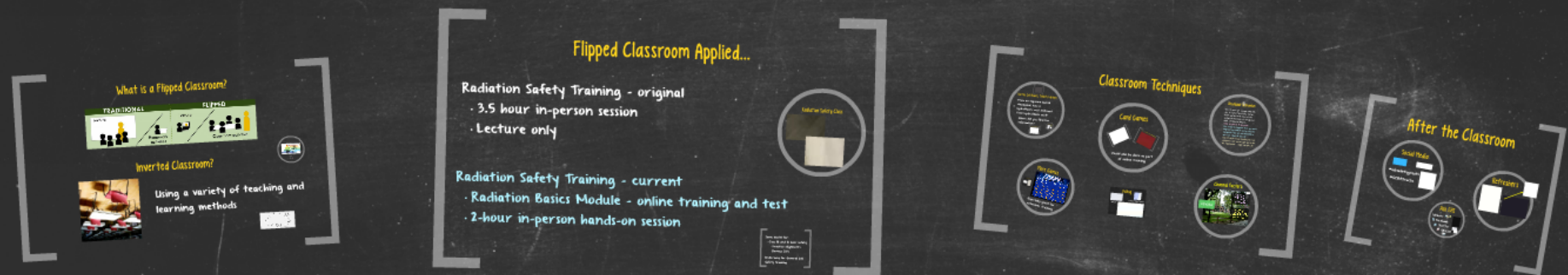


# Flipped Classroom Techniques in Lab Safety Training



Robin Izzo

Director, Environmental Health & Safety  
Princeton University

The diagram is titled "What is a Flipped Classroom?". It is divided into two columns: "TRADITIONAL" and "FLIPPED".

- TRADITIONAL:** Shows a teacher at the front of a classroom. The text below the teacher icon says "Teacher presents content".
- FLIPPED:** Shows students at their desks. The text below the student icon says "Students learn content".

## What is a Flipped Classroom?



### Inverted Classroom?



Using a variety of teaching and learning methods

- Radiation Safety Training - original
- 3.5 hour in-person session
- Lecture only

- Radiation Safety Training - original
- 3.5 hour in-person session
- Lecture only

Radiation Safety Training - current

- Radiation Basics Module - online training and test
- 2-hour in-person hands-on session



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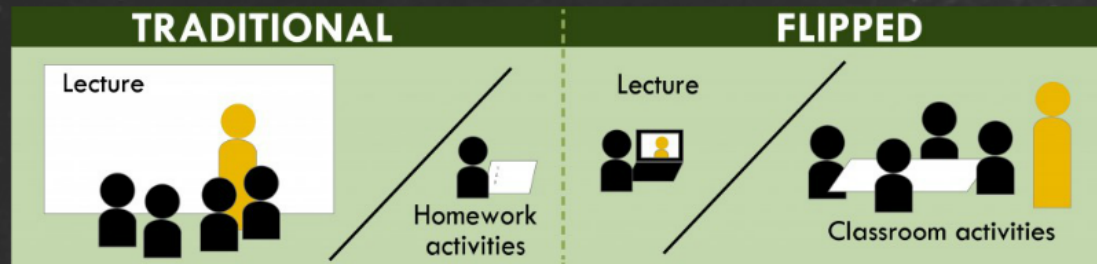
Card Games

[illegible]

