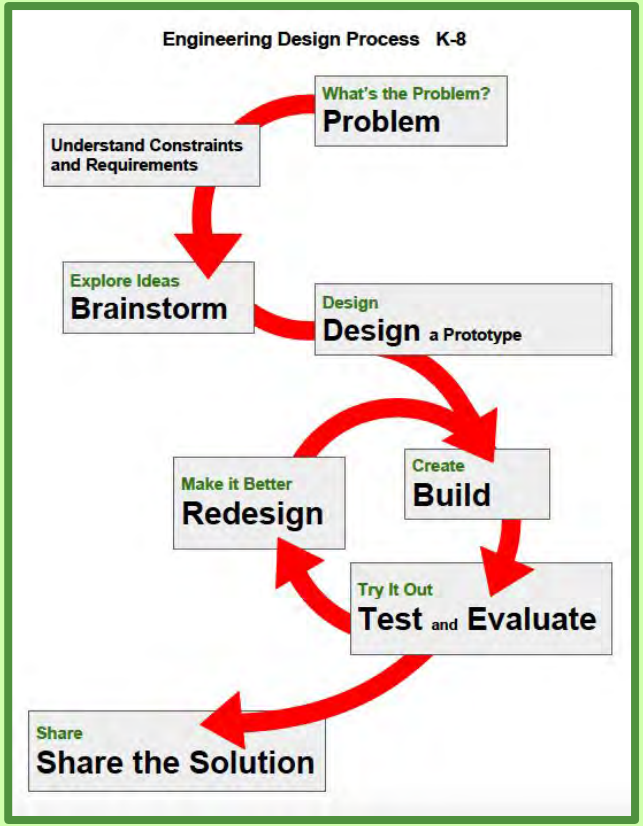
Step 5: Over 2 Years Select Resources and Materials to Support Instruction and Implementation

Step 6: Set Student Outcomes & Monitor Student Growth and Progress (District-Level)

Provide Ongoing Professional Learning Opportunities

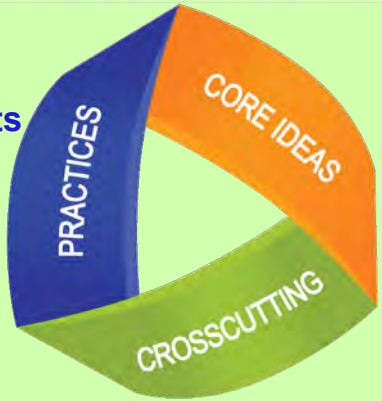
Next Generation Science Standards (NGSS)





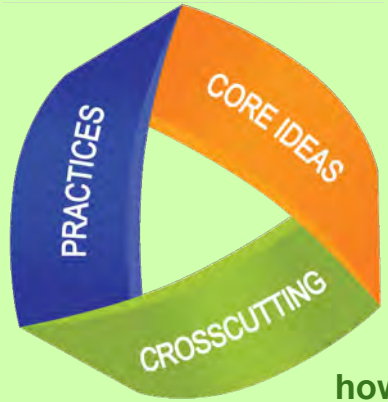
NGSS: Practices

what students do



Asking **Questions** Defining **Problems**	Using **Models**	Conducting **Investigations**	Analyzing **Data**	Using **Mathematics**	Constructing **Explanations** Designing **Solutions**	Arguing from **Evidence**	Communicating **Information**

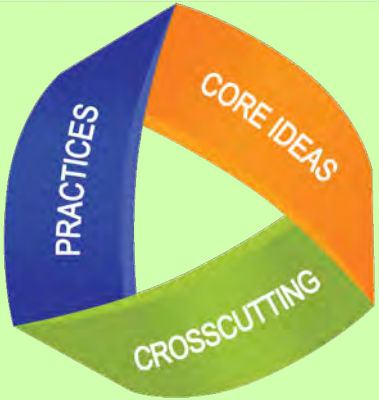
NGSS: Crosscutting Concepts (Big Ideas)



