Activity: Lab Safety, You’re Fired!

FOR THE TEACHER

Summary
In this activity, students will read an account of a laboratory tour which details numerous safety infractions. They will be charged with identifying the safety violations and determining which scientist working in the lab should be fired. This activity is designed to be used after both lab safety and Claim, Evidence, Reasoning framework has been introduced.

Grade Level
High School and Middle 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**: Engaging in Argument from Evidence

Objectives
By the end of this activity, students should be able to
- Identify lab safety violations.
- Describe appropriate safety procedures.
- Utilize Claim, Evidence, Reasoning framework (CER) to support their argument.

Chemistry Topics
This activity supports students’ understanding of
- Laboratory Safety

Time
**Teacher Preparation**: 10 minutes
**Lesson**: 45-60 minutes

Materials
- A copy of the scenario for each lab group. If it is in a page protector, students could mark them with dry erase markers and they could be wiped clean after each use.
- A whiteboard and whiteboard markers for each group.

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

Teacher Notes
- This activity should be done in groups of 3-4 students. Students begin by reading the scenario and identifying the safety violations. (~10 minutes)
- Students should annotate the scenario as they identify the violations, ultimately creating a list of violations on the group whiteboard. (~10 minutes)
- After students have completed their lists of violations the class holds a “Board Meeting”. The class stands in a big circle, so each board can be seen by everyone. Teacher leads the discussion by asking students to note similarities and differences on each board. Teacher should be
questioning, not giving away answers. The objective for this large group discussion is to allow students to explain violations and proper lab safety to their peers. (~10 minutes)
  o Why is that a violation?
  o What is the appropriate method in the lab?
  o Were there other violations in the scenario?”

- Students then go back to their small groups to decide which scientist will be fired. They should erase the whiteboard and create a new board that includes:
  o **Claim**: The name of the scientist that should be fired.
  o **Evidence**: What information from the scenario supports the claim?
  o **Reasoning**: Explain why this scientist was chosen. Explain why these safety violations are cause for termination (and what should have been done instead?) (~10 minutes)

- Each group does a quick share out (~1 minute per group) of their board and then the class has a student-led, large group discussion to come to a consensus. The objective of this discussion is to let students practice evidenced based argumentation while continuing to discuss lab safety concerns. Who they choose is not important, the reasoning behind their decision is key.

- There technically is no right answer, however an answer guide is provided to help the teacher identify all of the safety violations.

- Introducing this type of argumentation will set the stage for data-based discussions throughout the course.

- Teachers unfamiliar with using group whiteboards in class discussions can read more about these strategies in the article: *Whiteboarding Strategies*.

- Teachers unfamiliar with the CER Framework can read more about this strategy in the article: *Implementing the Claim, Evidence, Reasoning Framework in the Chemistry Classroom*.

### FOR THE STUDENT

**You’re Fired!**

**Group Task**
- Read the following excerpt from Dr. Howdya Passchem’s Diary.
- He has asked for help. It is your duty to use your knowledge of lab safety and proper lab procedure to make an informed decision.
- One person in the group should read his diary out loud, while each group member jots down notes on who should be fired and why. No discussion should be had while reading.
- Once the diary has been read, on your whiteboard make a list of as many safety violations as you can find.
- As a class, we will discuss the safety violations that have been identified.
- Finally, in your individual groups, you are to use this data to come up with a well written and well thought out C.E.R that answers the question as to who Dr. Passchem should fire.
- Be sure to state your claim firmly, support your claim with solid evidence from the passage, and then give your reasoning which includes what is your basis for firing the chosen employee and what should have been done differently in that scenario.
- The C.E.Rs will then be shared with the class and we will have a discussion about who should be fired and come to a class consensus which we will deliver to Dr. Passchem.
- Thank you in advance for your impeccable work.
Dear Diary,

Today is a rough day. While I am incredibly successful and smart (I mean, I passed Chemistry with a solid B+), times are tough. Today, I am tasked with the unfortunate job of firing one of my very worthy employees. I decided that I could not make this decision without gathering the necessary evidence, so I spent today taking a tour of my smoothly ran laboratory. As I toured the lab, I took notes so I could refer back to them to make my decision. These, my dear trusty friend, are the highlights of my great adventure of flawless scientific expertise.