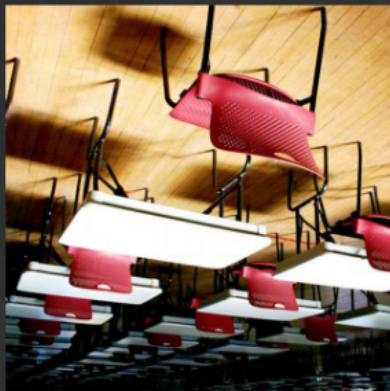
### After the Classroom



# What is a Flipped Classroom?



## Inverted Classroom?

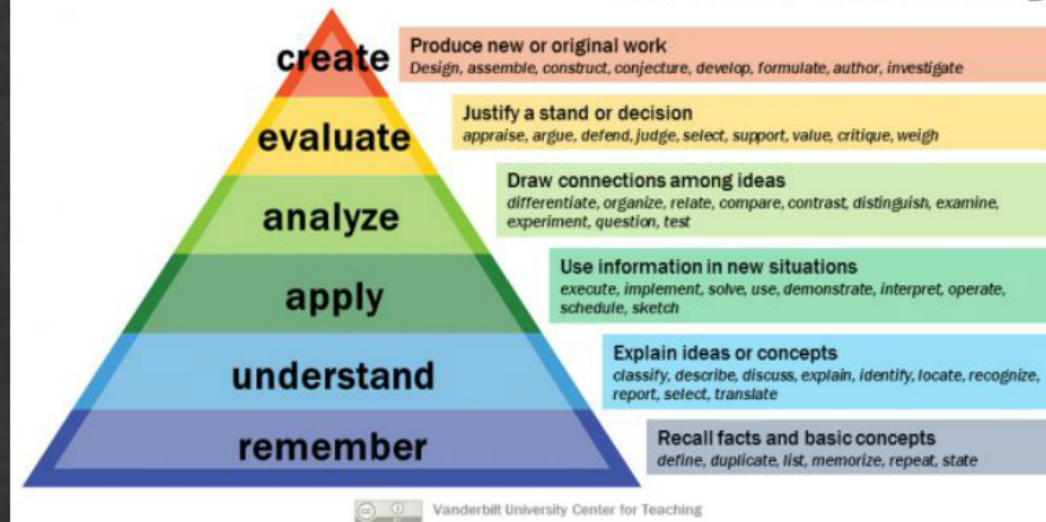


Using a variety of teaching and learning methods





## Bloom's Taxonomy



"We learn . . .  
10% of what we read  
20% of what we hear  
30% of what we see  
50% of what we see and hear  
70% of what we discuss  
80% of what we experience  
95% of what we teach others."

- William Glasser



"We Learn . . .

10% of what we read

20% of what we hear

30% of what we see

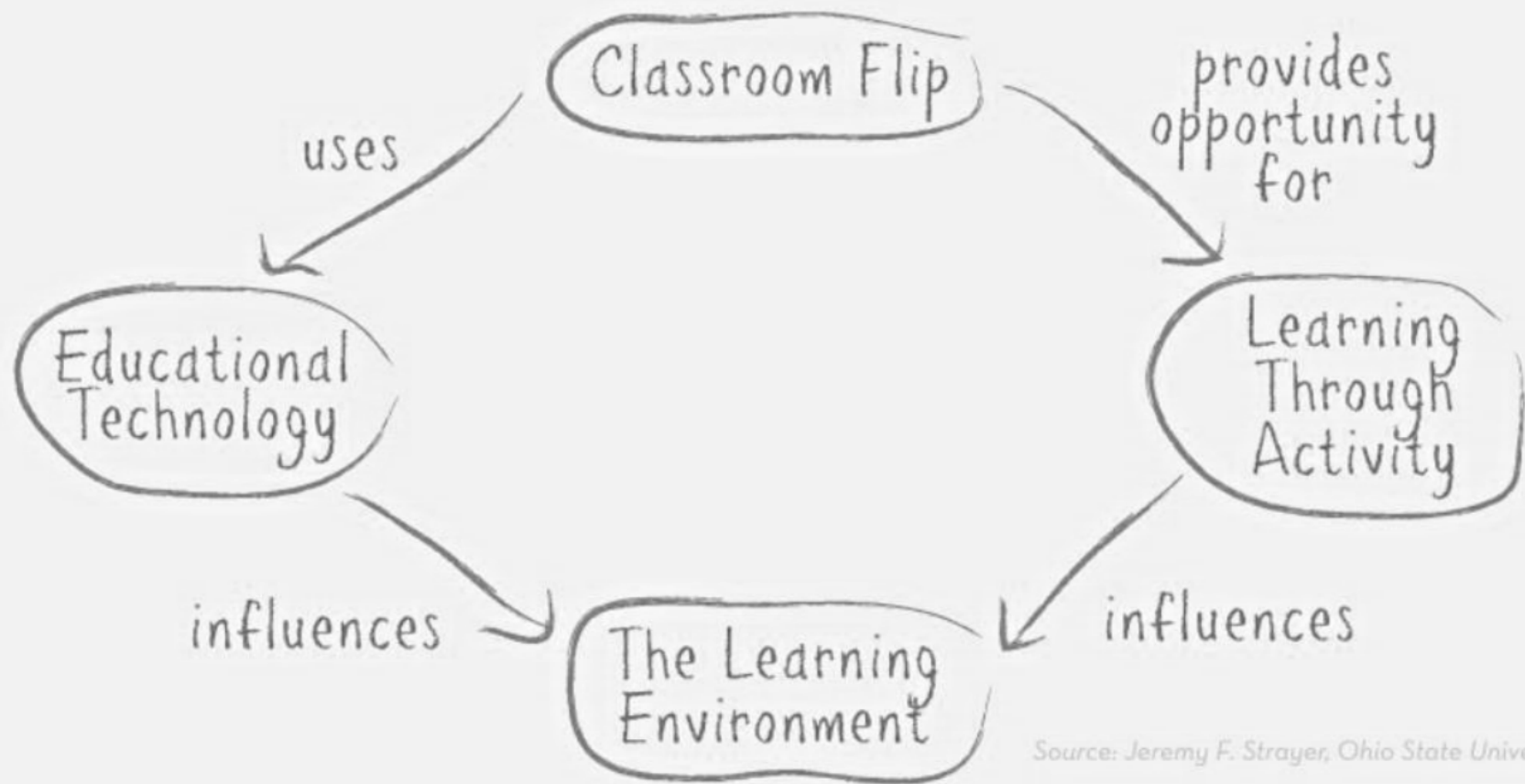
50% of what we see and hear

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95% of what we teach others."

