Welcome

NSTA Topic Study:
Assessing Three-Dimensional Learning:
Using the Critical Aspects of
Sensemaking to Design Assessments
Meaningful to Both Teachers and Students

Web Seminar 3
October 25, 2022
7:00 PM ET
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NSTA does not allow promotion of other products in our chats during web seminars. We ask that attendees keep the conversation on topic, use positive language and remain courteous of others throughout the event, and allow everyone time to participate in the chat.
Meet Today’s Presenters

Holly Hereau
NSTA Instructional Materials and Professional Learning Specialist
hhereau@nsta.org

Kate Soriano
NSTA Standards Implementation Specialist
ksoriano@nsta.org
@katesor1027
Fall 2022 Topic Study: Assessing Three-Dimensional Learning Collection

Resources in “Fall 2022 Topic Study: Assessing Three-Dimensional Learning” Collection

1. A Framework for K-12 Science Education (pdf)
   - Resource Type: Web Page

2. NSTA Quick-Reference Guide to the NGSS
   - Please Note: This is a book - we refer to as the "purple book" - with copyrights, you are not permitted to share or post elsewhere.
   - Resource Type: Web Page

https://my.nsta.org/collection/LLRd09oqGe0_E
Learning Community Norms for Discussion

- We come prepared to work toward a common goal.
- We share our own thinking to help us all learn.
- We use evidence to support our ideas, ask for evidence from others, and suggest ways to get additional evidence.
- We are open to changing our minds.
1. Open the participant window

2. Hover the cursor over your name. Select *More* and choose *Rename*.

3. Rename yourself using the following scheme. You may only choose one grade band for *today*.

<table>
<thead>
<tr>
<th>Grade</th>
<th>Naming Scheme</th>
</tr>
</thead>
<tbody>
<tr>
<td>K-2</td>
<td>EE_Name</td>
</tr>
<tr>
<td>3-5</td>
<td>UE_Name</td>
</tr>
<tr>
<td>6-8</td>
<td>MS_Name</td>
</tr>
<tr>
<td>9-12</td>
<td>HS_Name</td>
</tr>
</tbody>
</table>
Meet Our Learning Community

What is your favorite activity this time of year?
Learning Targets

- Gain experience evaluating and revising assessment tasks for sensemaking and accessibility to the task.
- Recognize characteristics of questions that elicit student responses for targeted elements of the three dimensions.
- Identify multiple opportunities within a lesson, lesson set and unit to formatively assess students’ understanding (and skill) of the targeted elements of the three dimensions.
- Be able to use the experience, tools, and resources to create assessment tasks and/or leverage existing tasks to formatively assess student understanding (knowledge and skills).
· Students are figuring something out (phenomenon)

· Students need to apply science ideas — grade-appropriate element(s) of disciplinary core idea(s) — and crosscutting concepts to figure something out

· Students are actively trying to figure something out (engaged in grade-appropriate elements of science and engineering practices)

· Students have access to the task (equity)
Design for Sensemaking: Assessment Task Must-Have List

- Students are figuring something out (phenomenon)
- Students need to apply science ideas — grade-appropriate element(s) of disciplinary core idea(s) — and crosscutting concepts to figure something out
- Students are actively trying to figure something out (engaged in grade-appropriate elements of science and engineering practices)
- Students have access to the task (equity)
Unit 7.3: Metabolic Reactions

Phenomenon: Bears survive an extended period of low activity (hibernation) without eating, drinking or eliminating waste.

Purpose: Use as summative assessment at end of the module/unit.
# Evaluating an Assessment Task Through the Lens of Disciplinary Core Ideas

<table>
<thead>
<tr>
<th>What to look for when evaluating a task through the lens of DCI(s):</th>
<th>Evidence from the Task</th>
<th>Meets Criterion (yes/no)</th>
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<td>Grade-appropriate DCI elements: What DCI element(s) is/are claimed by the task?</td>
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**Resource #23**

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**Resource #24**

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**Resource #26**
Assessing Disciplinary Core Ideas (DCIs/Science Ideas)

Modified Brown Bear Hibernation Task

Each winter brown bears in North America spend an average of 5 months inside of dens in a low activity state known as hibernation. During this time, they experience drastic body changes. They also do not eat, drink, defecate (poop), or urinate (pee) during this time. It is a wonder that the bears can survive each winter in this state without performing these essential body functions.

[Images of bears]

Above: This bear, 409, nicknamed “Baaddlaaax” from Katmai National Park in Alaska. The first picture was taken on June 29, and the second picture was taken on September 30.