8/13/2028- Tour of lab:
I entered the lab as I always do, and it was in perfect working condition, as always. Upon entering the first work station, I was greeted by Jeb. Well, I was greeted by Jeb’s slumbering self. He looked so peaceful in his sleep, that I didn’t want to wake him. However, as I turned to move forward I tripped over his backpack and a large box of glassware that was obstructing the walkway. As I cried out in pain, Jeb stirred to life. Karri came around the corner to check on my obviously warranted screams of pain. She was a very sympathetic audience. She informed me that she had also fallen victim to the mess on the floor. Her pain was made evident by the large bloody bandage that adorned her big toe. It looked so very painful, but the red of the blood complimented the deep blue hue of her freshly pedicured toes. I commented on how much I liked her new flip flops. She got them at Walmart. I may stop there today.

Luckily, my agonized yelps did not disturb Carlos who was deeply entranced by the new Vanilla Ice single that had dropped today and was (rightfully so) blaring through the speakers. Carlos’ dance moves often inspire awe, and he did not disappoint today. I’m not quite sure that Heath appreciates Vanilla Ice on the appropriate level though because while Carlos made his moves look rhythmic and good, Heath’s headbanging seemed a bit out of place. He often lacks control of his long blonde locks when he “gets in his groove”. Today they were whipping around at full force and were dangerously close to catching fire. I quickly moved the lit Bunsen burner to the side, which was perfect timing, because the chemicals they were heating had just begun to boil over. They only got on my hands a little, so I easily wiped them on my shorts, and left the boys to their terribly important work.

Around the corner I was greeted by my favorite trio: Drea, Jayden, and Sam. They have been working on making an amazing new polymer that is both sticky and smooth at the same time. Right now, the polymer is either a clear liquid or a gooey yellow/orange substance. We are working on making it right. I not only adore these three because they are hard workers but because they are so generous and kind. Jayden walked me through their brainstorming process while he slowly bounced the polymer from one hand to the other. It was truly mesmerizing. My trance was interrupted when Drea asked me to hold her chips while she took a drink of her water. Sam was preoccupied with stirring her macaroni and cheese, which she was cooking on the hot plate next to the warming polymer. It’s a good thing that Drea was paying attention though because when Sam turned to say “Hello”, the polymer bubbled and almost got into Sam’s beautiful brown eyes. It’s a good thing she had those amazingly safe goggles on her hairline, because she could have gotten the polymer in her hair, and that would have taken forever to get out. Eyes are much easier to clean since we have
that awesome eyewash station nearby. Plus, losing your eyesight wouldn’t be too terrible. At least you wouldn’t have to watch Heath dance.

As I went to leave my dear friends, I was almost knocked flat on the floor by Aaliyah. Jason had thrown a terrible spiral and she was leaping to catch it. Out of nowhere, Dante tackled her to the floor, nearly missing me. When she fell, she noticed a silky white powder on the floor under her station. Because we are always safety conscious she immediately had to identify the unknown chemical for proper clean up. She quickly put her nose close to the sample and inhaled deeply to see if it gave off any noxious fumes. It seemed to be odorless. To aid in the identification, Jason came over, licked his finger, and then stuck it in the powder. Once his finger was coated in the unknown chemical, he tasted it to rule out the chance it was powdered sugar. It wasn’t. Fun fact: sometimes eyewash stations can be used as mouthwash stations too—though it is not proper protocol. Jason is so loyal. He always takes one for the team.

At that point, we had a team huddle to talk about who was going to visit Jamal at the hospital first. He had broken his leg earlier that day due to slipping on a chemical that Lexi had spilled and forgotten about. We are hoping he comes out of the coma soon. After the meeting we had a nice thirty second group hug, and each went back to work in our appropriate work stations.

I am so lucky to work with these magnificent scientists. I have no idea who I will be able to cut from the team. We all play such a large role in making this very successful laboratory run like the well-oiled machine it is. This is a decision too hard to make on my own, I may have to illicit some help on this one.