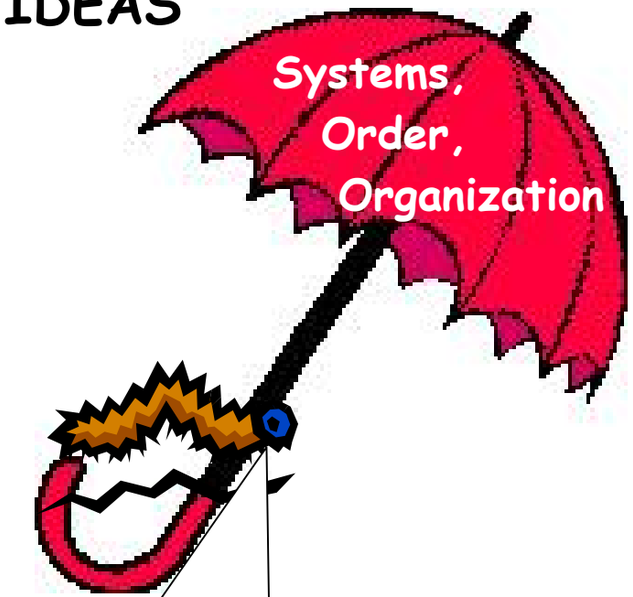
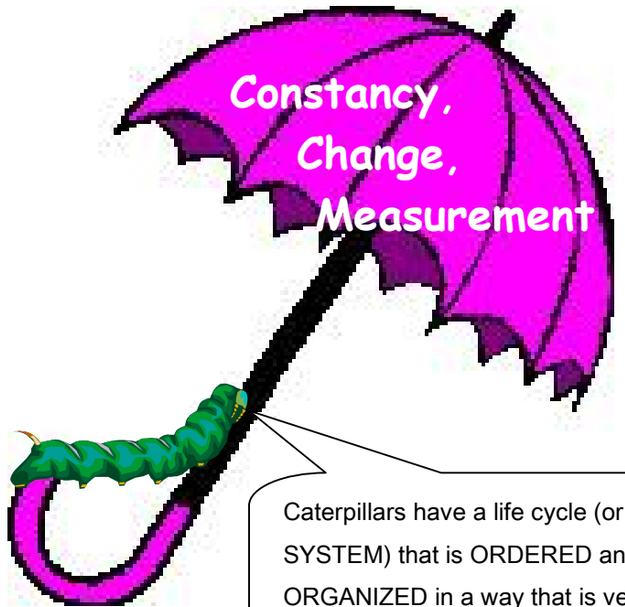
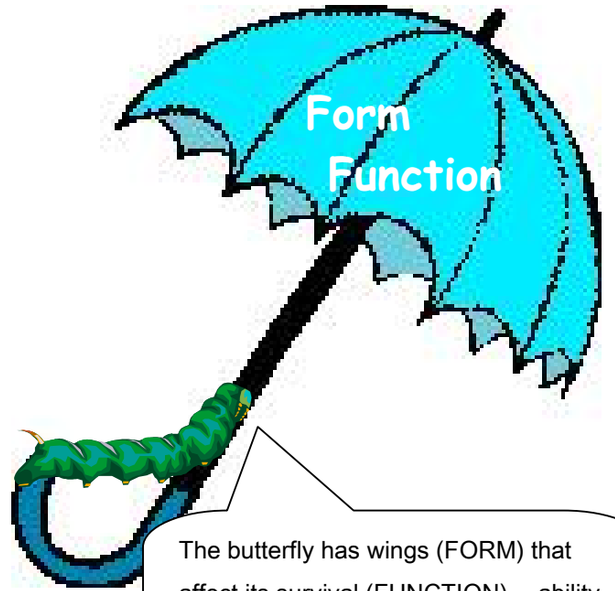
BIG IDEAS



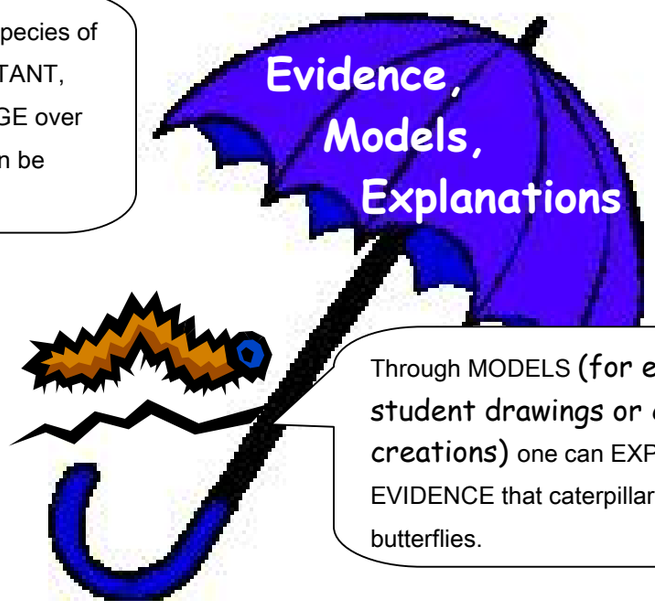
Characteristics of THIS species of caterpillar remain CONSTANT, the caterpillar will CHANGE over time, and that change can be MEASURED.