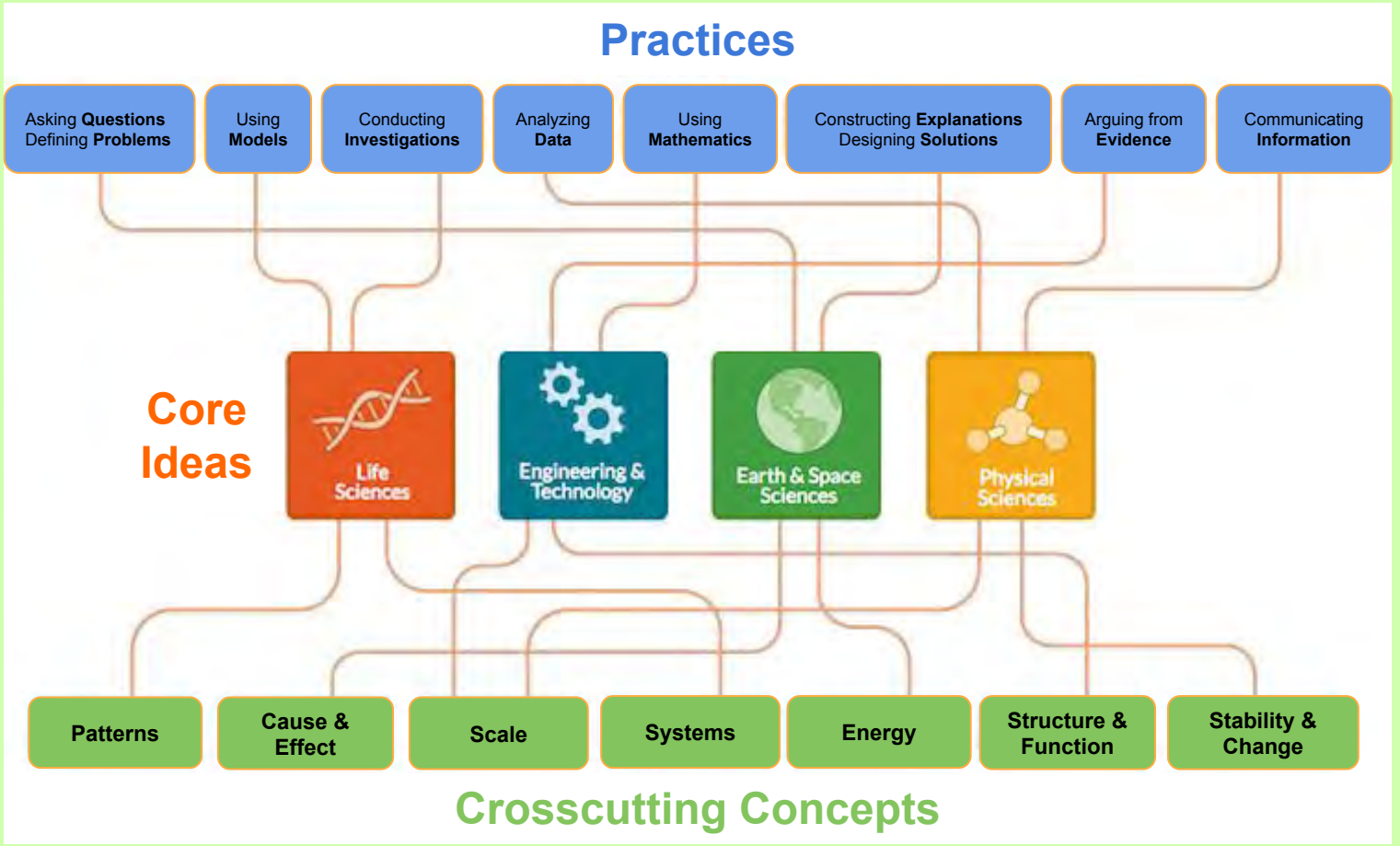
how students think

Patterns	Cause & Effect	Scale	Systems	Energy	Structure & Function	Stability & Change

NGSS: Disciplinary Core Ideas (Content)