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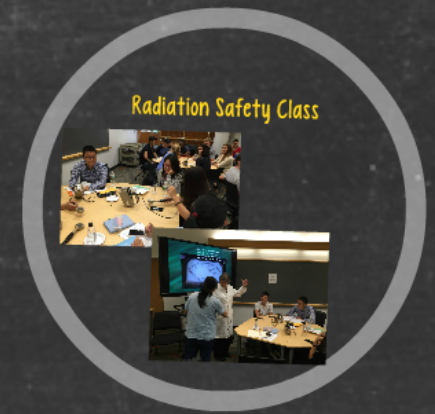


Source: Jeremy F. Strayer, Ohio State University

# Flipped Classroom Applied...

## Radiation Safety Training - original

- 3.5 hour in-person session
- Lecture only



## Radiation Safety Training - current

- Radiation Basics Module - online training and test
- 2-hour in-person hands-on session

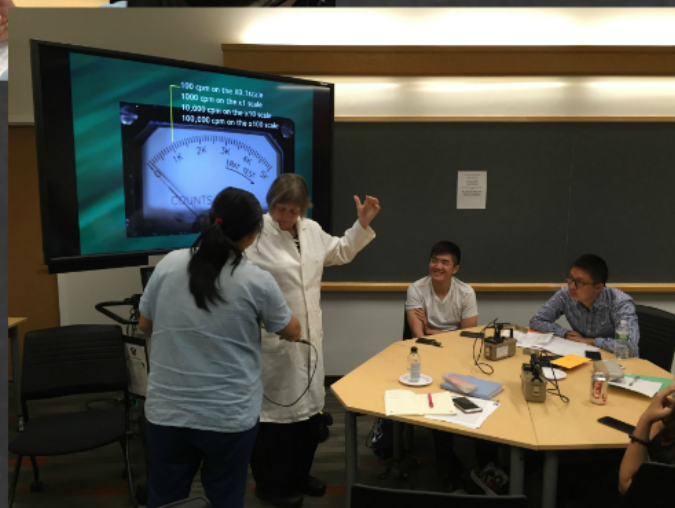
Same model for:

- Class III and IV laser safety
- Practice alignments
- Review SOPs

Underway for General Lab Safety Training



# Radiation Safety Class



Same model for:

- Class III and IV laser safety
  - Practice alignments
  - Review SOPs

Underway for General Lab  
Safety Training

# Classroom Techniques



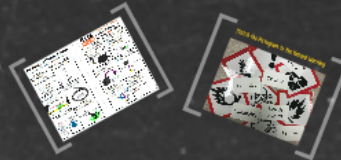
## Use the Cell Phones, Tablets, Laptops

From an exposure hazard standpoint, how is hydrofluoric acid different from hydrochloric acid?

Where did you find the information?



## Card Games

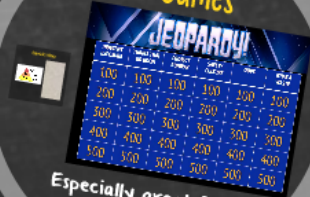


Could also be done as part of online training

## Breakout Scenarios

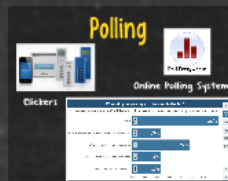
Your PI gives you a paper and asks you to repeat the study. You've never worked with some of the chemicals and have not conducted some of these techniques. What do you do to prepare? Your research suggests that you need engineering controls and protective equipment that are not available in your lab. What do you do? Your PI doesn't have funding for this equipment, but encourages you to do the experiment. What can you do?

## More Games

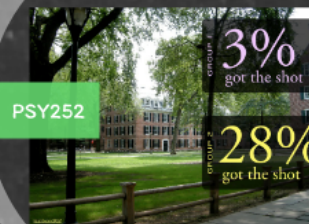


Especially great for refresher training

## Polling



## Channel Factors

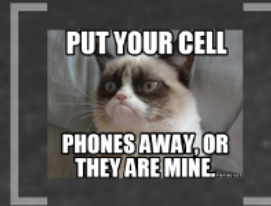




**PUT YOUR CELL**

**PHONES AWAY, OR  
THEY ARE MINE.**

memes.com



## Use the Cell Phones, Tablets, Laptops

From an exposure hazard standpoint, how is hydrofluoric acid different from hydrochloric acid?

Where did you find the information?



# Navigate your web resources...and bookmark



## Laboratory Safety

[Animal Research Health and Safety](#)

[Biological Safety](#)

**[Chemical Safety](#)**

[Chemical Hygiene Plans](#)

[Chemical Waste](#)

[Chemical-Specific Protocols](#)

[Aluminum Chloride \(anhydrous\)](#)

[Aqua Regia](#)

**[Hydrofluoric Acid](#)**

[Lithium Aluminum Hydride](#)

[Phenol](#)

[Phosphorus](#)

[Phosphorus Trichloride](#)

[Piranha Solutions](#)

[Potassium](#)

[Sodium](#)

## Hydrofluoric Acid

[< Aqua Regia](#)

[up](#)

[Lithium Aluminum Hydride >](#)

Hydrofluoric acid is an aqueous inorganic acid solution commonly used in research and industry for its ability to etch silicon compounds. It is an essential tool for semiconductor and electronic fabrication, mineral processing and glass etching. In addition to its useful properties, hydrofluoric acid also poses severe health risks upon exposure. Best management practices must be reviewed and continually employed while working with this material.

