**Learning Goals**

- Deconstruct the CER Process
- Provide Equitable Learning Experience
Explaining Science: CER Strategy

**Claim**
Answers a question.

**Evidence**
Scientific data collected through observations and measurements.

**Reasoning**
Why your evidence supports your claim.
Would you play in this water?

<table>
<thead>
<tr>
<th>Specifications</th>
<th>Feedback</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Claim</td>
<td>Answers the Question: Would you play in this water?</td>
<td>4/4</td>
</tr>
<tr>
<td>Evidence</td>
<td>Provide at least three pieces of evidence from your observations of the image</td>
<td>6/6</td>
</tr>
<tr>
<td>Reasoning</td>
<td>How does your evidence point to the conclusion you are making?</td>
<td>6/6</td>
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</table>

Include the terms:

- Environment
- Contamination
- Toxins
Find three pieces of evidence to answer the question, “Would you play in this water?”

**Evidence**

- Observations
  - Qualitative
  - Quantitative
- Stick to the Facts!
  - No opinions

**Claim**

**Reasoning**
Six people wearing yellow suits and green gloves are around the water.
Water is brown.
There is dark brown plant life in the water.
The water is near a Subway.
Some type of barrier is on the water’s surface.
There is a hose/pipe behind the individuals.
There is a large dumpster and a truck in the area.
A golf cart is on the grass.

Feedback + Score

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<td>Provide at least three pieces of evidence from your observations of the image</td>
<td>Excellent evidence, you are very strong here.</td>
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<td>How does your evidence point to the conclusion you are making? Include the terms:</td>
<td></td>
</tr>
<tr>
<td></td>
<td>➔ Environment</td>
<td></td>
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<td></td>
<td>➔ Contamination</td>
<td></td>
</tr>
<tr>
<td></td>
<td>➔ Toxins</td>
<td></td>
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</table>
**Evidence Progression**

Adapted from *NRC Framework, 2012, pg. 73*

- **K-2**
  - Use observations from investigations.

- **3-5**
  - Use observations and measurements.
  - Distinguish between appropriate and inappropriate data.
  - Consider sufficiency of evidence.

- **HS**
  - Use observations and measurements.
  - Distinguish between appropriate and inappropriate data.
  - Consider sufficiency of evidence.

---

**Would you play in this water?**

Adapted from *NRC Framework, 2012, pg. 73*
Evidence

➔ Observations
  ◆ Qualitative
  ◆ Quantitative
➔ Stick to the Facts!
  ◆ No opinions

Claim
➔ Use the evidence to answer the question.

Reasoning

➔ Six people wearing yellow suits and green gloves are around the water.
➔ Water is brown.
➔ There is dark brown plant life in the water.
➔ The water is near a Subway.
➔ Some type of barrier is on the water’s surface.
➔ There is a hose/pipe behind the individuals.
➔ There is a large dumpster and a truck in the area.
➔ A golf cart is on the grass.

Evidence

Claim
I would not play in this water.
Claim: "I would not play in this water."

- Answers a Question
- Solution to a Problem
- End of Exploration

VS.

Hypothesis: "If I played in this water, then I would be exposed toxins."

Feedback + Score

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Claim Progression

Adapted from *NRC Framework, 2012, pg. 73

K-2
Make conclusions from investigations.

3-5
Make conclusions.

MS
Make conclusions.

HS
Make conclusions.

How does your evidence point to the conclusion you are making?

Include the terms:
- Contamination
- Toxins
- Environment
Claim-Evidence-Reasoning: Implementing Strategies for Student Success

Evidence

- Observations
  - Qualitative
  - Quantitative
- Stick to the Facts!
  - No opinions

Reasoning

- Educated Ideas
  - Draw on Experiences
  - Scientific Knowledge

Claim

- Use the evidence to answer the question.

Reasoning Evidence

- Six people wearing yellow suits and green gloves are around the water.
- Water is brown.
- There is dark brown plant life in the water.
- The water is near a Subway.
- Some type of barrier is on the water’s surface.
- There is a hose/pipe behind the individuals.
- There is a large dumpster and a truck in the area.
- A golf cart is on the grass.

- Hazmat suits indicate the clean-up of toxic waste.
- The group is going to pump the contaminated water to remove toxic waste.
- The individuals have placed a barrier in the stream to stop the toxic waste in the water from spreading.
- The dark brown plants may be dead due to the toxins.
- People might be at risk of being exposed to the contaminants in the water.