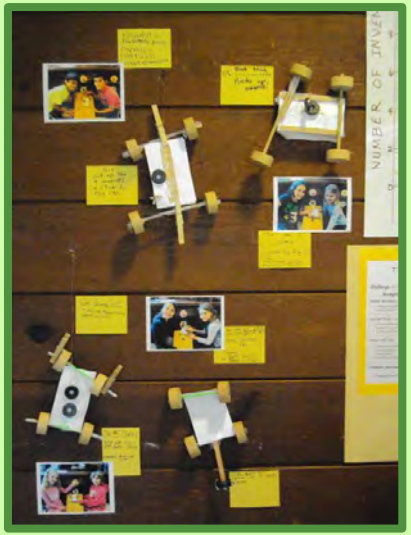


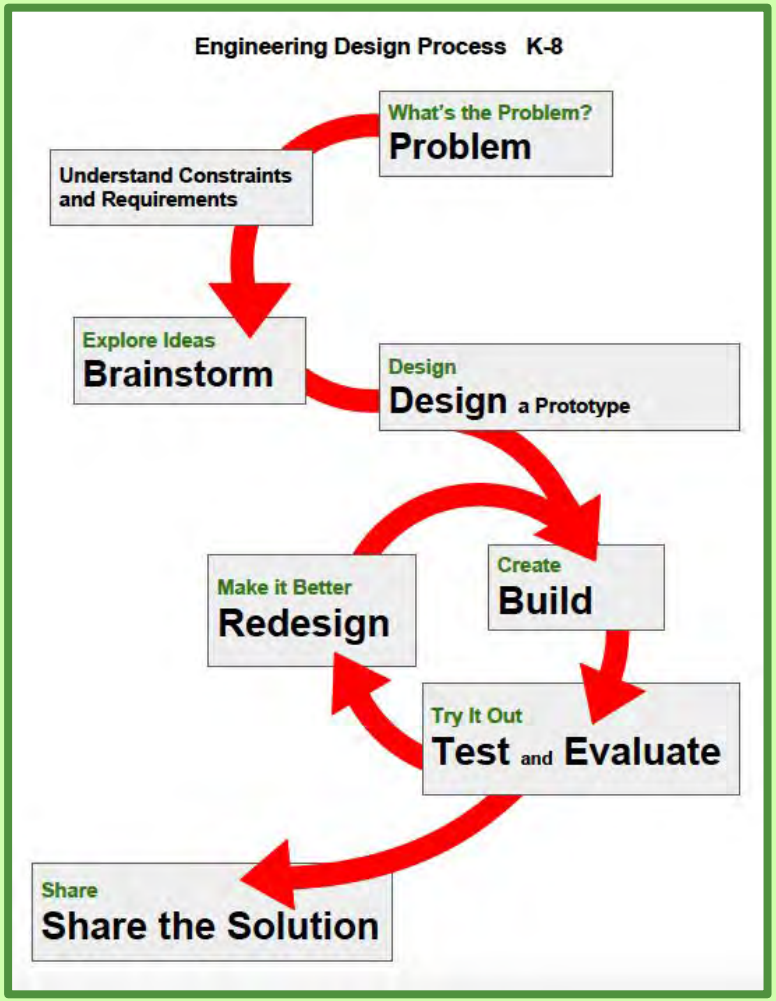
what students know

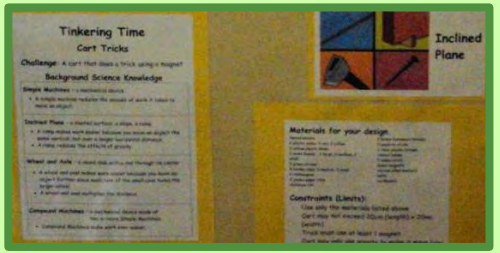


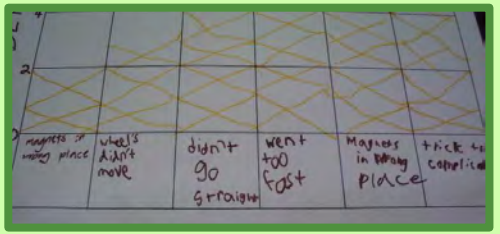
From: Concord Consortium NGSS Pathfinder

NGSS: Engineering Design Process







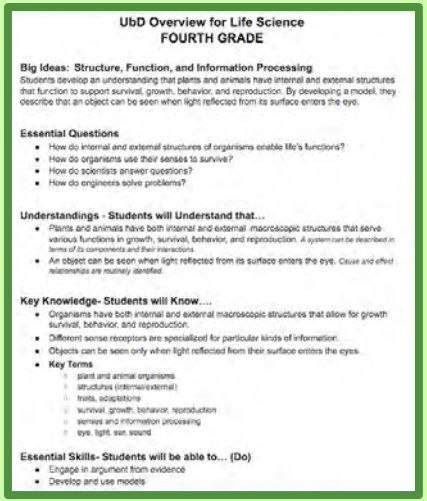


Science Expectations Grade to Grade

(sample KUDs)

