Lesson Plan: ACS Chemical Safety Video: RAMP

FOR THE TEACHER

Summary
In this lesson, students will learn about a simple yet powerful tool for protecting themselves and their classmates in the lab, RAMP. It stands for: Recognize hazards; Assess risks; Minimize risks and Prepare for emergencies. Using a video, and multiple activities, students will become more knowledgeable and better prepared to assess risks and identify hazards in the lab.

Grade Level
Middle and High School

NGSS Alignment
This lesson will help prepare your students to meet the performance expectations in the following standards:

- **Scientific and Engineering Practices:**
  - Constructing Explanations and Designing Solutions
  - Engaging in Argument from Evidence
  - Obtaining, Evaluating, and Communicating Information

Objectives
By the end of this lesson, students should be able to:

- Differentiate between a hazard and a risk.
- Recognize potential hazards in a laboratory.
- Evaluate risks effectively using the four-quadrant risk assessment.
- Apply the RAMP tool to a given scenario.

Chemistry Topics
This lesson supports students’ understanding of:

- Lab Safety
- Personal Protective Equipment (PPE)
- Risk/Hazard Assessment

Time
**Teacher Preparation:** 15-20 minutes
**Lesson:**
- Engage: 10-15 minutes
- Explore: 10-15 minutes
- Explain: 15-20 minutes
- Extend/Elaborate: 20 - 30 minutes (longer if the project is used)
- Evaluate: 1-2 hours

Materials
- Student Activity Handouts
- Device with Internet access
- Access to the ACS Safety Video: RAMP for Students
- Scissors
- Variety of Poster Materials
  - Colored Paper, Markers, Colored pencils, etc.
Safety

- No specific safety precautions need to be observed for these activities.

Teacher Notes

- To learn more about this 5E lesson plan, read the corresponding article, *Lab Safety Teaching Resources for the Chemistry Classroom*, published in the September 2020 issue of *Chemistry Solutions*.
- Below is a suggested outline of the activity, if used as a 5E lesson plan. Note that individual components of this lesson plan can be used separately as well.

- **Engage:**
  - First, use the “Video Anticipation Guide” to allow your students to gauge their safety knowledge. This should be used both before and after watching the video. An Answer Key has been provided for teacher reference.

- **Explore:**
  - Next, use the “Hazard or Risk? A Sorting Activity” so that students can differentiate between common lab hazards and risks. Note that this can also be used before and after the video. An Answer Key has been provided for teacher reference.

- **Explain:**
  - Teachers should show the video, “RAMP for Students”. While watching the video, students can record information in a set of Fill-In Notes or a Foldable to help them retain the new knowledge. Student handouts for both Fill-In Notes and a Foldable are available for download. Answer Keys have also been provided for teacher reference.

- **Extend/Elaborate:**
  - Students should complete the Hazard Symbols Activity. This will familiarize them with GHS Pictograms and allow students to apply what they’ve learned.
  - Then use the Four Quadrant Activity so that students have the opportunity to analyze scenarios and use the four quadrants of risk assessment.
  - Additionally, depending on time availability, it is suggested that teachers use the project, *Chemical Disasters: Good Chemical Gone Bad*. This would be an excellent opportunity for students to evaluate hazards and risks in given case studies.
  - Students can also sketch their own laboratory environment in order to familiarize themselves with the locations of important equipment and PPE.

- **Evaluate:**
  - Students can be given the opportunity to demonstrate what they have learned through creating a RAMP poster. A rubric is included in the student handout for planning purposes as well as assessment.
  - Additionally, students can be presented with a lab scenario, and asked to complete a Hazard/Risk Assessment on it. For this assignment, student will use the RAMP template developed by ACS. The scenario presented on the student handout for this activity, originated from the lab, *Exploring Intermolecular Forces*. 