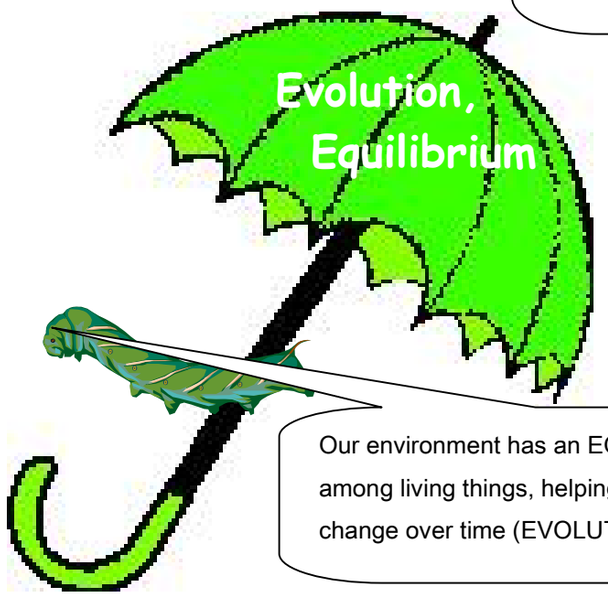
Caterpillars have a life cycle (or SYSTEM) that is ORDERED and ORGANIZED in a way that is very predictable.



The butterfly has wings (FORM) that affect its survival (FUNCTION) --ability to fly from plant to plant to find food or to escape predators.



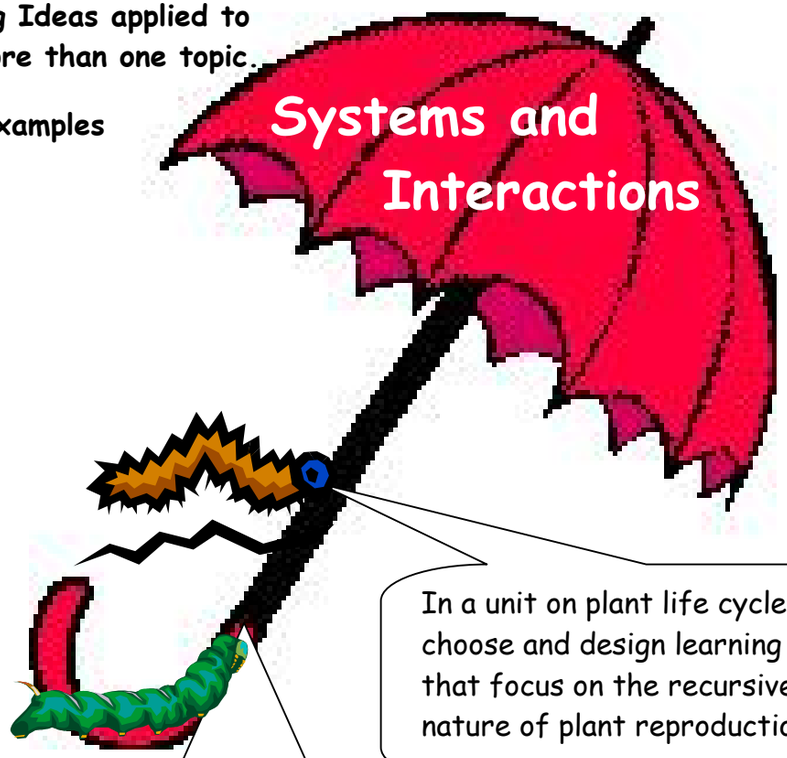
Through MODELS (for example student drawings or clay creations) one can EXPLAIN the EVIDENCE that caterpillars change into butterflies.



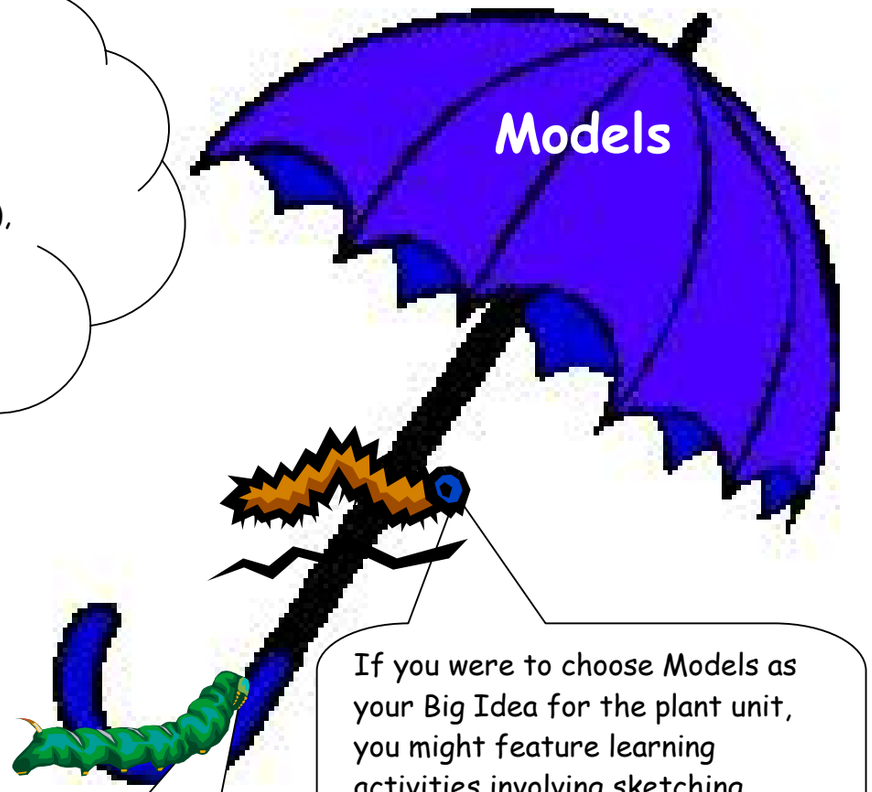
Our environment has an EQUILIBIUM or balance among living things, helping them to survive and change over time (EVOLUTION).

