

Safety Rules

PPE
Goggles

Teaching Labs
Research Labs

Using traditional safety rules to teach more advanced concepts in chemical hygiene

Chemicals
Hazards
Chemical Spills
Broken Glass
Basics
Emergency Response



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OUTLINE FOR TALK

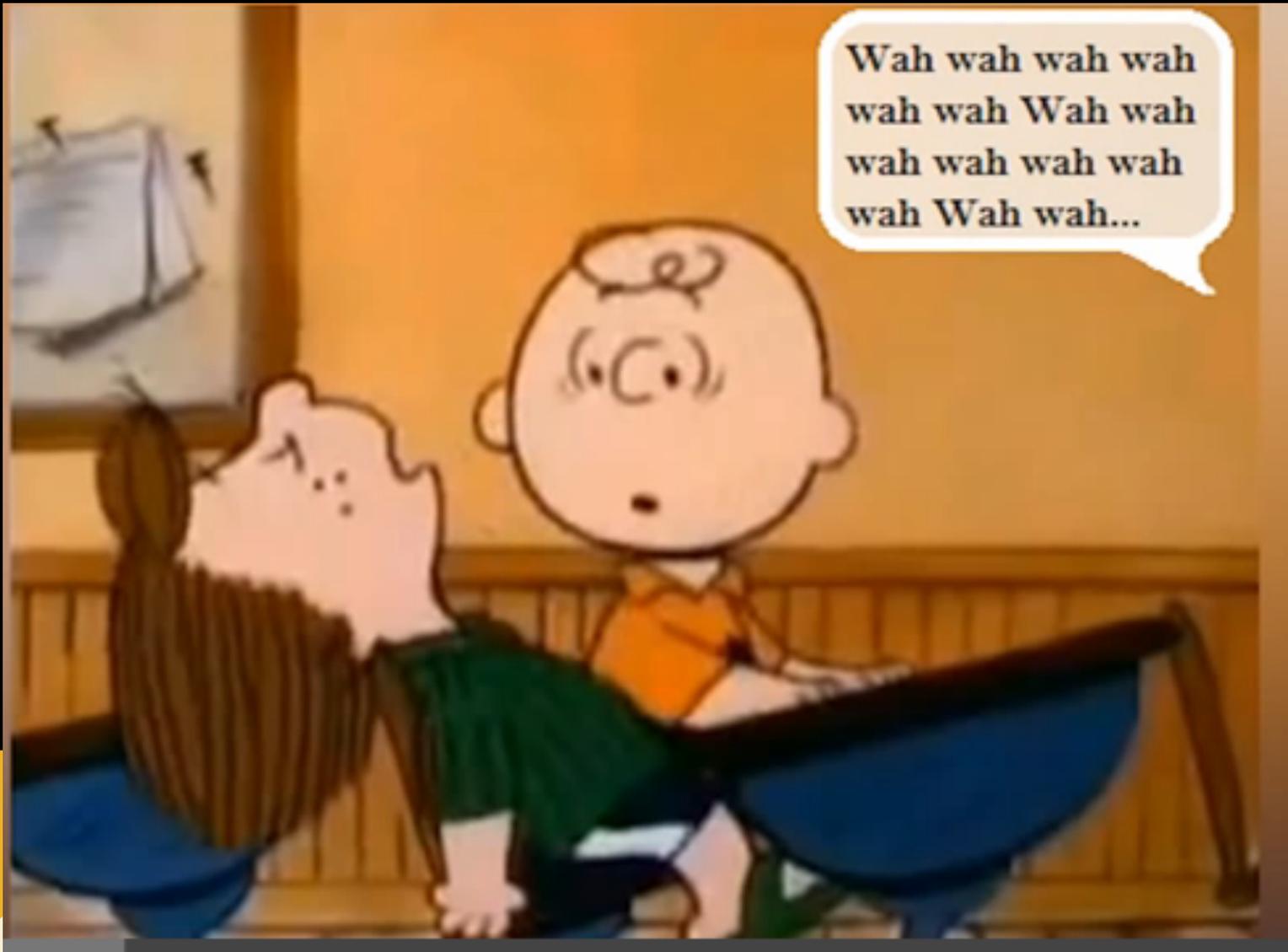
The Basics

Real World Examples

Rationale & Historical Context

From Teaching Lab to Research Lab

HELP STUDENTS SEE BEYOND THE “LIST”



[Charlie Brown Teacher Talking](#)

HELPING STUDENTS LEARN



**CREATE COGNITIVE CATEGORIES
& PUT STUFF IN THEM**

- **PROPER CONDUCT/BEHAVIOR**
- **PROPER LAB ATTIRE**
- **SAFE HANDLING OF CHEMICALS**
- **SAFE HANDLING OF EQUIPMENT**
- **SAFETY EQUIPMENT & PPE**
- **PROPER HOUSEKEEPING**
- **PROPER HYGIENE**
- **EMERGENCY PREPAREDNESS**

START WITH THE BASICS

**USE THE BASIC RULES
MORE EFFECTIVELY**
Real World Examples

**Give “real world”
examples
whenever possible
to create a
cognitive category
for the student.**

**Rules may seem obvious
but...**

**Most students are far
removed from the rationale
for many of our existing
common rules**

**WHY ARE YOU TELLING ME THIS? –
THAT WOULD NEVER HAPPEN!**

In 1998 two students were sickened when a classmate added potassium dichromate as a “prank” to the drink they were sharing in chemistry lab

NO FOOD OR DRINKS IN THE LAB

Organic Chemistry Lab (F14)

A student intentionally
“licked” an IR salt plate
when the instructor told him
it was table salt or sodium
chloride

NEVER TASTE CHEMICALS

Experimental Procedure

“While waiting for it to cool, do not eat any soda ash, the name is misleading.”