### The Technical Info:

Hydrofluoric acid (CAS#7664-39-3) is the aqueous form of hydrogen fluoride gas, miscible with water. Both versions are commonly referred to as HF in research and industry. It has a molecular weight of 20.01 and can typically be found in concentrations of 48-52% in water. **Hydrofluoric acid is extremely corrosive!** Aqueous solutions dilute as 0.1 M will pH at approximately 1.0. Unlike other mineral acids, hydrofluoric acid will attack glass, concrete, rubber, quartz and alloys containing silica.

### Why So Dangerous?

Common mineral acids such as hydrochloric, phosphoric, nitric and sulfuric acid can cause surface burns when a dermal exposure occurs. The area affected is localized, in

## Staff

**Kyle Angjelo** 

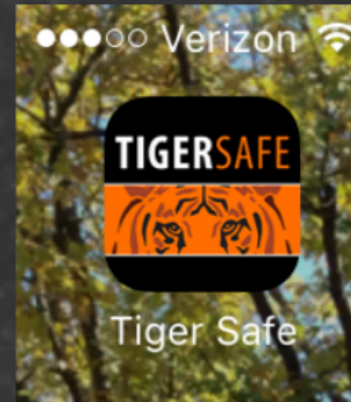
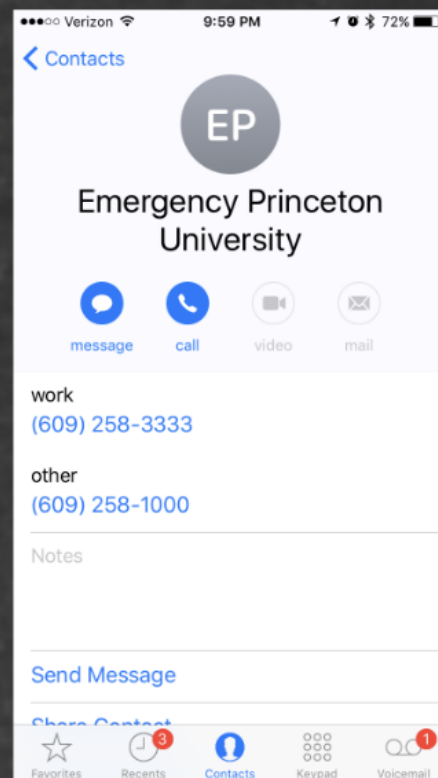
Program Manager, Chemical Safety  
609-258-2711

**Steve Elwood** 

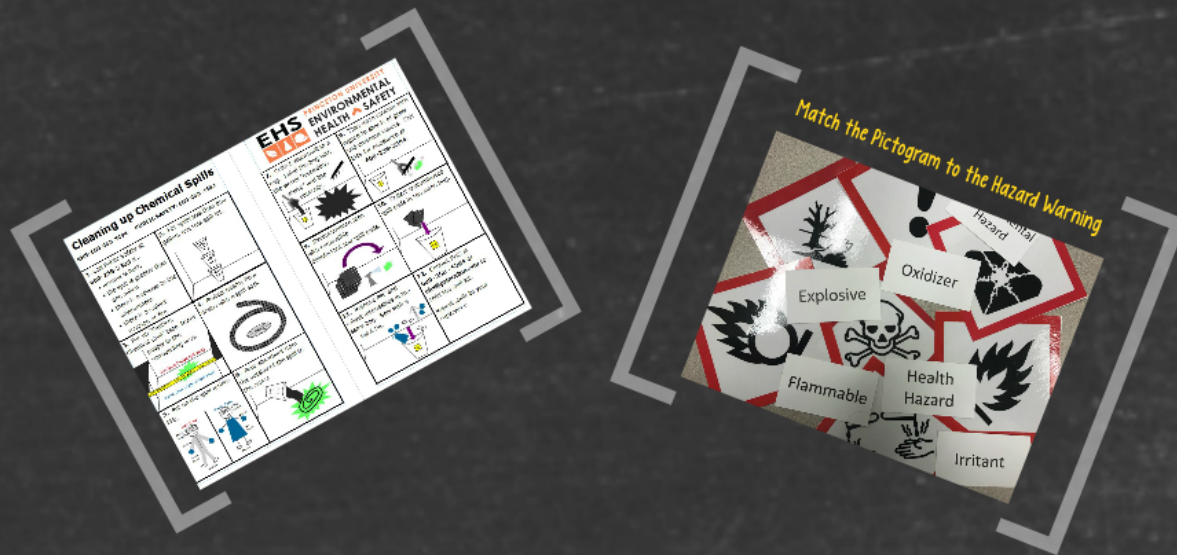
Associate Director for Laboratory Safety  
609-258-6271