Big Ideas applied to more than one topic.

Examples



Big Ideas in Science are unifying concepts that cross the discrete disciplines of Science (Life, Earth, Physical), and are, in my opinion, best used as a lens onto specific Science content.

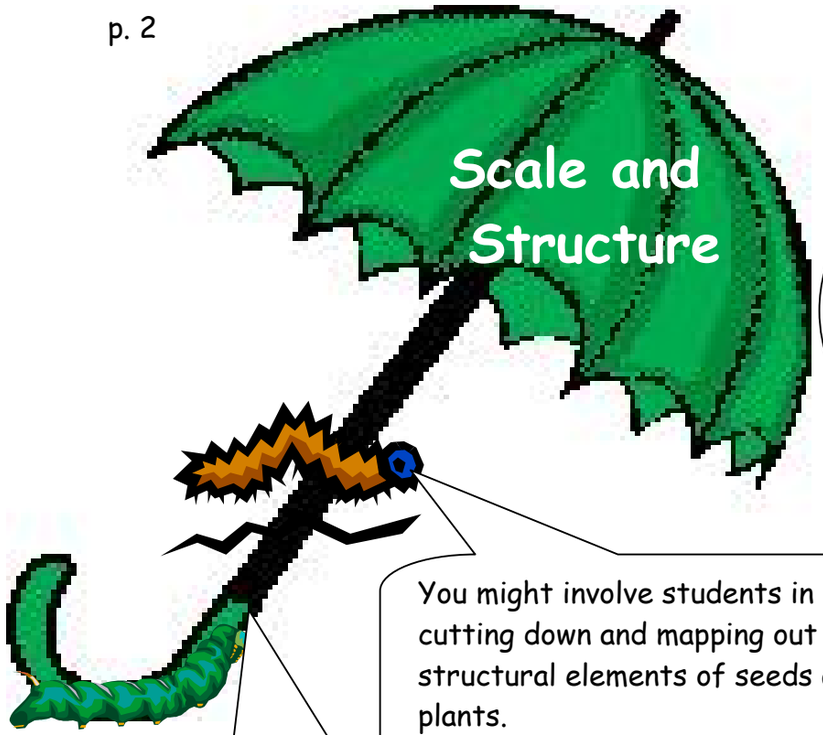


In a unit on plant life cycles: you might choose and design learning activities that focus on the recursive, systematic nature of plant reproduction.

If students study the Solar System in a different unit, what they have learned about Systems and Interactions will allow them to better understand both the variety of systems at play within the Solar System as well as the way in which the planetary bodies which make up the Solar System act and interact with one another.

If you were to choose Models as your Big Idea for the plant unit, you might feature learning activities involving sketching, diagramming, and creating models of, for example, germinating.

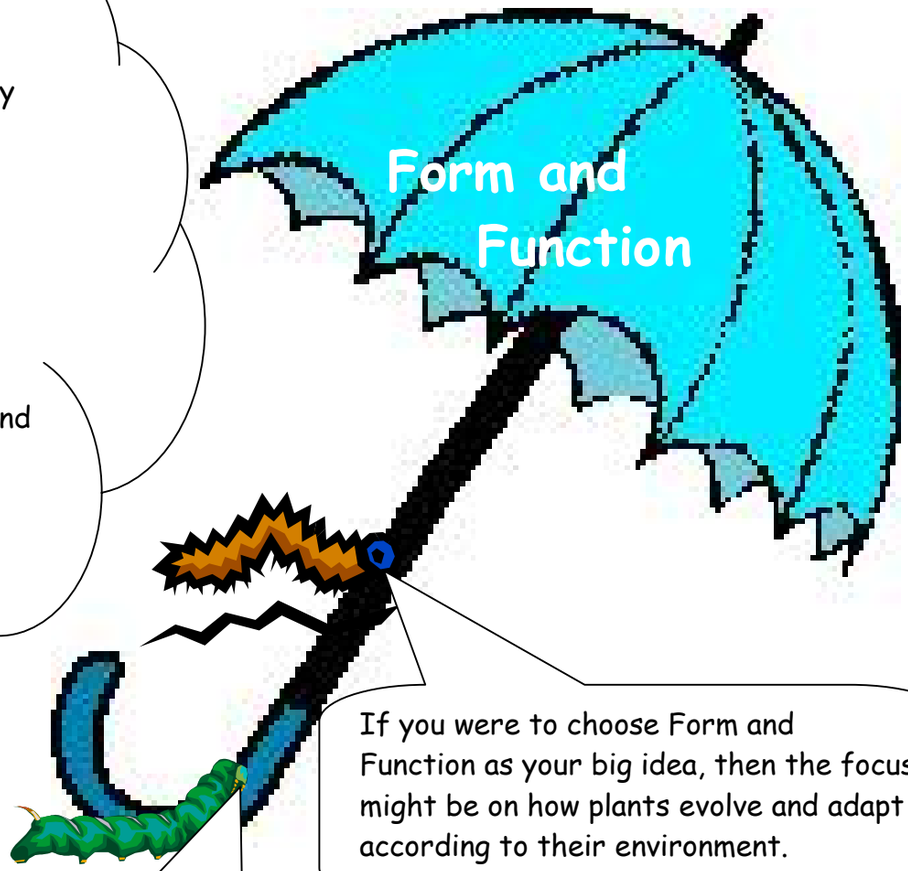
Later, if they study electricity and magnetism in a different unit, what they have learned about Models will help them understand why the use of models allows us to study natural phenomena such as electricity in a controlled environment.



