

Claim Evidence Reasoning Introduction/Review Lesson

Mrs. Fortney's Honors Chemistry Course

Science and Engineering Practices:

- Engaging in Argument from Evidence
- Obtaining, Evaluating and Communicating Information

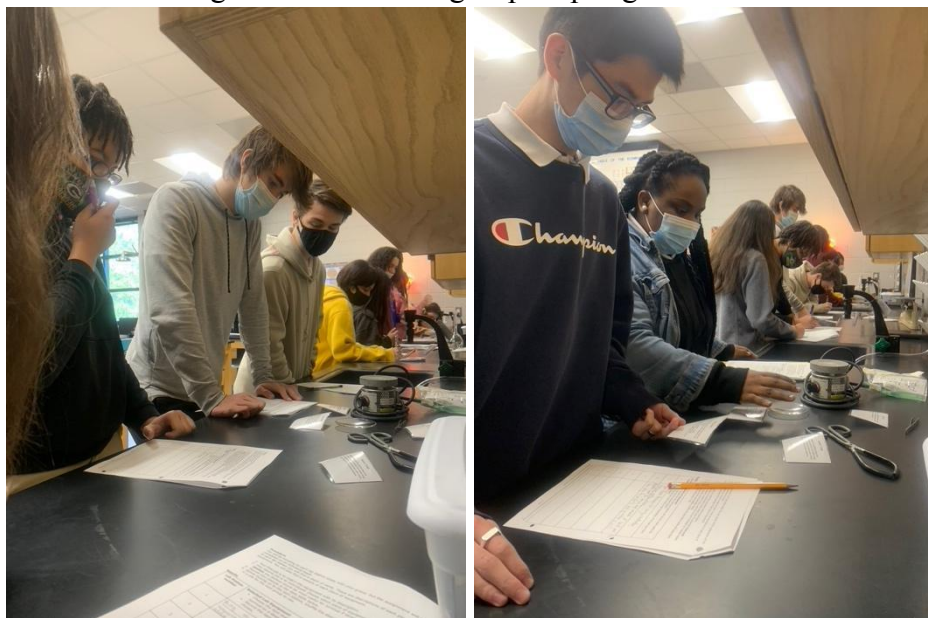
The purpose of this lesson is to introduce/review the claim evidence reasoning (C.E.R.) model with students in my chemistry classroom while also introducing students to lab equipment.

Plan

Introduction into Claim, Evidence, Reasoning

1. Review the parts of a C.E.R. with my students in a presentation format.
2. Then students are shown a small video clip <https://youtu.be/r2EcgNfK3PA> . With the question: What happened to the Cat?
3. Students are then asked to use the Claim, Evidence, Reasoning format to write a scientific explanation of what they believe happened to the cat.
4. Since, then may be students first exposure to C.E.R., then as a class we write a C.E.R. for the video together on the whiteboard.
5. Then students are split into their lab groups to complete the Essentials for Survival Activity. (Provided on the following pages is a description of this activity, along with what the teacher and student's do throughout the activity.)

Students working in Collaborative groups. Spring 2022





American Association
of Chemistry Teachers

Activity: The Essentials for Survival

FOR THE TEACHER

Summary

In this activity, the students will be introduced to and explore different lab equipment, model appropriate group work and class discussions, and practice writing efficient Claim-Evidence-Reasoning reports. This is an introductory activity for use in a general education chemistry class.

Grade Level

High School

NGSS Alignment

This activity will help prepare your students to meet the performance expectations in the following standards:

- **HS-ETS1-3:** Evaluate a solution to a complex real-world problem based on prioritized criteria and trade-offs that account for a range of constraints, including cost, safety, reliability, and aesthetics as well as possible social, cultural, and environmental impacts.
- **Scientific and Engineering Practices:**
 - Constructing Explanations and Designing Solutions
 - Engaging in Argument from Evidence

Objectives

By the end of this activity, students should be able to

- Match essential lab equipment to their appropriate descriptions.
- Understand the expectations for group work and class discussions in the chemistry classroom.
- Write a valid and complete CER defending their choice for most “essential” lab equipment.

Chemistry Topics

This activity supports students’ understanding of

- Lab Equipment
- Lab Safety
- Claim-Evidence-Reasoning (CER)

Time

Teacher Preparation: 30 minutes

Lesson: 90 minutes

Materials

- Description Cards printed on cardstock
- White boards for CERs (optional)
- Dry Erase markers for CERs
- One of each of the following to be placed at the lab stations:
 - Beaker; Graduated Cylinder; Erlenmeyer Flask; Stopper; Thermometer; Digital thermometer; Hot Plate; Bunsen Burner; Rubber Tubing; Striker; Watch glass; Beaker Tongs; Forceps; Wash Bottle; Wire Gauze; Disposable Pipette; Stir rod; Scoopula; Rubber Spatula; Magnetic Stirrers; Safety Goggles; Ring Stand; Clamps; Test Tube; Test Tube Holders; Test Tube Rack; Rings; Droppers; Florence Flask; Crucible; Funnel; Volumetric Flask; Burets; Clay Triangle; Indicator Paper; General Tongs; Balance

Safety

- No specific safety precautions need to be observed for this activity.