## Program Emergency Numbers and Apps



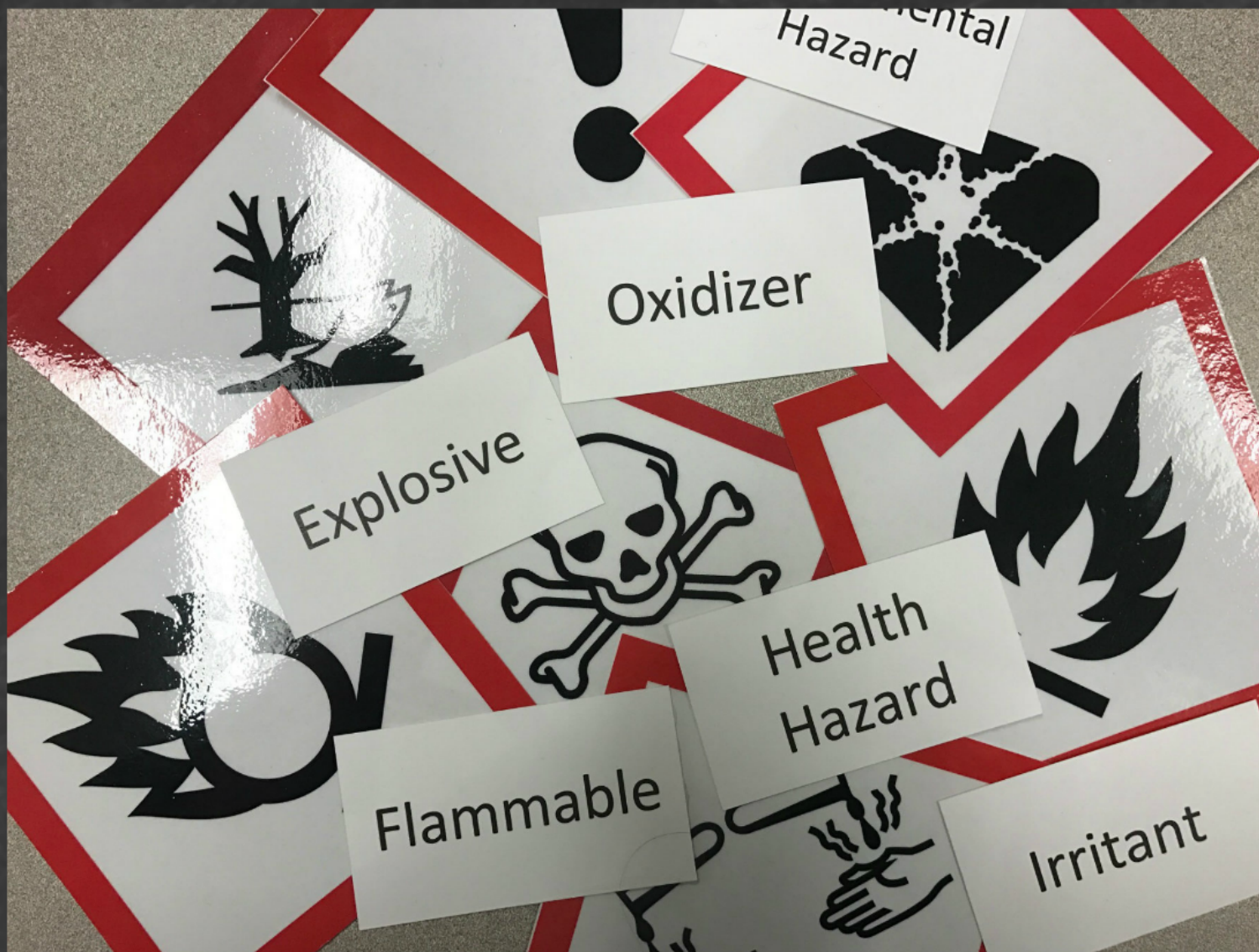
# Card Games



Could also be done as part  
of online training



# Match the Pictogram to the Hazard Warning





# Cleaning up Chemical Spills

EHS: 609-258-5294 PUBLIC SAFETY: 609-258-3333

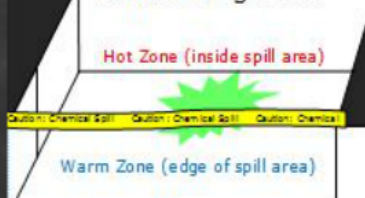
1. Call Public Safety at 609-258-3333 if...

- anyone is hurt,
- the spill is greater than one gallon
- there is a release to the environment
- there is a violent reaction or fire

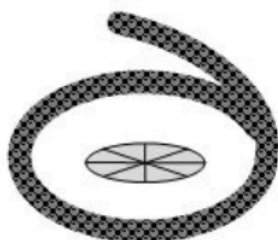
2. For spills less than one gallon, use this spill kit.



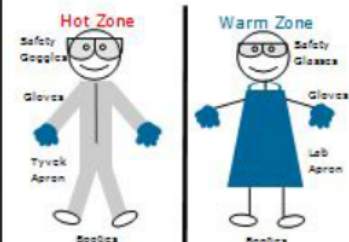
3. Put up "Caution: Chemical Spill" tape. Notify people in the surrounding area.