I think by focusing on a relatively defined chunk of content knowledge (e.g. the plant life cycle), students have a greater opportunity to Internalize the notion that science is both deep (in its specific content area knowledge) as well as broad (in terms of the inquiry processes and Unifying Big Ideas which can be applied to any content area of Science).

You might involve students in cutting down and mapping out the structural elements of seeds and plants.

Later, if they study geology in a different unit, what they have learned about Scale and Structure can then be applied and expanded as they learn how structures are created and changed by the geological change processes.



If you were to choose Form and Function as your big idea, then the focus might be on how plants evolve and adapt according to their environment.

Later, if they study simple machines in a different unit, what they have learned about Form and Function helps them to understand both how simple machines work and how they are important.

BIG IDEAS

The example with the umbrellas is how ONE topic might be approached using each Big Idea.

There are "Unifying Concepts (or Big Ideas) that carry across all areas of Science. You should be able to substitute ANY Science topic for the caterpillar. The important thing to remember about Big Ideas/Unifying Concepts is that no matter what grade level you teach, PreK through grade 12 and beyond, these 5 Big Ideas will be the foundation for everything your students learn in Science. They "unify" all Science teachings. I guess what I'm trying to say is that individual facts are not as important as the over-arching concept for kids to understand. We cannot teach EVERY Science topic...it's impossible. But, if we take a topic and teach the Unifying Concept, kids will, over time understand the big picture.

The 5 BIG IDEAS in the National Science Education Standards (UNIFYING CONCEPTS AND PROCESSES) found in the getting started section of your portfolio instructions are:

1. Systems, order, organization
2. Evidence, models, explanations
3. Constancy, change, measurement
4. Evolution and equilibrium
5. Form and function

Benchmarks for Science Literacy Project 2061, American Association for the Advancement of Science Oxford University Press (New York), 1993
Common Science Themes:

- Systems
- Models
- Constancy and Change
- Scale Science

Framework for California Public Schools: K-12 California Department of Education (Sacramento), 1990
Major Themes of Science:

- Energy
- Evolution
- Patterns of Change
- Scale and Structure
- Stability
- Systems and Interactions

You can use any of these as your big idea.

Some excellent questions to help you think about your Big Idea taken from a posting. I am sorry that I can't give credit because I did not save the poster's name.

BIG IDEAS ARE:

Systems, Order, and Organization

1. What system or systems did you observe during your investigation?
2. What are the parts of each system?
3. Could some parts be removed without changing how the system functions?
4. What parts could not be removed without changing how the system functions?
5. What would happen if different parts were added to the system?

Constancy, Change, and Measurement

1. What did you observe that stayed the same during your investigation?
2. What changed during your investigation?
3. What caused the change?
4. How long did it take for the changes to occur?
5. What could be done to make the changes faster or slower?

Evidence, Models, and Explanation

1. What evidence of properties did you observe during your investigation?
2. What evidence of patterns did you observe during your investigation?
3. How are properties and patterns used in constructing models?
4. Why do we construct models?
5. How are models similar or different from the natural world?

Form and Function:

1. What characteristics help something function? Think in terms of performance, survival, protection, reproduction.
2. How do these characteristics help it function?
3. What changes to the form will make it function differently?
4. How and why do changes occur?
5. What can happen when changes do not occur?