<table>
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<tr>
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<th>Fall – October Going into Hibernation</th>
<th>Winter During Hibernation</th>
<th>March – May Coming out of Hibernation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Body Temperature</td>
<td>100°F-107°F</td>
<td>68°F</td>
<td>100°F-107°F</td>
</tr>
<tr>
<td>Breathing Rate &amp; Heart Rate</td>
<td>Normal</td>
<td>Very Slow</td>
<td>Normal</td>
</tr>
<tr>
<td>Heart Rate</td>
<td>40-50 beats per min</td>
<td>6-19 beats per min</td>
<td>40-50 beats per min</td>
</tr>
<tr>
<td>Weight</td>
<td>about 450 pounds</td>
<td>Not measured</td>
<td>about 360 pounds</td>
</tr>
<tr>
<td>Body Fat Percentage Similar to DEER ace:</td>
<td>30%</td>
<td>Not measured</td>
<td>13%</td>
</tr>
</tbody>
</table>

Evaluating an Assessment Task Through the Lens of Disciplinary Core Ideas

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<td></td>
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Resource #7

Resource #25
## Assessing Disciplinary Core Ideas (DCIs/Science Ideas)

### Evaluating an Assessment Task Through the Lens of Disciplinary Core Ideas

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### LS1.C: Organization for Matter and Energy Flow in Organisms (p 69)

<table>
<thead>
<tr>
<th>Grades K–2</th>
<th>Grades 3–5</th>
<th>Grades 6–8</th>
<th>Grades 9–12</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>All animals need food in order to live and grow. They obtain their food from plants or from other animals. Plants need water and light to live and grow.</em> (K-LS1-1)</td>
<td><em>Food provides animals with the materials they need for body repair and growth and the energy they need to maintain body warmth and for motion.</em> (secondary to 5-PS3-1)</td>
<td><em>Plants, algae (including phytoplankton), and many microorganisms use the energy from light to make sugars (food) from carbon dioxide from the atmosphere and water through the process of photosynthesis, which also releases oxygen. These sugars can be used immediately or stored for growth or later use.</em> (MS-LS1-6)</td>
<td><em>The process of photosynthesis converts light energy to stored chemical energy by converting carbon dioxide plus water into sugars plus released oxygen.</em> (HS-LS1-5)</td>
</tr>
<tr>
<td><em>Plants acquire their material for growth chiefly from air and water.</em> (5-LS1-1)</td>
<td></td>
<td><em>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.</em> (MS-LS1-7)</td>
<td><em>The sugar molecules thus formed contain carbon, hydrogen, and oxygen; their hydrocarbon backbones are used to make amino acids and other carbon-based molecules that can be assembled into larger molecules (such as proteins or DNA), used for example to form new cells.</em> (HS-LS1-6)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td><em>As matter and energy flow through different organizational levels of living systems, chemical elements are recombined in different ways to form different products.</em> (HS-LS1-6),(HS-LS1-7)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td><em>As a result of these chemical reactions, energy is transferred from one system of interacting molecules to another and released energy to the surrounding environment and to maintain body temperature. Cellular respiration is a chemical process whereby the bonds of food molecules and oxygen molecules are broken and new compounds are formed that can transport energy to muscles.</em> (HS-LS1-7)</td>
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</tbody>
</table>

Please do not share in chat window until invited to do so.

**K–8 Participants:** Share a specific example of a science idea in the targeted 6-8 element that builds on a science idea in the K-2 or 3-5 grade band or is first introduced in the 6-8 grade band.

**9-12 Participants:** Share a specific example of a science idea in the 9-12 grade band that builds on the targeted 6-8 element or a related science idea that is first introduced in the 9-12 grade band.
Bear Task (Q1) Targeted Element of LS1.C Organization for Matter and Energy Flow in Organisms

DCI: Within individual organisms, food moves through a series of chemical reactions in which it is broken down and rearranged to form new molecules, support growth, or release energy.

SEP: Apply scientific ideas, principles, and/or evidence to construct, revise and/or use an explanation for real-world phenomena, examples or events.

CCC: Patterns in rates of change and other numerical relationships can provide information about natural and human-designed systems.

Evidence of DCIs: How does the task require students to demonstrate the claimed element(s) in use?

Making thinking visible: Does the task require students to make their thinking visible?

Scientific Accuracy: Does the task use information that is scientifically accurate?