4. Protect nearby floor drains with a spill sock.



5. Put on the appropriate PPE.

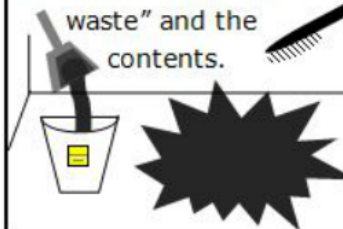


6. Pour absorbent from the outside of the spill to the center.



PRINCETON UNIVERSITY  
ENVIRONMENTAL  
HEALTH & SAFETY

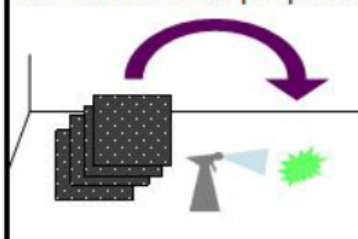
7. Collect absorbent in a bag. Label the bag with the words "hazardous waste" and the contents.



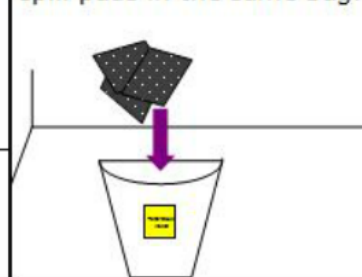
8. Take extra caution with regard to shards of glass and chemical vapors. Call EHS for assistance at 609-258-5294.



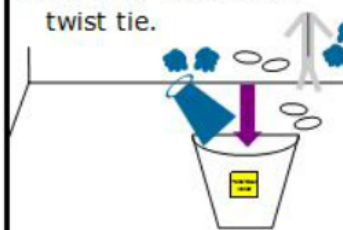
9. Decontaminate area with compatible disinfectant and spill pads.



10. Collect contaminated spill pads in the same bag.



11. Remove PPE and collect disposables in the same bag. Seal with a twist tie.



12. Contact EHS at 609-258-5294 or [ehs@princeton.edu](mailto:ehs@princeton.edu) to refill the spill kit.

Report spills to your supervisor.

# More Games



JEOPARDY!					
INDECENT EXPOSURE	THINGS THAT GO BOOM	PROJECT RUNWAY	SAFETY CULTURE	OOPS	WHAT A WASTE
100	100	100	100	100	100
200	200	200	200	200	200
300	300	300	300	300	300
400	400	400	400	400	400
500	500	500	500	500	500

Especially great for  
refresher training



# Heinrich's Plinko





# Breakout Scenarios

Your PI gives you a paper and asks you to repeat the study. You've never worked with some of the chemicals and have not conducted some of these techniques.

What do you do to prepare?

Your research suggests that you need engineering controls and protective equipment that are not available in your lab. What do you do?

Your PI doesn't have funding for this equipment, but encourages you to do the experiment. What can you do?