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Thanks to:

Dow Chemistry Teacher
Summit

Teacher Notes

- In this activity, students will be introduced to lab equipment, practice Claim-Evidence-Reasoning (CERs), and be introduced to classroom expectations of lab work, group discussions, and general classroom behavior.
- In the activity, I have six different chemistry lab "tools" placed at each lab station. There are also cards with the names and descriptions of each tool at each station. During the activity the students rotate throughout each lab station to make sure that they are exposed to each piece of equipment.
- The students' first job is to match the card with the tool at each station. Then, they individually decide which tool they believe would be most useful for survival on a desert island. (This makes the lab a little more exciting for the kids). They do not need to agree with their group members on which tool they would take to the island with them.
- After each group has been to each lab station and completed both tasks at each, they return to their home lab station. While at their original station, the students then look over the seven tools they have chosen (one from each station visited) and decide which ONE they would take to the island. They then write a CER to support their decision.
- Once each member has a solid CER* (this is a practice for CER writing as well), then they read their CERs to their group members. At this point they give feedback on both the quality of the CER and the tool choice itself. Once they have heard each group member's CER, the students must work as a group to decide which one lab piece that the group decides they will take for survival. When they have made a decision as a group, they write a group CER.
- After each group has completed their CER the class shares out in a circle format (white boards are helpful here).
- After the activity we discuss how we are not actually being stranded on a desert island, but we will be using all of these tools in the chemistry lab and we must understand how they work in order to ensure proper lab results and lab safety. If they don't then they will be exiled to the deserted island of "no lab zone". It's not a fun place.
- Background information:
 - Claim-Evidence-Reasoning (CER) is a way of reporting the results of a lab or activity without doing a formal lab report.
 - The **C** stands for *Claim*. This is where you essentially state your findings from the lab. It should be a statement and it should be concise.
 - The **E** stands for *Evidence*. This is where the students will include their data tables, graphs, and any other evidence that they have collected throughout the lab. I always tell my students that evidence cannot be argued.
 - The **R** stands for *Reasoning*. This is where the students explain the implications of their data and discuss how the lab makes sense. Many teachers incorporate different parts into their reasoning, but it should always relate the data back to the claim, without using circular reasoning.
 - Example: *Claim: The tool that I believe to be most useful would be the striker. Evidence: The striker requires no electricity. When used correctly it creates a spark. Sparks can be used to make fire. Reasoning: The striker is most useful because it will provide the ability to make a fire for both warmth and the heating of food while stranded on the island. It is reusable and it would be immensely helpful on the island.*
- Additional helpful hints:
- It is useful to print the description cards (available as a separate download) on cardstock and even laminate them.
- Before the students begin the lab you will have distribute the tools to the lab stations. I usually try to make sure not to put anything too closely related at the same station, but there isn't a set order.
- Make sure to place the matching description cards for each tool at the station as well. Instruct students to shuffle the cards up and restack them before leaving the station.

- White boards are good for sharing out CERs and facilitating the group discussion. Sometimes we hold them up and discuss, sometimes we lay them in the middle of a circle for observation, and other times we display them in the front of the class.
- A gallery walk could be a good idea in this lab as well, depending on your time limit/preference.
- Sometimes I make the rule that only one group can take each tool, so once one group decides their tool, they write it on the class signup sheet and no other group may choose that tool.
- After the activity we discuss how we are not actually being stranded on a desert island, but we will be using all of these tools in the chemistry lab and we must understand how they work in order to ensure proper lab results and lab safety. If they don't- then they will be exiled to the deserted island of "no lab zone". It's not a fun place!

FOR THE STUDENT

Lesson

The Essentials for Survival

Background

Just as with any job, in order to be a skilled and successful chemist you must not only understand the tools that you have available to you but also, you must be able to use them properly. Today, you will be introduced to these tools, and you will be able to explore both their structure and function.

Once introduced to the equipment, you will decide which piece of equipment you believe would be most beneficial for survival on a desert island. You will present your decision in the form of a CER.

Remember: C= Claim, E= Evidence, R= Reasoning

Pre-lab Questions

1. List every piece of lab equipment that you can think of:
2. Which piece of lab equipment that you listed do you think is most important?
3. Why did you choose this piece of equipment?

Objective

Identify which piece of lab equipment you believe would be the most beneficial to your survival when stranded on a desert island. Support your claim with solid evidence and thoughtful reasoning.

Materials

- Various lab equipment

Safety

- If any glassware is broken, please tell the teacher immediately. Do not attempt to clean it up yourself. Your teacher will place the glassware in the broken glassware container.

Procedure

You will be traveling to each lab station today with your group, but the assignment will be completed on an individual basis.

At each lab station you will find a stack of cards. These are descriptions of each piece of equipment. You will also find a sample of each piece of equipment.

1. Your first job is to match the equipment with its description.
2. Your second job is to *individually* choose which piece of equipment **from each station** you believe would be most useful for survival if stranded on a desert island.
3. Record your choices in the data table below.
4. Before moving on to the next station, shuffle the description cards and place them in a pile for the next group to use.

Results

Lab Station number	Selected Lab Equipment • Choose the item that you believe will be the most useful for survival on a desert island. • Record the name and a brief description of the tool you have chosen.
1	
2	
3	
4	
5	
6	
7	

Analysis

1. Select **ONE** piece of lab equipment from all of your choices listed in the table above to take with you if you were stranded on a desert island.
2. What sets this tool apart from the others?
3. Why does it make sense to choose this tool?

Now take your answers to the questions above and turn them into a solid CER.

- C=
- E=
- R=

Group Analysis

- Each member of your group will share their CER response created.
- Peer edit each other's work for both quality of the CER and tool choice.
- After each CER has been read and edited, as a group, decide and select ONE of the tools that your entire group would choose to take to the desert island.

Conclusion

As a group, write a solid and complete CER to support your decision.

- C=
- E=
- R=

Finally, write your CER on your group's white board, and prepare to share your CER with the class.

**Remember,* in order to be a good group member, you must participate fully and listen when others are presenting and provide meaningful feedback.

Examples of the Lab Station