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<tbody>
<tr>
<td>Body Temperature</td>
<td>100°-101°F</td>
<td>about 88° degrees F</td>
<td>100°-101°F</td>
</tr>
<tr>
<td>Breathing Rate &amp; Heart Rate One way to measure energy used</td>
<td>Normal</td>
<td>Very Slow</td>
<td>Normal</td>
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<tr>
<td>Heart Rate</td>
<td>40-50 beats per min</td>
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<tr>
<td>Weight</td>
<td>about 450 pounds</td>
<td>Not measured</td>
<td>about 250 pounds</td>
</tr>
<tr>
<td>Body Fat Percentage Similar to DEXA scans—one way to measure how much fat the bear has stored.</td>
<td>30%</td>
<td>Not measured</td>
<td>15%</td>
</tr>
</tbody>
</table>

Use what you’ve learned from our investigations related to McKenna’s case and the data above to explain this phenomenon.

1. During hibernation, bears do not eat for 5 to 6 months in a row. How can the bear stay alive without eating for this long? Use patterns in the data table and science ideas developed throughout this unit to support your answer.
Bear Task (Q1) Targeted Element of LS1.C Organization for Matter and Energy Flow in Organisms

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Scientific Accuracy: Does the task use information that is scientifically accurate?

The task cues students to use science ideas to explain how the bear can stay alive without eating for 5 to 6 months.

Use your phenomena.

1. During hibernation, bears do not eat for 5 to 6 months in a row. How can the bear stay alive without eating for this long? Use patterns in the data table and science ideas developed throughout this unit to support your answer.

Data is real or well-crafted. Targeted DCI element accurately accounts for how the bear stays alive during hibernation (mechanism).
DCI: Within individual organisms, food moves through a series of chemical reactions in which it is broken down and rearranged to form new molecules, support growth, or release energy.

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1. During hibernation, bears do not eat for 5 to 6 months in a row. How can the bear stay alive without eating for this long? Use patterns in the data table and science ideas developed throughout this unit to support your answer.
Tasks should explicitly prompt students to make their thinking visible.

Look for evidence of how the task surfaces current understanding:
- Abilities (apply in a new context if appropriate)
- Gaps (partial conception/understanding)
- Problematic ideas (holding on to misconceptions/preconceptions)

Task provides opportunities for students to show they have a deep understanding of the science ideas.
<table>
<thead>
<tr>
<th>Assessments look <strong>less like</strong> asking students to...</th>
<th>Assessments look <strong>more like</strong> asking students to...</th>
</tr>
</thead>
<tbody>
<tr>
<td>Provide just a factually correct or incorrect answer.</td>
<td>Make their thinking—including their evidence-based reasoning—visible through models, explanations, arguments, investigation plans, questions, and/or predictions.</td>
</tr>
</tbody>
</table>
Small Group (Breakout Rooms)

Discuss the following questions with your group

- Why do you think it's important **for students** to have an opportunity to make their thinking visible?

- Why do you think it's important **for teachers** to see students' thinking?

Capture your group’s thinking in your assigned table

https://docs.google.com/document/d/11g3KTyICuYiwLvH_U5pTnb6Uuk-xdQ39gnQa-8mGeq0/edit?usp=sharing

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Use what you've learned from our investigations related to M'Kenna’s case and the data above to explain this phenomenon.

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Evidence of DCIs: How does the task require students to demonstrate the claimed element/s in use?

Making thinking visible: Does the task require students to make their thinking visible?

Scientific Accuracy: Does the task use information scientifically?

Students’ reasoning which data counts as evidence would include:

- Even though the bears are not eating, their cells can still get the energy they need because, during hibernation, bears can use stored fat for energy.
- In order for this energy to be transferred to another system (and used by cells), chemical reactions happen that rearrange the fat molecules and oxygen into carbon dioxide and water.
- Evidence to support this claim includes the decrease in body fat percentage (bears are burning body fat) and decreased weight (probably related to the decrease in body fat).
- The stored fat can sustain them for the entire hibernation because they are sleeping and using very little energy—they don’t use any energy to move around and are just sitting there. Evidence for this is that, during hibernation, all of the processes that the bear requires energy for are working a lot slower, like breathing and heart rate, compared to the fall or spring months. Even their body temperatures are lower compared to other times of the year.