I would not play in this water.
### Feedback + Score

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</tr>
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<td><strong>Reasoning</strong> How does your evidence point to the conclusion you are making? Include the terms: ➔ Environment ➔ Contamination ➔ Toxins</td>
<td>Great use of the terms contamination and environment. What causes the contamination? What are ways in which the environment will be affected?</td>
<td>4 / 6</td>
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### Reasoning Progression

Adapted from *NRC Framework, 2012, pg. 73*

- **3-5** Provide a simple connection between claim and evidence using the big ideas they have learned in science.
- **MS** Provide a justification for why the evidence supports the claim using scientific principles.
- **HS** Provide a justification for why the evidence supports the claim using scientific principles. Each piece of evidence may have a different justification.
- **Rebuttal** Describe why a counterclaim is not appropriate by critiquing the alternative evidence and reasoning.
<table>
<thead>
<tr>
<th>Grades</th>
<th>Progression of Argumentation Focus</th>
</tr>
</thead>
<tbody>
<tr>
<td>K-2</td>
<td><strong>Claim + Evidence</strong>&lt;br&gt;• Claim – Make conclusions from investigations.&lt;br&gt;• Evidence – Use observations from investigations.</td>
</tr>
<tr>
<td>3-5</td>
<td><strong>Claim + Evidence + Reasoning</strong>&lt;br&gt;• Claim – Make conclusions.&lt;br&gt;• Evidence – Use observations and measurements.&lt;br&gt;• Reasoning – Provide a simple connection between claim and evidence using the big ideas they have learned in science.</td>
</tr>
<tr>
<td>6-8</td>
<td><strong>Claim + Evidence + Reasoning (greater complexity)</strong>&lt;br&gt;• Claim – Make conclusions.&lt;br&gt;• Evidence – Use observations and measurements. Distinguish between appropriate and inappropriate data. Consider sufficiency of evidence.&lt;br&gt;• Reasoning – Provide a justification for why the evidence supports the claim using scientific principles.</td>
</tr>
<tr>
<td>9-12</td>
<td><strong>Claim + Evidence + Reasoning + Rebuttal</strong>&lt;br&gt;• Claim – Make conclusions.&lt;br&gt;• Evidence – Use observations and measurements. Distinguish between appropriate and inappropriate data. Consider sufficiency of evidence.&lt;br&gt;• Reasoning – Provide a justification for why the evidence supports the claim using scientific principles. Each piece of evidence may have a different justification.&lt;br&gt;• <strong>Rebuttal</strong> – Describe why a counterclaim is not appropriate by critiquing the alternative evidence and reasoning.</td>
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Adapted from *NRC Framework, 2012, pg. 73*

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**Support Learning**

- **Model + Examples**
  - Graphic Organizers
  - Chunk Information
  - Anchor Charts
  - Students Lead
**Personalize Learning**

**More Support**  
**Less Support**  
**Exceeds**

### Expectations

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<td>/6</td>
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### Evidence:

<table>
<thead>
<tr>
<th>I see...</th>
<th>I know...</th>
<th>I observe...</th>
</tr>
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### Claim: Would you play in this water? Circle your choice.

- I would play in this water.
- I would not play in this water.

### Reasoning: Choose the choice that best connects the evidence to your claim:

- The yellow suits are helping to protect the workers from the toxic fumes.
- It’s a rainy day and the river is overflowing, so workers are trying to pump the water out of the area.
- Yellow suits mean the workers are protecting themselves from the toxic water. The toxicity and safety gear is to ensure the environment remains clean for the future.

STEMscopes – NSTA Regional Conference, Portland – Heydrick & Shield
### Expectations

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#### Evidence:

1. 
2. 
3. 

#### Reasoning:

**Evidence** | **Reason or idea why this explains your claim** | **Uses the terms:**
--- | --- | ---
| | |  - Contamination
  - Toxins
  - Environment

### Your Explanation:

#### Rebuttal

<table>
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<tr>
<th>Peer 1</th>
<th>Evidence/Refute</th>
<th>Argumentation Points</th>
</tr>
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<tr>
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#### Exceeds

<table>
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<th>Peer 2</th>
<th>Evidence/Refute</th>
<th>Argumentation Points</th>
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Why do we do this?

Asking **students** to demonstrate their **own understanding** of the implications of a scientific idea by developing their **own explanations of phenomena**, whether based on observations they have made or models they have developed, engages them in an **essential part of the process by which conceptual change can occur**.

~ NRC Framework, 2012, p. 68-69

**Thank You**
Please contact us for any assistance!

Kenn Heydrick, EdD
kheydrick@acceleratelearning.com

Stephanie Shield, MEd
sshield@acceleratelearning.com

Shared Resources:
https://bit.ly/2JtEVPb