Some advice from Teresa Jones : Instead of thinking about what to do. Think about what you think is important for them to know/learn. Think in science concepts rather than science activities or projects. Here are some sites to check out for ideas.

http://www.ed.gov/pubs/parents/Science/Concepts.html
http://www.sasked.gov.sk.ca/docs/elemsci/scilescb.html
http://www.ncsu.edu/sciencejunction/terminal/imse/lowres/4/elementaryEd.htm

Here are some science sites saved by Sheila Shearer during the process of certifying:

http://www.nsf.gov/pubs/2000/nsf99148/htmstart.htm Inquiry, long, but excellent
http://www.learner.org/channel/workshops/inquiry/
http://hea-www.harvard.edu/ECT/

National Science Content Standards
http://www.nde.state.ne.us/ndestandards/sciencedrft.htm
http://bob.nap.edu/readingroom/books/nses/html/6a.html

Learning Science Through Inquiry
http://www.learner.org/resources/series129.html#
Unifying Concepts and Processes
http://www.nap.edu/readingroom/books/nses/html/6b.html

Sinetag
http://home.earthlink.net/~sinetag/bp/
http://home.earthlink.net/~sinetag/ACPrep/Pages/ASWS.html
http://home.earthlink.net/~sinetag/bp/Pages/bigideas.html

http://www.enc.org/features/focus/archive/bigideas/document.shtm?input=FOC-003471-index

Nebraska Science Standards
http://www.nde.state.ne.us/ndestandards/sciencedrft.htm

California NBPTS help
http://www.gse.uci.edu/nbc/nbweblinkssubjectarea.html

Benchmarks on line
http://www.project2061.org/publications/bsl/online/bolintro.htm

http://www.sciencenetlinks.com/

Science Misconceptions
http://www.learner.org/resources/series129.html#

http://www.mhschool.com/science/2005/student/ejournal.php?language=0&state=0

http://www.techknowassociates.com/links/science.htm

http://www.brainpop.com/
http://www.dcn.davis.ca.us/~explorit/quiz.html

From: Nancy Brown <sinetag

Big Ideas in Science are unifying concepts that cross the discrete disciplines of Science (Life, Earth, Physical), and are, in my opinion, best used as a lens onto specific Science content.

If you are, for example, teaching a unit on plant life cycles, there is specific science content which you want your students to acquire (e.g. how seeds travel, germination, parts of plant, etc.) There are also specific science inquiry skills that you want them to acquire (e.g. observation, data collection, hypothesizing, etc.) The Big Idea(s) on which you choose to focus in this unit provide a lens through which you then frame that science content and provide authentic opportunities for students to practice those inquiry skills. Along with the content, they learn about the fundamental nature of the Big Idea you have chosen. As students become more fluent and well-versed in a given Big Idea, they are better able to apply what they have learned about that Big Idea to a different content area of Science.

Consider, for example, the unit on plant life cycles:

If you were to choose Systems and Interactions as your Big Idea for that unit, for example, you might choose and design learning activities that focus on the recursive, systematic nature of plant reproduction. Later, if students study the Solar System in a different unit, what they have learned about Systems and Interactions will allow them to better understand both the variety of systems at play within the Solar System as well as the way in which the planetary bodies which make up the Solar System act and interact with one another.

If you were to choose Models as your Big Idea for that unit, you might feature learning activities involving sketching, diagramming, and creating models of, for example, germinating seeds. Later, if they study electricity and magnetism in a different unit, what they have learned about Models will help them understand why the use of models allows us to study natural phenomena such as electricity in a controlled environment.

If you were to choose Scale and Structure as your big idea, then you might involve students in cutting down and mapping out the structural elements of seeds and plants. Later, if they study geology in a different unit, what they have learned about Scale and Structure can then be applied and expanded as they learn how structures are created and changed by the geological change processes.

If you were to choose Form and Function as your big idea, then the focus might be on how plants evolve and adapt according to their environment. Later, if they study simple machines in a different unit, what they have learned about Form and Function helps them to understand the both how simple machines work and why they are important.

As teachers, we might want (or feel compelled) to try and teach all of the above and much more about plants, However, in Science, as with most content areas, it is not possible (nor

desirable) for us to teach children 'everything about everything'. It is important to provide students with a discipline-specific framework of concepts and skills toward assisting students in becoming, at least to some extent, auto-didactic.

I think by focusing on a relatively defined chunk of content knowledge (e.g. the plant life cycle), students have a greater opportunity to Internalize the notion that science is both deep (in its specific content area knowledge) as well as broad (in terms of the inquiry processes and Unifying Big Ideas which can be applied to any content area of Science).

Nancy Brown, NBCT (MC/GEN)

"Theme" can mean many different things depending on its use. Once upon a time the entry that candidates in the *old* portfolio did was largely an exercise in interdisciplinarianism (try spelling that drunk). In that entry they used "theme" to mean a global theme in your classroom that united all learning in all disciplines for a period of time. WITHIN that interdisciplinary unit were studies in Language Arts, Social Studies, Math, The Arts, and, our favorite, Science. That Science unit was tied to the other disciplines via the interdisciplinary theme. IT WAS ALSO focused and filtered through one of the big ideas of Science (which are, for wont of a better term, really INTRAdisciplinary themes, since they unite learning within and across the disciplines of Science). In the portfolio entry you are all currently pursuing with such gusto the interdisciplinary focus of the portfolio directions has changed and you are asked to specifically link your instruction between Science and Math, with a big idea of Science once again providing that focus and filter for the science unit. In this case the "theme" is a bit more vague, and I have worked with candidates who have approached it in a variety of ways, including: 1. using an interdisciplinary theme as I described was required in the old days; or 2. using a cute title such as Rainforest Rangers (or whatever) to describe their overall Science/Math unit; or 3. using the Science content area as their theme (e.g. Life Cycles). So long as the connection between Science and Math is strong, and so long as you have chosen a big idea of Science and are teaching it via your Science/Math unit, I think you will fare well. Just remember that the theme is about connecting your Science to other disciplines, even if it's "just" Math. The Big Idea is your Science lens or filter. It dictates HOW you will be teaching Life Cycles or Geology or whatever. And no, there is no right Big Idea for Life Cycles or Magnets or Force and Motion. YOU CHOOSE the Big Idea. The Big Idea focuses the learning. Do you want to students to use your Life Cycles unit (part of your ongoing theme of Basic Needs, for example) to illustrate the nature of Change, Constancy, and Measurement in Science? Or would you rather use it to illustrate the nature of Systems, Order, and Organization? You choose.

