

# SAFETY RUBRIC—ASSESSING CHEMICAL DEMONSTRATION VIDEOS

The National Science Teaching Association (NSTA) advises that an important obligation of science teachers is to provide appropriate modeling of science safety in all circumstances, and media posted for public viewing is no exception.<sup>1</sup> The purpose of this *Safety Rubric for Assessing Chemical Demonstration Videos* is to provide a template for educators to review the safety and pedagogy of chemical demonstration videos in order to determine whether they should be used in the classroom.

Hazard and risk assessment is an integral part of a culture of laboratory safety. In its published *Safety Guidelines for Chemical Demonstrations*,<sup>2</sup> the American Chemical Society (ACS) recommends that teachers always follow tested, written procedures that include comprehensive safety precautions. Safety precautions enable teachers to identify potential hazards and understand the risks arising from chemical exposure and/or improper handling of a chemical, process, or procedure. Effective safety precautions are designed to minimize risks and prevent injury, damage, or harm due to unplanned incidents. These principles are the cornerstone of hazard and risk assessment.

The ACS booklet *Guidelines for Chemical Laboratory Safety in Secondary Schools*<sup>3</sup> contains detailed background information to understand hazards and risks. The organizing concept for this information is **RAMP**,<sup>4</sup> an acronym that stands for **Recognize Hazards, Assess Risks, Minimize Risks, and Prepare for Emergencies**.

Additional guidance about hazard and risk assessment for laboratory activities is available from the National Fire Protection Association (NFPA). Chapter 12 in NFPA 45, the *Standard on Fire Protection for Laboratories Using Chemicals*,<sup>5</sup> describes the responsibilities of teachers in K-12 schools. Teachers are required to perform documented risk assessments for laboratory activities involving chemicals, carry out safety briefings for students, and provide appropriate personal protective equipment.



The attached rubric describes criteria for considering the pedagogical role of a demonstration video and determining whether it meets or exceeds best practices for safety. Safety requirements are organized using the RAMP protocol. To use the rubric, assign the indicated number of points to rate whether the video presentation is deficient, acceptable, or superior in each category. Any video that is rated as deficient in any safety category should not be used in the classroom. Use the total number of points as a guide to compare different options for chemical demonstrations by ranking the relative strength of the safety practices demonstrated. There is no intent that a specific score denotes that a video may be considered “safe” in all circumstances. Consistently applying the criteria in this resource will help you to integrate appropriate safety learning objectives with essential chemistry knowledge and skills.

## REFERENCES

1. *Safety in the Media*, National Science Teaching Association (2019).
2. *Safety Guidelines for Chemical Demonstrations*, American Chemical Society Division of Chemical Education (2017).
3. *Guidelines for Chemical Laboratory Safety in Secondary Schools*, American Chemical Society (2016).
4. Hill, R. H. and Finster, D. C. *Laboratory Safety for Chemistry Students*, 2nd ed.; Wiley: New York, 2017.
5. *NFPA 45: Standard on Fire Protection for Laboratories Using Chemicals*, National Fire Protection Association (2019).

EVALUATION CRITERIA	DEFICIENT (0 POINTS)	ACCEPTABLE (1–2 POINTS)	SUPERIOR (3 POINTS)	POINTS
<b>Pedagogy</b>				
Concepts and Skills	Attention-getting only—created for the “wow” factor!	Includes discussion of principles, concepts, or skills	Provides opportunities for student discussion or further inquiry	
Audience	Not age-appropriate for intended audience	Instructions are appropriate for intended audience	Describes how activity can be tailored to different potential audiences	
<b>Recognize Hazards</b>				
Chemical Hazards	Does not identify chemicals used or their concentrations and amounts	Identifies chemicals and their concentrations and amounts, but lacks hazard information	Identifies chemicals and their hazard classifications using Safety Data Sheets	
Other Hazards	Does not identify physical, equipment, or process hazards (temperature, pressure, projectiles, etc.)	Mentions possible physical hazards in passing, but does not explain them	Describes physical hazards arising from use and/or misuse of equipment or procedure	
<b>Assess Risks</b>				
	Does not describe potential risks (injury, damage, or harm) from use of chemicals or procedure	Risks may be implicitly acknowledged via use of appropriate safety precautions	Analyzes potential risks, such as exposure to harmful vapors, fires, spills, cuts, or burns	
<b>Minimize Risks*</b>				
Planning	Haphazard—chemicals are not premeasured, equipment is not ready, etc.	Chemicals may be premeasured, but presenter scrambles to assemble or explain what is needed	Chemicals and equipment are prepared in advance, and presenter is in control of entire demonstration	
Ventilation	Harmful vapor or smoke leads to chemical exposure and/or injury	Use of appropriate ventilation equipment prevents exposure to harmful vapors	Provides appropriate ventilation and explains requirements	
Personal Protective Equipment (PPE)	Presenter and/or audience do not wear required PPE	Presenter and audience wear appropriate PPE to minimize risk	Demonstrates selection and use of appropriate PPE for presenter and audience	
Safety Precautions	Standard laboratory safety precautions are not followed, risking potential injury or damage	Standard laboratory safety precautions are observed	Provides standard operating procedure and explains purpose of safety precautions	
<b>Prepare for Emergencies</b>				
Safety Equipment	Safety equipment is missing, risking potential injury or damage	Safety equipment is visible, but it is not described or explained	Provides necessary safety equipment and explains why it is needed	
Waste Disposal	Improper collection of acids and bases, solvents, heavy metals, etc.	Possible wastes are collected or separated, but disposal is not discussed	Describes proper disposal of wastes that may be hazardous to environment	
Venue	Space is not appropriate for chemical or physical demonstrations	Appropriate space/layout, but signs of overcrowding or poor organization	Includes necessary safety equipment and is neat and organized	

\*See *Safety Guidelines for Chemical Demonstrations* for a comprehensive analysis.