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Above: This is bear 409, nicknamed “Beadnose” from Katmai National Park in Alaska. The first picture was taken on June 29, and the second picture was taken on September 30.
### Assessing Disciplinary Core Ideas (DCIs/Science Ideas)

#### Evaluating an Assessment Task Through the Lens of Disciplinary Core Ideas

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| **Making thinking visible:** Does the task require students to make their thinking visible? | Students’ reasoning which data counts as evidence would include:  
- Even though the bears are not eating, their cells can still get the energy they need because, during hibernation, bears can use stored fat for energy.  
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- Evidence to support this claim includes the decrease in body fat percentage (bears are burning body fat) and decreased weight (probably related to the decrease in body fat).  
- The stored fat can sustain them for the entire hibernation because they are sleeping and using very little energy—they don’t use any energy to move around and are just sitting there. Evidence for this is that, during hibernation, all of the processes that the bear requires energy for are working a lot slower, like breathing and heart rate, compared to the fall or spring months. Even their body temperatures are lower compared to other times of the year. | Yes |
| **Scientific Accuracy:** Does the task use information that is scientifically accurate? | Data is real or well-crafted. Targeted DCI element accurately accounts for how the bear stays alive during hibernation (mechanism). | Yes |
Bear Task (Q1) Evaluated Through the Lenses of the Three Dimensions and Accessibility

DCI: Within individual organisms, food moves through a series of chemical reactions in which it is broken down and rearranged to form new molecules, support growth, or release energy.

SEP: Apply scientific ideas, principles, and/or evidence to construct, revise and/or use an explanation for real-world phenomena, examples or events.

CCC: Patterns in rates of change and other numerical relationships can provide information about natural and human-designed systems.

The question is compelling and relatable.

1. During hibernation, bears do not eat for 5 to 6 months in a row. How can the bear stay alive without eating for this long? Use patterns in the data table and science ideas developed throughout this unit to support your answer.

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</tr>
</thead>
<tbody>
<tr>
<td>Body Temperature</td>
<td>100°F to 101°F</td>
<td>about 86°F</td>
<td>100°F to 101°F</td>
</tr>
<tr>
<td>Breathing Rate &amp; Heart Rate</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
| On our pictures show bears before and hibernation

Students decide what counts as evidence.

Students are provided data and must reason which data count as evidence to explain how the phenomenon occurs.

<table>
<thead>
<tr>
<th>Weight</th>
<th>about 450 pounds</th>
<th>Not measured</th>
<th>about 250 pounds</th>
</tr>
</thead>
<tbody>
<tr>
<td>Body Fat Percentage</td>
<td>30%</td>
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Use what you've learned from our investigations related to M'Kenna's case and the data above to explain this phenomenon.

- Students decide what counts as evidence.
- Students are provided data and must reason which data count as evidence to explain how the phenomenon occurs.
- The question is compelling and relatable.
Design for Sensemaking: Assessment Tasks (Must-Have List)

- Students are figuring something out (phenomenon)
- Students need to apply science ideas — grade-appropriate element(s) of disciplinary core idea(s) — and crosscutting concepts to figure something out
- Students are actively trying to figure something out (engaged in grade-appropriate elements of science and engineering practices)
- Students have access to the task (equity)
**Alone Zone**

- Read **Task Annotation in Science: Sense-Making** (focus on page 1)
Evaluate Three-Dimensional Assessment Tasks - Sensemaking

### Alone Zone

- **K-2 Resource #13**
- **3-5 Resource #15**
- **6-8 Resource #16**
- **9-12 Resource #17**
- **Resource #26**

#### K-2 Resource #13
- Read Task Annotation in Science: Sense-Making (focus on page 1)
- Read the assessment task in your chosen grade-band.
Alone Zone

- Read Task Annotation in Science: Sense-Making (focus on page 1)
- Read the assessment task in your chosen grade-band.
- Does your grade-band task provide students an opportunity for sensemaking?

Be ready to provide specific examples from your assessment task to support your claim.
Does your grade-band task provide students an opportunity for sensemaking?

Small Group (Breakout Rooms)
- Share your claim and task examples that support the claim.
- Reach consensus.
- On your assigned Jamboard frame 2 (+)
  - Post your claim
  - Share your reasoning
  - Cite at least one specific example from the assessment task to connect your reasoning to the claim
<table>
<thead>
<tr>
<th>Grade</th>
<th>Jamboard Link</th>
</tr>
</thead>
<tbody>
<tr>
<td>K-2</td>
<td><a href="https://jamboard.google.com/d/1yl-VY8aK9UvuXihwRSEzqJ7-FTsVYID-J07t1BDzpso/edit?usp=sharing">Link</a></td>
</tr>
<tr>
<td>3-5</td>
<td><a href="https://jamboard.google.com/d/1XycRgl6hEnlN1yzA55tp4VCIsjtUirW8JM5K82kteg/edit?usp=sharing">Link</a></td>
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<tr>
<td>6-8</td>
<td><a href="https://jamboard.google.com/d/1m7TTXsTuqo4EkQ6MnktvNzAb7s-gmhMhm3yJLgZpgY/edit?usp=sharing">Link</a></td>
</tr>
<tr>
<td>9-12</td>
<td><a href="https://jamboard.google.com/d/13Idqu-vOLTn1PgNNVXEbcgA1q8W0Vu7Nu_2ZzeAZS8/edit?usp=sharing">Link</a></td>
</tr>
</tbody>
</table>
Evolution of the Task Annotation Project in Science Resources