Nancy Brown, NBCT (MC/GEN)

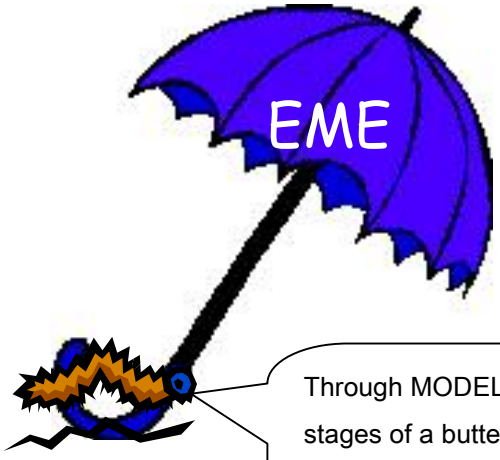
All science content has aspects that are developmentally appropriate for a given age. As for magnets, as an example, the K-3 Physical Science section of the California Science Framework (1991) states the following as developmentally-appropriate content: "Magnets attract and repel one another and attract common materials made from iron or steel. Magnets can attract steel paper clips at a distance, and this effect can be transmitted through a series of several clips in contact with one another. Magnets do not attract common materials other than iron and steel. [Systems and Interactions]... Magnetism can be used to separate materials containing iron from those that do not. Permanent magnets are frequently used to hold notes and messages to vertical metal surfaces (refrigerator doors, for example). [Systems and Interactions]" Just FYI.
Nancy Brown, NBCT (MC/GEN)

BIG IDEAS

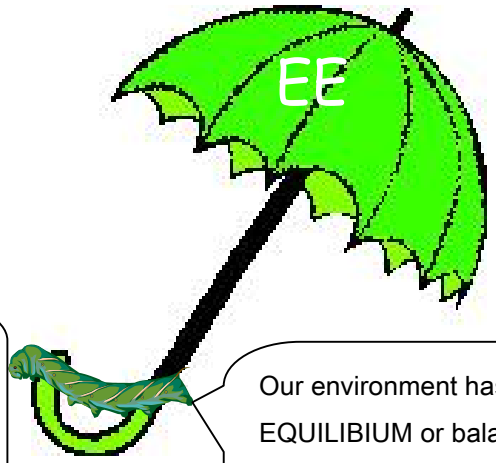
Characteristics of THIS species of caterpillar remain CONSTANT, the caterpillar will CHANGE over time, and that change can be MEASURED.

Caterpillars have a life cycle (or SYSTEM) that is ORDERED and ORGANIZED in a way that is very predictable.

The butterfly has wings (FORM) that affect its survival (FUNCTION) --ability to fly from plant to plant to find food or to escape predators.

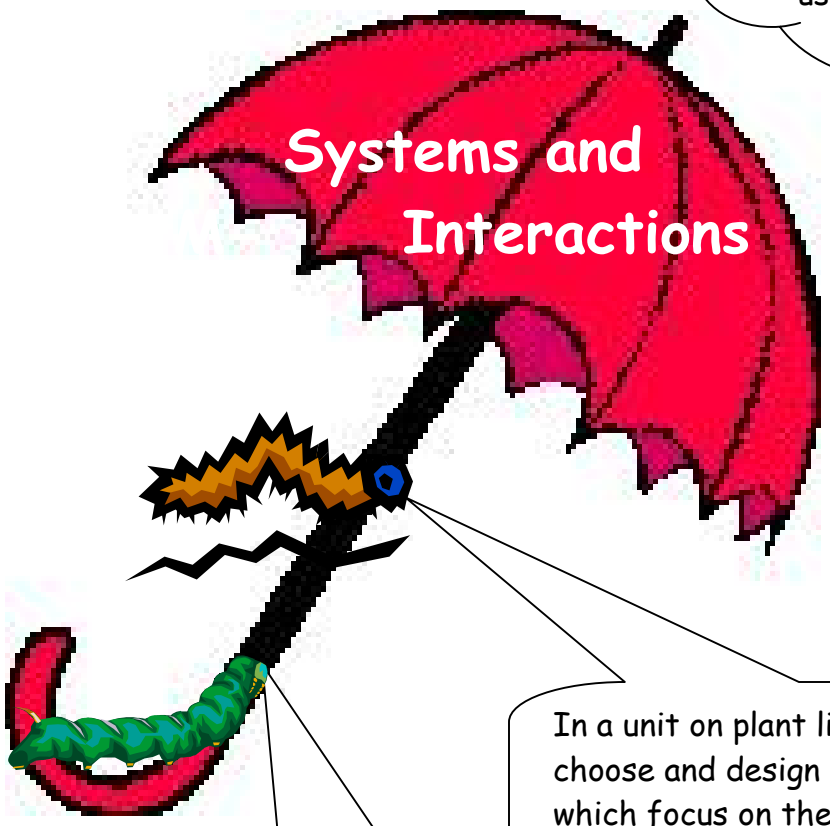


Through MODELS (those plastic stages of a butterfly kit) one can EXPLAIN the EVIDENCE that caterpillars change into butterflies.