# Channel Factors

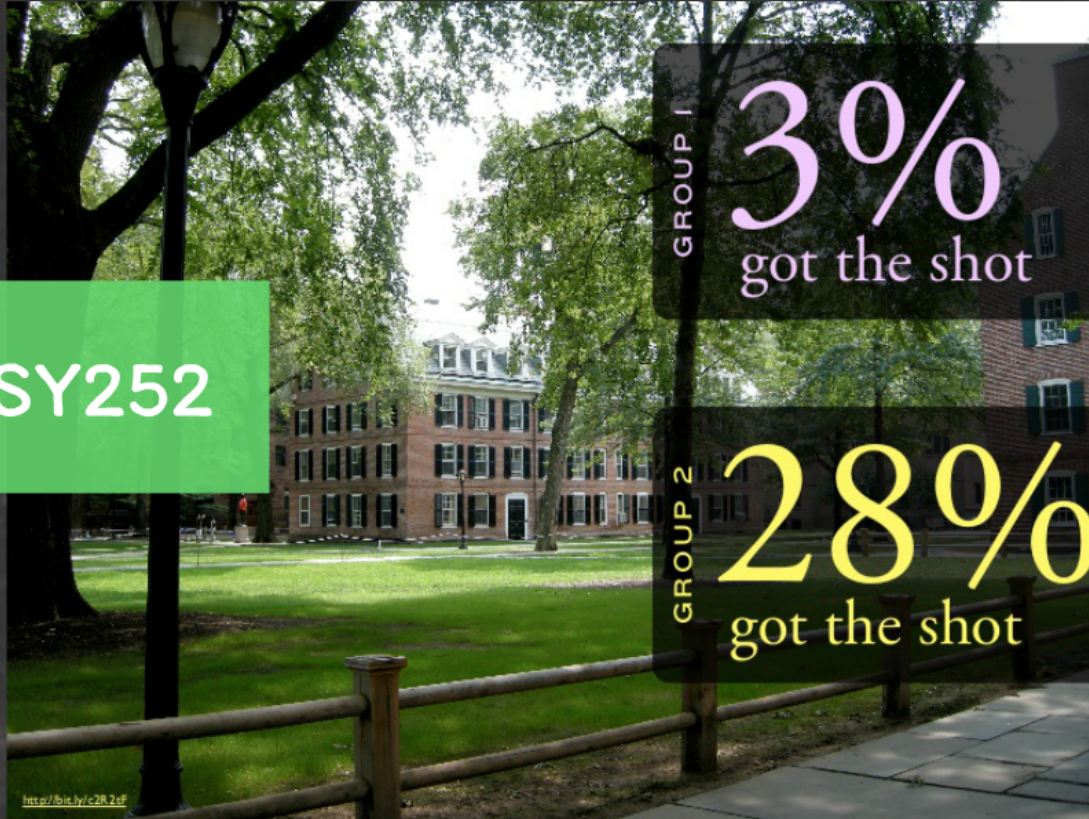
PSY252

GROUP 1

3%  
got the shot

GROUP 2

28%  
got the shot



<https://bit.ly/c28.2cf>

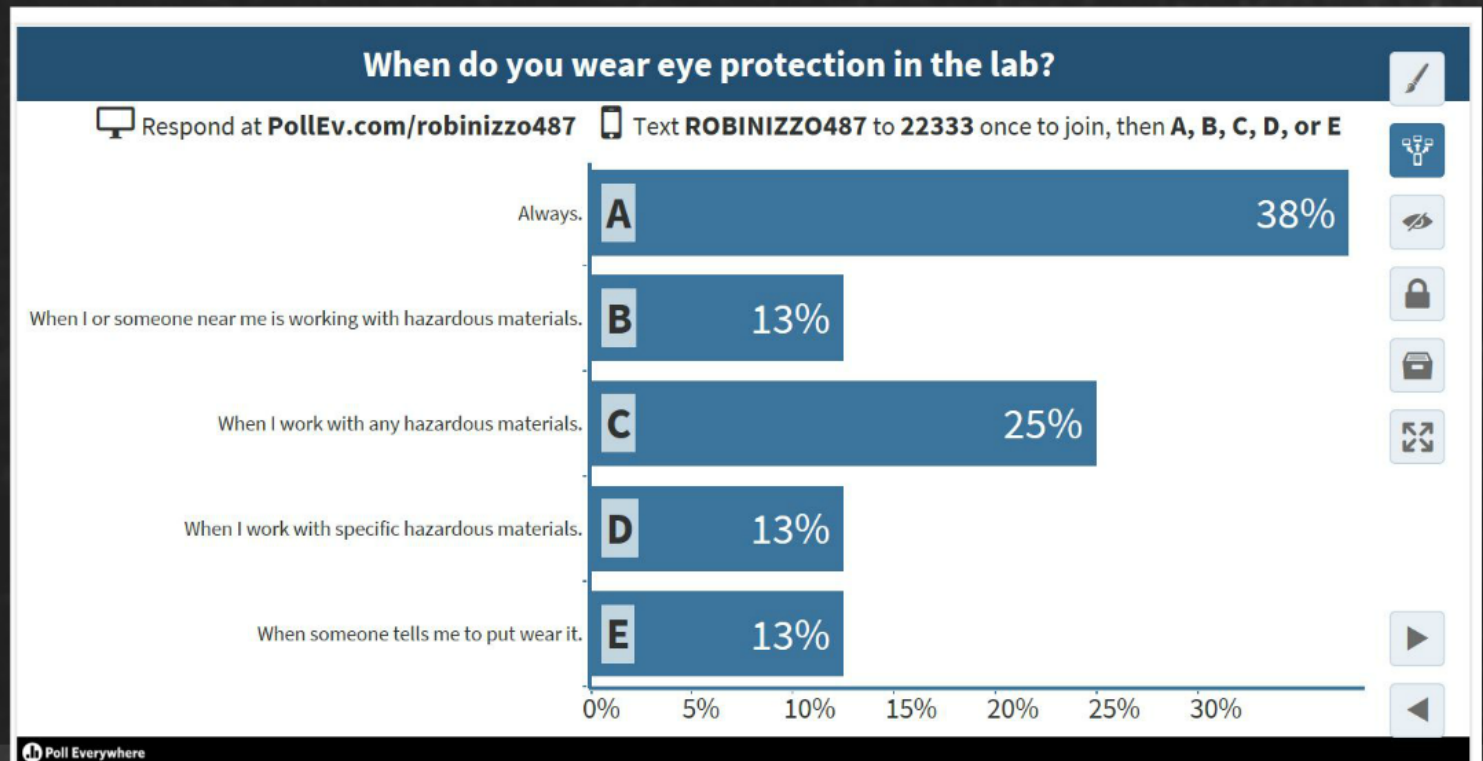


# Polling



## Online Polling Systems

### Clickers



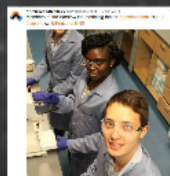


# After the Classroom

## Social Media



#labsafetygreats  
#DCHASrocks



## Ask EHS

Website



Facebook



Twitter



SHIELD



I'LL BE  
THERE  
FOR YOU



## Refreshers



Maintain your safety, maintain your environmental footprint – watch this short video to learn more about how to improve the tool.

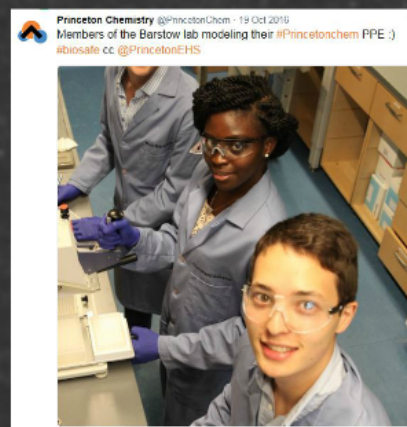


# Social Media



#labsafetygreats

#DCHASrocks





# Refreshers

**SHARPS SAFETY**

**Use Sharps Safely in the Research Lab**

Penetration of the skin with a biologically-contaminated sharp device can result in transmission of microorganisms and viruses that could lead to serious infections.