Curriculum Overview for Science (Step 3)

- Includes best practice research and instructional approaches
- Aligns to the NGSS performance expectations progressions
- Details Essential Questions, Understandings, Key Knowledge, and Essential Skills for all Grades K-8



UbD Overview for Life Science
FOURTH GRADE

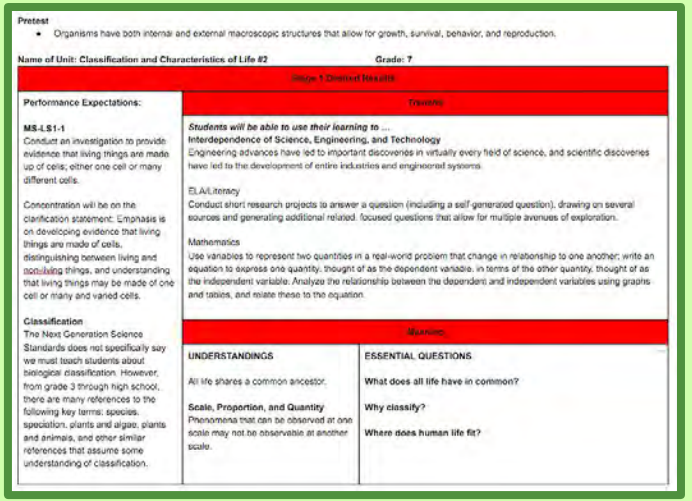
Big Ideas: Structure, Function, and Information Processing
Students develop an understanding that plants and animals have internal and external structures that function to support survival, growth, behavior, and reproduction. By developing a model, they describe that an object can be seen when light reflected from its surface enters the eye.

Essential Questions
- How do internal and external structures of organisms enable life's functions?
- How do organisms use their senses to survive?
- How do scientists answer questions?
- How do engineers solve problems?

Understandings - Students will Understand that…
- Plants and animals have both internal and external macroscopic structures that serve various functions in growth, survival, behavior, and reproduction. *A system can be described in terms of its components and their interactions.*
- An object can be seen when light reflected from its surface enters the eye. *Cause and effect relationships are routinely identified.*

Key Knowledge- Students will Know….
- Organisms have both internal and external macroscopic structures that allow for growth survival, behavior, and reproduction.
- Different sense receptors are specialized for particular kinds of information.
- Objects can be seen only when light reflected from their surface enters the eyes.
- **Key Terms**
  - plant and animal organisms
  - structures (internal/external)
  - traits, adaptations
  - survival, growth, behavior, reproduction
  - senses and information processing
  - eye, light, ear, sound

Essential Skills- Students will be able to… (Do)
- Engage in argument from evidence
- Develop and use models



Pretest
- Organisms have both internal and external macroscopic structures that allow for growth, survival, behavior, and reproduction.

Name of Unit: Classification and Characteristics of Life #2 **Grade: 7**

Stage 1 Desired Results

Performance Expectations:

MS-LS1-1
Conduct an investigation to provide evidence that living things are made up of cells; either one cell or many different cells.

Concentration will be on the clarification statement: Emphasis is on developing evidence that living things are made of cells, distinguishing between living and nonliving things, and understanding that living things may be made of one cell or many and varied cells.

Classification
The Next Generation Science Standards does not specifically say we must teach students about biological classification. However, from grade 3 through high school, there are many references to the following key terms: species, speciation, plants and algae, plants and animals, and other similar references that assume some understanding of classification.

Transfer

Students will be able to use their learning to …
Interdependence of Science, Engineering, and Technology
Engineering advances have led to important discoveries in virtually every field of science, and scientific discoveries have led to the development of entire industries and engineered systems.

ELA/Literacy
Conduct short research projects to answer a question (including a self-generated question), drawing on several sources and generating additional related, focused questions that allow for multiple avenues of exploration.