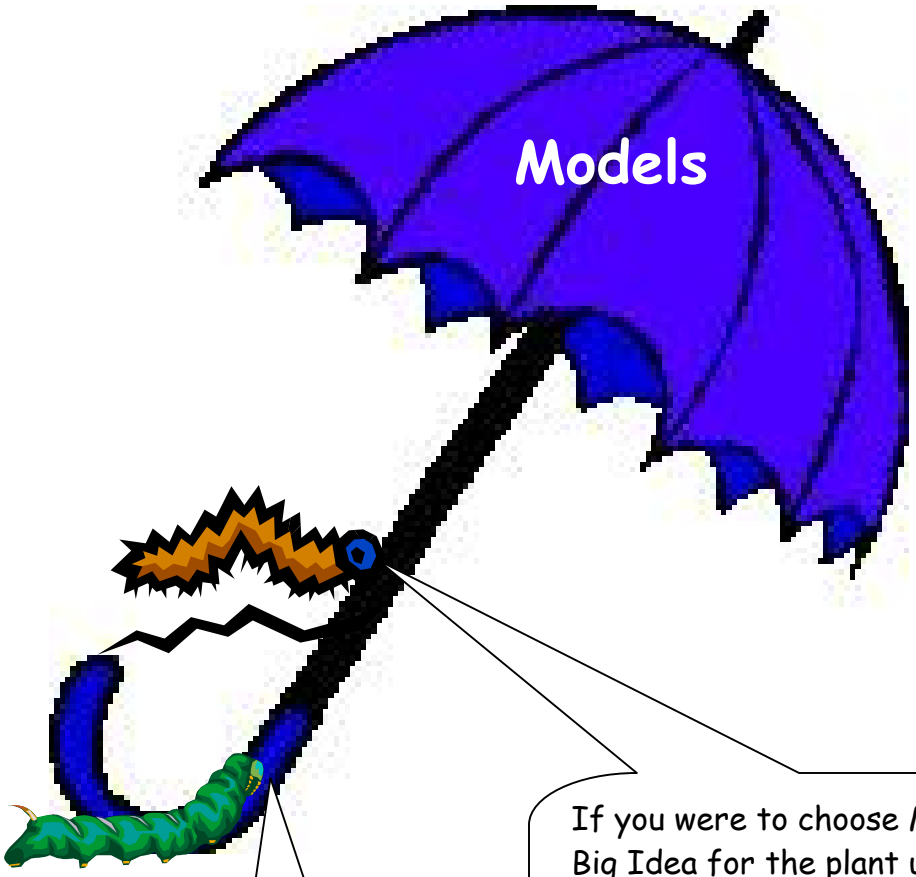
Our environment has an EQUILIBIUM or balance among living things, helping them to survive and change over time (EVOLUTION).

Big Ideas in Science are unifying concepts which cross the discrete disciplines of Science (Life, Earth, Physical), and are, in my opinion, best used as a lens onto specific



In a unit on plant life cycles: you might choose and design learning activities which focus on the recursive, systematic nature of plant reproduction

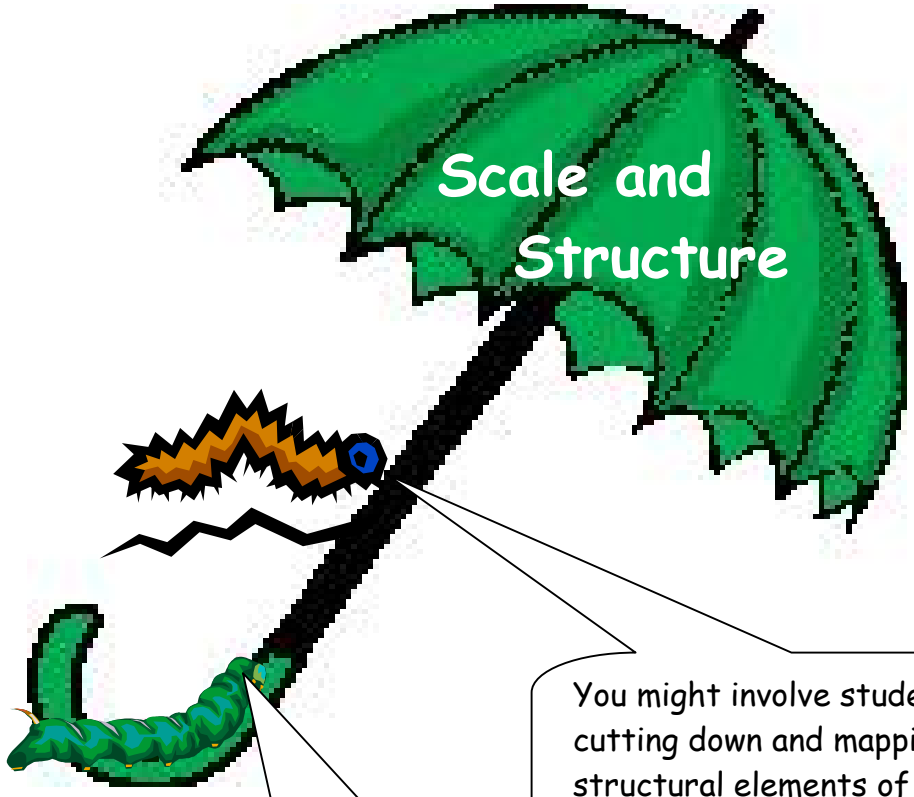
If students study the Solar System in a different unit, what they have learned about Systems and Interactions will allow them to better understand both the variety of systems at play within the Solar System as well as the way in which the planetary bodies which make up the Solar System act and interact with one another.