Utilize alternatives, such as plastic aspirating pipettes or blank-tipped needles when possible. **← Use Wisely**

**Dispose Properly →** In an approved sharps container. Never overfill the container.

Poor technique can increase your risk of sustaining a sharps exposure. Practice in a controlled setting before using a sharp with potentially infectious material. **← Get Trained**

Learn more: [ehs.princeton.edu/laboratory-research/biological-safety/manual/using-sharps-safely](https://ehs.princeton.edu/laboratory-research/biological-safety/manual/using-sharps-safely)

**EHS** PRINCETON UNIVERSITY  
ENVIRONMENTAL HEALTH & SAFETY

262 Alexander St Princeton, NJ 08540  
609-258-1545  
[ehs.princeton.edu](https://ehs.princeton.edu)

Maximize your safety, minimize your environmental footprint – watch this short video to learn more about how to operate this hood.






# Ask EHS

Website 

 Facebook

 Twitter

 SHIELD



I'LL BE  
T.H.E.R.E  
FOR you



Princeton Environmental Health & Safety

Robin Home 20+

**PRINCETON UNIVERSITY**  
**EHS**  
ENVIRONMENTAL  
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@PrincetonEHS

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Princeton Environmental Health & Safety  
March 8 at 1:43pm ·

It's time to focus on eye safety and injury prevention in the lab and workplace. #BeSafe #EyeHealth #SaveYourVisionMonth #WorkplaceEyeWellnessMonth

Focus on Eye Safety and Injury Prevention | Office of Environmental Health and Safety

When it comes to safety awareness in March, the eyes have it. Along with the coming of spring, the

EHS.PRINCETON.EDU

Like
 Comment

Contact Us

Message

The Princeton University Office of Environmental Health and Safety (EHS) works to promote safety and safe practices for the campus community.

48 people like this and 49 people follow this

0 people have been here

About See All

262 Alexander Street  
Princeton, NJ 08540  
(609) 258-5294  
Message Now



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[Workplace & Construction](#)
[Environmental Programs](#)
[Health & Safety for the Campus Community](#)
[Emergencies & Incidents](#)



#### New Waste Removal Plan Streamlines Pick-Ups

As of March 8, 2017, Princeton University has instituted a new waste removal and collection process for the main campus.



#### Emergencies 24 Hours

Do you need to plan for or respond to an emergency? The Emergency Preparedness Page will help you prepare an effective response.

#### Report & Manage Safety Issues

Who is responsible for managing safety issues? How can you report or resolve a safety problem?

#### Tools

For quick access to the **SHIELD** database and some frequently used EHS forms

#### Training

For a listing of EHS training sessions and to arrange training or access online training.

#### News & Announcements

##### New Waste Removal Plan Streamlines Pick-Ups

As of March 8, 2017, Princeton University has instituted a new waste removal and collection process for the main campus.

#### EHS Twitter Feed



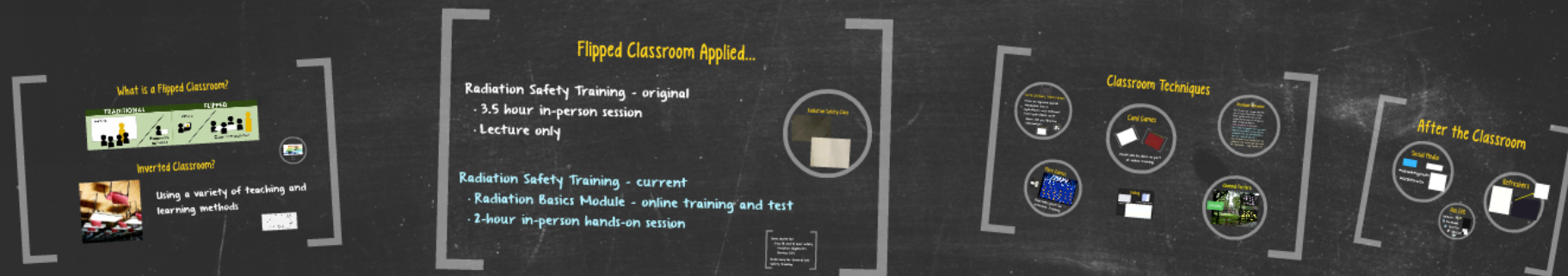
New waste removal plan streamlines pick-ups for @PrincetonChem @PrincetonMoBio @AndingerCenter @PrincetonNeuro etc. ehs.princeton.edu/news/new-waste...

#### Popular content

- Handling Radioactive Materials Safety
- Ceramics
- Painting and Drawing
- Personal Protective Equipment (PPE) for Construction
- Radiation Monitoring Badges
- What is a Controlled Dangerous



# Flipped Classroom Techniques in Lab Safety Training



Robin M. Izzo  
rmizzo@princeton.edu  
609-258-6259