CLEARING THE CONCLUSION CONFUSION

KIMBERLY ANDERSON, KORTNEY FIELD, MICHELLE NAPIER, JOEY SEGURA

CLEAR CREEK HIGH SCHOOL, CLEAR CREEK ISD
OUR COMMON ISSUE

• **Problem**: Students struggle with coming to a valid conclusion.

• **Solution**: Facilitate a method that helps students draw a valid conclusion.
Claim
Evidence
Reasoning
WHY WE USE CER

• CER is
  – Structured
  – Objective
  – Effective
  – Versatile
QUESTION AND CLAIM

• The claim answers the question posed to your students. It is similar to a conclusion statement.
  – The claim should lead to students providing evidence and reasoning on the concept you want them to know.
  – The question asked should lead students to focus on the concept covered and result in a claim that is the same among all students.

• The claim is usually one sentence in length.
• The claim must be accurate and specific and completely answer the question.

  – Ex: Are dolphin fins and human arms examples of homologous structures?
  – Claim: Dolphin fins and human arms are examples of homologous structures.

  – Ex: What evolutionary evidence is supported by the structure of a dolphin’s fin and a human’s arm?
  – Claim: The dolphin’s fin and a human’s arm are examples of homologous structures.
OUR QUESTION FOR TODAY:

Huey, Dewey, and Louie are 3 brothers. If the following statements are all true, which of them is the youngest?
- Huey is the oldest
- Dewey is the tallest
- Dewey is not the oldest
- Louie’s age is a prime number
- Louie is not the youngest

Claim:
The youngest brother is Dewey.
EVIDENCE

– A body of facts, findings or observations that support a claim.

– Data collected during/after conducting an experiment/study.

– This section of the CER can be the window to measuring a student’s ability to choose and summarize data appropriately.
DATA CAN BE...

- Measurable
- Objective
- Factual
- Unbiased
- Numerical values
- Observations
### Ways to Get Evidence: Tables

#### Does Water pH Affect Tadpoles?

<table>
<thead>
<tr>
<th>pH of Water</th>
<th>Number of Tadpoles</th>
</tr>
</thead>
<tbody>
<tr>
<td>8.0</td>
<td>45</td>
</tr>
<tr>
<td>7.5</td>
<td>69</td>
</tr>
<tr>
<td>7.0</td>
<td>78</td>
</tr>
<tr>
<td>6.5</td>
<td>88</td>
</tr>
<tr>
<td>6.0</td>
<td>43</td>
</tr>
<tr>
<td>5.5</td>
<td>23</td>
</tr>
</tbody>
</table>

#### Disability Status of the Civilian Noninstitutional Population

**Population 5 Years and Over**

<table>
<thead>
<tr>
<th></th>
<th>Both sexes</th>
<th>Male</th>
<th>Female</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total</td>
<td>257,167,527</td>
<td>124,636,825</td>
<td>132,530,702</td>
</tr>
<tr>
<td>With a disability</td>
<td>49,746,248</td>
<td>24,439,531</td>
<td>25,306,717</td>
</tr>
<tr>
<td>Percent with a disability</td>
<td>19.3</td>
<td>19.6</td>
<td>19.1</td>
</tr>
</tbody>
</table>

**Population 5 to 15 Years**

<table>
<thead>
<tr>
<th></th>
<th>Both sexes</th>
<th>Male</th>
<th>Female</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total</td>
<td>45,133,667</td>
<td>23,125,324</td>
<td>22,008,343</td>
</tr>
<tr>
<td>With a disability</td>
<td>2,614,919</td>
<td>1,666,230</td>
<td>948,689</td>
</tr>
<tr>
<td>Percent with a disability</td>
<td>5.8</td>
<td>7.2</td>
<td>4.3</td>
</tr>
<tr>
<td>Sensory</td>
<td>442,894</td>
<td>242,706</td>
<td>200,188</td>
</tr>
<tr>
<td>Physical</td>
<td>455,461</td>
<td>251,852</td>
<td>203,609</td>
</tr>
<tr>
<td>Mental</td>
<td>2,078,502</td>
<td>1,387,393</td>
<td>691,109</td>
</tr>
<tr>
<td>Self-care</td>
<td>419,018</td>
<td>244,824</td>
<td>174,194</td>
</tr>
</tbody>
</table>
WAYS TO GET EVIDENCE: GRAPHS
WAYS TO GET EVIDENCE: OBSERVATIONAL DATA

Given the following Minions who are not from the same species:

<table>
<thead>
<tr>
<th>Minion</th>
<th>Has Goggles</th>
<th>Has Hair</th>
<th>Has 2 eyes</th>
<th>Pointed teeth</th>
<th>Sprout Hair</th>
<th>Long Body</th>
</tr>
</thead>
<tbody>
<tr>
<td>Minion 1</td>
<td>✓</td>
<td></td>
<td></td>
<td>✓</td>
<td></td>
<td>✓</td>
</tr>
<tr>
<td>Minion 2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Minion 3</td>
<td>✓</td>
<td></td>
<td></td>
<td>✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Minion 4</td>
<td>✓</td>
<td></td>
<td>✓</td>
<td></td>
<td></td>
<td>✓</td>
</tr>
<tr>
<td>Minion 5</td>
<td>✓</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Minion 6</td>
<td>✓</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
WAYS TO GET EVIDENCE:
ILLUSTRATIONS
AVOIDING THE “FLUFF”

– A student must choose the best information to support their claim using reasoning and critical thinking.

– There will be evidence that doesn’t support the claim—“Fluff Data”.

– Ex: Describe elephant evolution based on geographical evidence.
  
  • Similar fossils of similar species of a “insert elephant species” have been discovered on different continents at similar depths within the fossil layers.

  • Ancient ancestors of elephant share 99% of their DNA compared to modern elephants.
OUR QUESTION FOR TODAY:
Huey, Dewey, and Louie are 3 brothers. If the following statements are all true, which of them is the youngest?

- Huey is the oldest
- Dewey is the tallest
- Dewey is not the oldest
- Louie’s age is a prime number
- Louie is not the youngest

Evidence:
- Huey is the oldest; Dewey is not the oldest; Louie is not the youngest
REASONING

• Reasoning is the “WHY” and “HOW” section
  – WHY does your evidence support your claim?
  – HOW did it happen (the science)?

• In the reasoning section students demonstrate an understanding of the science principle and its application within the lab.

• Reasoning is where students interpret the data, explain trends in the data and/or discuss why the science phenomenon was observed.

• This section will be several sentences and the longest section.
Huey, Dewey, and Louie are 3 brothers. If the following statements are all true, which of them is the youngest?

- Huey is the oldest
- Dewey is the tallest
- Dewey is not the oldest
- Louie’s age is a prime number
- Louie is not the youngest

**Reasoning:**

- Huey is the oldest so he cannot be the youngest. It was stated that Louie is not the youngest so he cannot be the youngest. Therefore, the youngest must be Dewey because he is the only brother left.
WHAT IS HAPPENING IN THIS IMAGE?
Claim: The coach is mad at number 85.
Evidence:
- The coach is yelling towards 85.
- Number 85 looks annoyed with the coach.
- The two other players are looking at 85.
Reasoning: People yell when they are mad and usually target the individual they are mad at. Number 85 has the “look” of someone that is in trouble. Yelling gets the attention of others, and people love drama.
AFTER THESE MESSAGES, WE’LL BE RIGHT BACK
IT’S YOUR TURN

• Spend 30 seconds to write down a question from the video that can be supported with evidence from the video.
• You are only writing a question.
| QUESTION | CLAIM (an answer to the question) | EVIDENCE (summary of the data, including measurements, calculations, and observations) | REASONING (supports the claim based on the evidence) |
PASS YOUR WHITE BOARD TO YOUR ELBOW PARTNER

• Based on the question, write a claim, evidence for the claim, and reasoning.

• Pass the paper back to the original owner. Read the response.
  • Was it the answer you were looking for?
  • Does all the evidence listed support the claim?
  • Is there any evidence recorded that is not needed?
  • Does the reasoning explain why the evidence supports the claim?
DID ANYBODY WRITE DOWN THE QUESTION “WHAT HAPPENED TO THE CAT?”

- What would you answer as the claim?
CLASSROOM IDEAS FOR STUDENTS TO PRACTICE CER
CER IS VERSATILE

• Videos
• Labs
• But wait there’s more!
Pair with the I² Method

What I See

What It Means

I see a # of prey vs prey running speed graph that has a dotted line representing the running speed of a predator.

It means that a prey needs to run above that speed to not get caught by the predator.

Question: At what speed do prey need to run to better survive in their environment?
Question: Is object $m$ in equilibrium?

Claim: Yes or No

Evidence: Free Body Diagram and Calculations

Reasoning: Newton’s First Law
QUESTIONS

• kianderson@ccisd.net
• mnapier@ccisd.net
• kfield@ccisd.net
• jsegurajr@ccisd.net