If you were to choose Models as your Big Idea for the plant unit, you might feature learning activities involving sketching, diagramming, and creating models of, for example, germinating seeds.

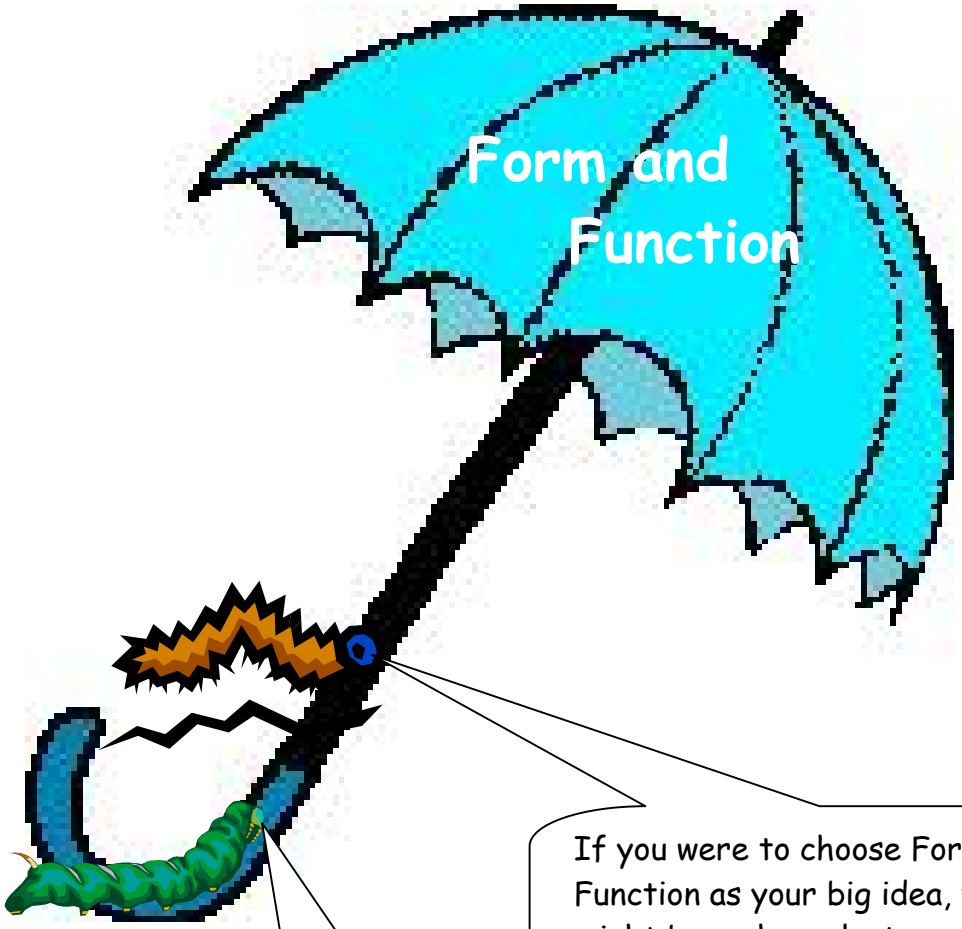
Later, if they study electricity and magnetism in a different unit, what they have learned about Models will help them understand why the use of models allows us to study natural phenomena such as electricity in a controlled environment.

I think by focusing on a relatively defined chunk of content knowledge (e.g. the plant life cycle), students have a greater opportunity to Internalize the notion that science is both deep (in its specific content area knowledge) as well as broad (in terms of the inquiry processes and Unifying Big Ideas which can be applied to any content area of Science).



You might involve students in cutting down and mapping out the structural elements of seeds and plants.

Later, if they study geology in a different unit, what they have learned about Scale and Structure can then be applied and expanded as they learn how structures are created and changed by the geological change processes.



If you were to choose Form and Function as your big idea, then the focus might be on how plants evolve and adapt according to their environment.

Later, if they study simple machines in a different unit, what they have learned about Form and Function helps them to understand both how simple machines work and how they are important.