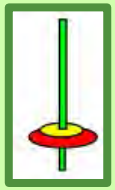
Mathematics
Use variables to represent two quantities in a real-world problem that change in relationship to one another; write an equation to express one quantity, thought of as the dependent variable, in terms of the other quantity, thought of as the independent variable. Analyze the relationship between the dependent and independent variables using graphs and tables, and relate these to the equation.

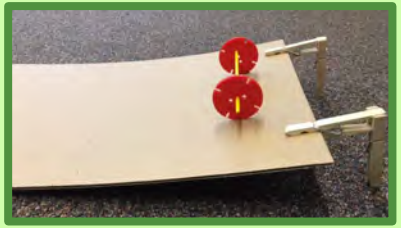
Meaning

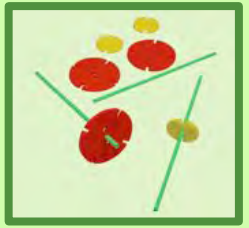
UNDERSTANDINGS	ESSENTIAL QUESTIONS
All life shares a common ancestor.	**What does all life have in common?**
Scale, Proportion, and Quantity Phenomena that can be observed at one scale may not be observable at another scale.	**Why classify?**
	Where does human life fit?

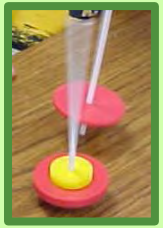
Grade 1

Balance & Motion









Grade 1, Forces and Interactions

Essential Questions

- In what ways can objects move?
- How can one predict an object's continued motion, changes in motion, or stability?
- How do scientists answer questions? How do engineers solve problems?

Understandings- Students will Understand that…

- Different strengths or directions of pushes and pulls have an effect on the motion of an object.
- Objects can balance with counterweights, a spinning motion, and a rolling motion.

Key Knowledge- Students will Know….

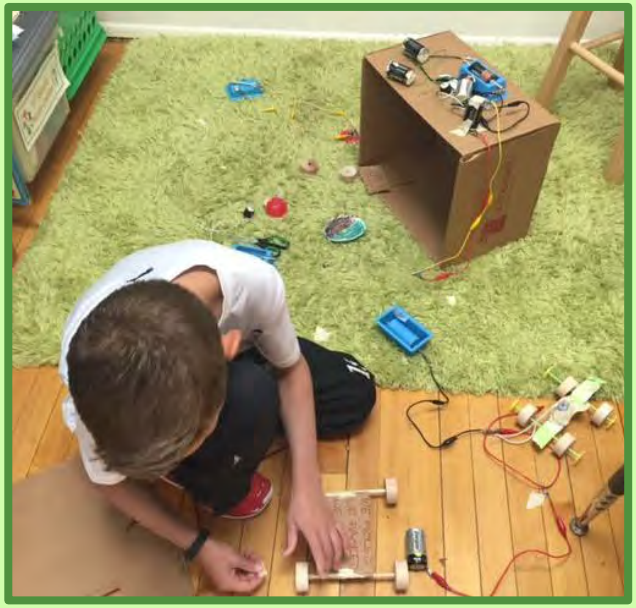
- Pushes and Pulls have different strengths and directions.
- **Pushes and Pulls can change the speed or direction of motion.**

Essential Skills- With prompting and support, students will begin to…(Do)

- Plan and carry out investigations
- Analyze and interpret data
- Obtain, evaluate and communicate information

Grade 3

Magnetism & Electricity



Grade 3, Forces and Interactions

Essential Questions

- In what ways can objects move?
- How can one predict an object's continued motion, changes in motion, or stability?
- What underlying forces explain the variety of interactions observed?
- How do scientists answer questions? How do engineers solve problems?

Understandings- Students will Understand that…

- Balanced and unbalanced forces have effects on the motion of the object.
- There is a cause and effect relationship of electric or magnetic interactions between two objects not in contact with each other.

Key Knowledge- Students will Know….

