Instructional Shifts...

Some of the events in this video should not be attempted in your classroom.

What students should be able to do with content on the NAEP

• The following broadly organized science principles illustrate how well students can use science knowledge through reasoning:
  • Identifying Science Principles
  • Using Science Principles
  • Using Scientific Inquiry
  • Using Technological Design

Identifying Science Principles

• Tests students’ ability to recognize, recall, define, relate, and represent basic science principles specified in the Physical Science, Life Science, and Earth and Space Sciences content statements.
Identifying Science Principles

- Describe, measure, or classify observations (e.g., describe the position and motion of objects; measure temperature; classify relationships between organisms as being predator/prey, parasite/host, producer/consumer).
- State or recognize correct science principles (e.g., mass is conserved when substances undergo changes of state; all organisms are composed of cells; the atmosphere is a mixture of nitrogen, oxygen, and trace gases that include water vapor).
- Demonstrate relationships among closely related science principles (e.g., connect statements of Newton's three laws of motion, relate energy transfer with the water cycle).
- Demonstrate relationships among different representations of principles (e.g., verbal, symbolic, diagrammatic) and data patterns (e.g., tables, equations, graphs).

Illustrative Item

The Earth's Moon is
A. always much closer to the Sun than it is to the Earth.
B. always much closer to the Earth than it is to the Sun.
C. about the same distance from the Sun as it is from the Earth.
D. sometimes closer to the Sun than it is to the Earth and sometimes closer to the Earth than it is to the Sun.

Key: B

Using Science Principles

- Both scientists and informed citizens can use patterns in observations and theoretical models to predict and explain observations that they make now or that they will make in the future.
- The practices assessed in this category draw primarily on schematic knowledge (or “knowing why”) in addition to declarative knowledge.

Using Science Principles

- Explain observations of phenomena (using science principles from the content statements).
- Predict observations of phenomena (using science principles from the content statements, including quantitative predictions based on science principles that specify quantitative relationships among variables).
- Suggest examples of observations that illustrate a science principle (e.g., identify examples where the net force on an object is zero; provide examples of observations explained by the movement of tectonic plates; given partial DNA sequences of organisms, identify likely sequences of close relatives).
- Propose, analyze, and/or evaluate alternative explanations or predictions.
Sometimes these two are combined...

Using Scientific Inquiry

- Scientific inquiry involves the collection of relevant data, the use of logical reasoning, and the application of imagination and evidence in devising hypotheses to explain patterns in data.
- These critical thinking and systems thinking skills are the basis for exercising sound reasoning, making complex choices, and understanding the interconnections among systems.
- Scientific inquiry is more complex than simply making, summarizing, and explaining observations, and it is more flexible than the rigid set of steps often referred to as the "scientific method."

Using Scientific Inquiry

- Design or critique aspects of scientific investigations (e.g., involvement of control groups, adequacy of sample).
- Conduct scientific investigations using appropriate tools and techniques (e.g., selecting an instrument that measures the desired quantity—length, volume, weight, time interval, temperature—with the appropriate level of precision).
- Identify patterns in data and/or relate patterns in data to theoretical models.
- Use empirical evidence to validate or criticize conclusions about explanations and predictions (e.g., check to see that the premises of the argument are explicit, notice when the conclusions do not follow logically from the evidence presented).
Using Technological Design

• Technological design refers to the process that underlies the development of all technologies, from paper clips to space stations.
• Using technological design describes the systematic process of applying science knowledge and skills to solve problems in a real-world context.

Using Technological Design

• Propose or critique solutions to problems, given criteria and scientific constraints.
• Identify scientific tradeoffs in design decisions and choose among alternative solutions.
• Apply science principles or data to anticipate effects of technological design decisions.
Illustrative Item:

Occasionally, a tree will die, a forest, leaving down branches and prun-ning wildlife out of their forest homes. However, the forest will grow back. Eventually, through the process of forest succession, new trees, shrubs, grasses, and plants become established. Small animals and wildlife begin to grow and animals make their homes.

Forest Succession

Time

Each time, a large animal begins to grow. The forest returns to a lush habitat for the wildlife found in the dead forest.

Forest Wildlife

<table>
<thead>
<tr>
<th>Ground dwelling</th>
<th>Worms, buried</th>
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<tbody>
<tr>
<td>Election and emigration</td>
<td>American toads, wood frogs, snakes, various tree trunks</td>
</tr>
<tr>
<td>Small rodents</td>
<td>Spiders, chipmunks</td>
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<tr>
<td>Medium to large mammals</td>
<td>Operty, raccoon, bobcat, bobcat, birds</td>
</tr>
<tr>
<td>Insects</td>
<td>Bumble bees, wasps, butterflies, pollinated plants, beetles</td>
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</tbody>
</table>

A power company now part of a forest that is destroyed by a fire. The forest could take decades to rebuild on its own. The company's department of environmental studies suggests planting new trees to help the forest rebuild.

Using the information in the scenario:

- Explain how planting trees could benefit the natural ecosystem.
- Explain how planting trees could harm the natural ecosystem.

(See appendix C for item scoring guides.)

2015 Alabama Course of Study: Science
Learning Progressions

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<th>Year 3</th>
<th>Year 4</th>
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2015 Alabama Course of Study:
Science and NAEP Standards Correlation

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(DOC 40)
Items to Consider

- **Scheduling** – ALL students in K-12 should receive science instruction on a daily basis.
- **Rigor** – Classroom instruction should follow the rigorous 3-Dimensional requirements outlined by the 2015 Alabama Course of Study: Science.