NEVER TASTE CHEMICALS

A Yale senior died in a freak accident in the campus lab after her hair was caught in a machine

Dailymotion.com

**CONFINE LONG HAIR & LOOSE CLOTHING
REMOVE JEWELRY – DO NOT WORK ALONE**

**USE THE BASIC RULES
MORE EFFECTIVELY**
Rule Rational

**Have numerous
reasons why the
rule is important -
Allows you to
match the rule to
the situation**

Common Rule

Always wear
chemical splash
goggles when
working in a
chemistry
laboratory

Rational for Rule

Your eyes are irreplaceable
– there are no “do-
overs”

You cannot always predict
a potential splash
hazard

The risk from splash
increases with multiple
workers and procedures
occurring in the lab

SAFETY EQUIPMENT & PPE

Common Rule

When moving about in the laboratory anticipate sudden backing up or changes in direction by others

If you should stumble or fall while carrying glassware or chemicals, try to project them away from yourself and others

Rational for Rule

This is known as “situational awareness”

One should be thinking about what is occurring in the lab and what potential hazards are present

Communication with others working in the lab is often required

PROPER CONDUCT/BEHAVIOR

Common Rule

Keep chemicals and apparatus well away from the edges of your laboratory bench or other workspace

Rational for Rule

It is far too easy to knock bottles, beakers, and flasks off the counter

A spilled chemical must be contained and disposed of as hazardous waste – an extra expense for the lab

In addition to the time lost cleaning, the loss of experimental material could result in a project timeline being extended

**SAFE HANDLING OF CHEMICALS
PROPER HOUSEKEEPING**

Common Rule

Never perform
unauthorized
experiments

Rational for Rule

This is linked to managing
change or “change
control”

Changing scope
(conditions, chemicals,
or equipment) without
thought can create a
hazard that one is not
prepared to control

PROPER CONDUCT/BEHAVIOR

Common Rule

Never remove
chemicals or
other
equipment
from the
laboratory

Rational for Rule

When chemicals are used in the proper setting, risk can be controlled, but any chemical used incorrectly has the potential to cause harm

There is no justification for personal use of laboratory chemicals

Removing chemicals from a laboratory is unethical and may be illegal

**PROPER CONDUCT/BEHAVIOR
SAFE HANDLING OF CHEMICALS**

Common Rule

Never pipette by mouth



[India 2011](#)

Rational for Rule

There was a time where pipetting by mouth was common practice in Chemical, Biological, and Healthcare laboratories

It is possible that students may come from countries where mouth pipetting is still practiced

This is much like the “no smoking” signs in airplanes

This technique was phased out by the 1970s in the US...

PROPER CONDUCT/BEHAVIOR

... OR WAS IT?

Photo taken on August 8, 2007

(According to Source)

[Source](#)



EVOLVING THE RULES

Moving From Teaching Lab to Research Lab

**The Safety Rules
should evolve as
students
progress from
instructional
labs into
research labs**

Teaching Lab Rule

Follow all procedural
and safety
instructions
carefully

The Rule Evolved

Teaching lab experiments are
carefully designed and tested –
research has “unknowns”

Do not change procedures without
careful thought as to how this
may affect the hazards of the
chemicals, the energy of the
reaction or processes being used

Following instructions is very
important, but action without
thought can be dangerous also –
question things that don't seem
safe

SAFE HANDLING OF CHEMICALS
SAFE HANDLING OF EQUIPMENT

Teaching Lab Rule

Become thoroughly acquainted with the location and use of safety equipment and facilities such as exits, safety showers, and eyewash fountains

The Rule Evolved

Become an active participant in the maintenance of the safety and engineering equipment (e.g. eyewashes and hoods) in the laboratory
- schedule tasks to various lab workers on a rotating basis

Ensure that showers, eyewashes, and exits are never blocked

Check the fire extinguishers – take a class on their use

EMERGENCY PREPAREDNESS

Teaching Lab Rule

Wear PPE while in the lab

The Rule Evolved

As you begin more self-directed chemical research, the onus on you to protect yourself increases

Research the hazards associated with your chemicals and procedures as you would any other portion of your work so you can be certain your PPE prevents exposure

Actively question your research advisor regarding safety issues

SAFETY EQUIPMENT & PPE

Teaching Lab Rule

Do not work
alone

The Rule Evolved

Ensure that someone
outside the lab knows
what work you are
performing

Review emergency
response procedures

Ensure that someone is
available that
understands the work
you are performing & ER
procedures

**PROPER CONDUCT/BEHAVIOR
EMERGENCY PREPAREDNESS**

SUMMARY

Give students as much information as possible about the relevance and context of safety rules so that they can build new knowledge categories (accommodate knowledge)

Whenever possible, safety rules should evolve as the work becomes increasingly complex and complicated (assimilate knowledge)

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