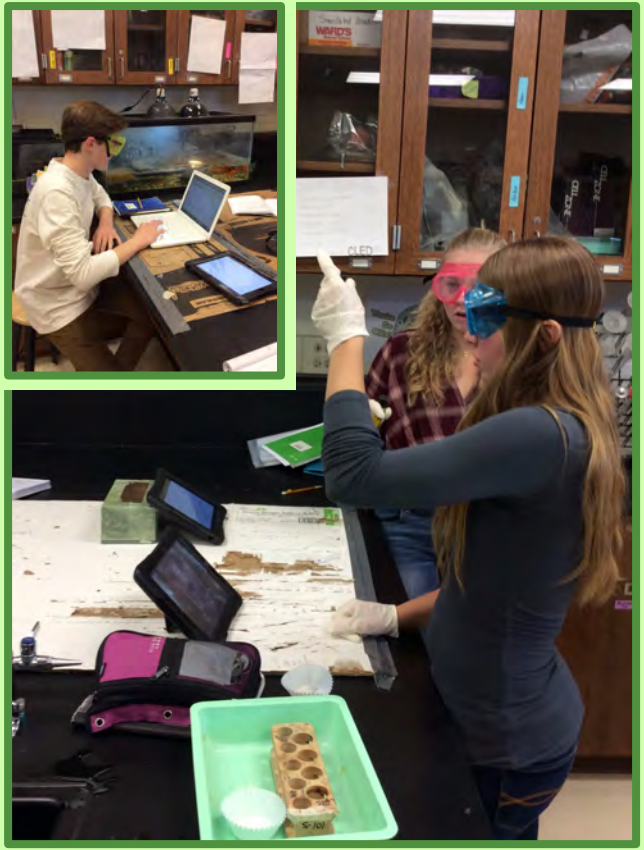
- Each force acts on one particular object and has both strength and a direction.
- **Objects in contact exert forces on each other. Some forces act even when the objects are not in contact.**
- The patterns of an object's motion in various situations can be observed and measured.

Essential Skills- With prompting and support, students will begin to…(Do)

- Plan and carry out investigations
- Ask questions and define problems.

Grade 8
Water Rockets

Grade 8, Forces and Interactions



Essential Questions

- What are the relationships between forces and motion?
- What are the variables that affect motion and force?
- How does Newton's third law describe the motion of a moving object?
- How can you build a water rocket that will remain in flight for the longest time period?

Understandings - Students will Understand that…

- Models can be used to represent systems and their interactions -- such as inputs, processes and outputs -- and energy and matter flows within systems.

Grade 8, Forces and Interactions

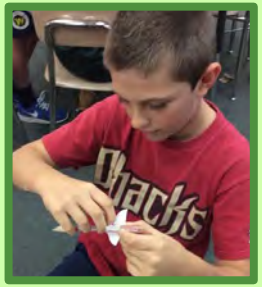
Key Knowledge -- Students Will Know

- **For any pair of interacting objects, the force exerted by the first object on the second object is equal in strength to the force that the second object exerts on the first, but in the opposite direction.**
- The more precisely a design task's criteria and constraints can be defined, the more likely it is that the designed solutions will be successful. Specification of constraints includes consideration of scientific principles and other relevant knowledge that is likely to limit possible solutions.
- A solution needs to be tested, and then modified on the basis of the test results in order to improve it.
- Sometimes part of different solutions can be combined to create a solution that is better than any of its predecessors.
- The iterative process of testing the most promising solutions and modifying what is proposed on the basis of the test results leads to greater refinement and ultimately to an optimal solution.

Essential Skills- With prompting and support, students will begin to…(Do)

- Students will apply Newton's Third Law of Motion to design, build, and test a water rocket using the Engineering Design Process (EDP).

Phase-In Implementation Plan



2016-2017

- First half of NGSS aligned units tried and reflected upon
- Three dimensional learning and teaching developed

2017-2018

- First half of NGSS aligned units in place and functioning
- Second half of NGSS aligned units tried and reflected upon
- Three dimensional learning and teaching developed and practiced

2018-2019

- All units in place
- Three dimensional learning and teaching practiced and mastered

Science Committee 2015-2016:

Teachers:

Kim Barbaro

Emily Berna

Dave Cooper

Dayle Ellis

Megan Florkowski

Marla Goldberg

Andrea Graf

Ted Graf

Melissa Hilty

Laura Lieberman

Emily Keeter

John Pappas

Missy Parks

Eva Petersen

Byrd Rhyne

Jesse Semeyn

Elizabeth Skydell

Katie Ward

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Maureen Miller

Betty Weir

Science Facilitators:

Jean Bierner

Jennifer Parkinson

Irene Lo


Q & A