Complete recording: https://podbay.fm/p/ngs-navigators-were-phenomenal/e/1559188800

Segment 50:00 - 52:57

Find resources at www.ngsnavigators.com/blog/033

Resource #33
Are you planning to attend **Web Seminar 5** on **Tuesday, November 8, 2022** (7:00 pm ET - 8:30 pm ET)?

A. Yes  
B. No
If you are planning to attend **Web Seminar 5**, what is your primary goal?

A. Share a revised or new assessment task for peer feedback.

B. Provide peer feedback on a shared revised or new assessment task.
Participants Grade Band Assessment Task Support

Fall 2022 Topic Study: Assessing Three-Dimensional Learning Collection

Resources in “Fall 2022 Topic Study: Assessing Three-Dimensional Learning” Collection

- Participant Grade Band Assessment Task Support
- Participant Grade Band Assessment Task Support K-12 Assessment Topic Study Fall 2022
- Slides Topic Study 10_18_2022
- Slides Topic Study 10_31_2022

Phenomenon/Problem Checklists
- Completed Phenomenon/Problem Checklists for All Assessment Tasks
- Q & A Padlet Boards
  - K-2 Assessment Questions
  - 3-5 Assessment Questions
  - 6-8 Assessment Questions
  - 9-12 Assessment Questions

Evaluating an Assessment Task Through the Lenses of SEPs and CCCs
- Evaluating the LITTLE DANCER Assessment Task Through the Lenses of SEPs and CCCs
- Evaluating the OIL SPILL Assessment Task Through the Lenses of SEPs and CCCs
- Evaluating the SEATURTLE Assessment Task Through the Lenses of SEPs and CCCs
- Evaluating the SWALLOWS Assessment Task Through the Lenses of SEPs and CCCs

Annotated Assessment Tasks (Google slides) One question on each assessment task has been evaluated and annotated as of 10/22/22. Evaluation and annotation of the remaining questions on each assessment task will be completed by 10/29/22.

- Little Dancer Task - Grade 2 (Grade Band K-2)
- Oil Spill Task - Grade 3 (Grade Band 3-5)
- Sea Turtle Task - Middle School (Grade Band 6-8)
- Swallows Task - High School (Grade Band 9-12)
Evaluating Assessment Tasks for Equitable Sensemaking

Try evaluating the assessment task in your grade band for equitable sensemaking.

See Participant Grade Band Assessment Task Support (link found in the collection) for support.
Thanks to Today’s Presenters…

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NSTA Standards Implementation Specialist
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Thank You for Participating!

https://www.nsta.org
Post-program Survey – coming up!

We value your feedback!

The post-program survey link will be shared after the recording is stopped at the end of the program.

Your completed survey confirms your attendance which allows us to award you a certificate of participation and attendance.
Collection of Resources

This collection includes the slides (as PDF), handouts and other resources.

Link to the collection:
https://my.nsta.org/collection/LLRd09oqGe0_E
NSTA Opportunities: Web Seminars

**Web Seminar:** NSTA Teacher Awards – Recognizing Excellence Rewarded  
**October 27, 7:00 PM ET**

**Science Update:** NOAA - Observing and Understanding Earth Systems  
**November 3, 7:00 PM ET**

**Web Seminar:** Fall 2022: Developing a Competitive Application for Shell Teaching Awards  
**November 7, 7:00 PM ET**

**Transforming Science Learning:** Leading the Implementation of High-Quality Instructional Materials to Enact Standards: Practical Guidance From the Field  
**November 7, 7:00 PM ET**

**Web Seminar:** Exploration Generation: Sensemaking in Rocketry  
**November 9, 7:00 PM ET**

**Web Seminar:** Case Studies from Connected Science Learning: Developing Critical Consciousness in Middle-School Science Through Engineering for Sustainable Communities  
**November 14, 7:00 PM ET**

[https://www.nsta.org/webseminars](https://www.nsta.org/webseminars)
This concludes today’s program.