Make Safety Habits By Finding Your Cues, Routines, and Rewards for Safety

Robert H. Hill, Jr.
Battelle Memorial Institute
Atlanta, GA 30329

Emma June Tillmanns-Skolnik

- ACS 1942-1984
- ICI Americas Research Scientist, Industrial Toxicology, Health & Environmental Affairs
- CHAS Founding Committee: Councilor, Awards Chair, CCS Liaison
- Delaware Section: Councilor, Chair (first woman), Secretary
  - Service award: Tillmanns-Skolnik Award
- Division of Chemical Information: Program Chair, Asst Secretary, Committee on Membership Chair
  - Herman Skonik, Leader; Achievement Award in his name

Eye injury from an explosion[1]

- 1st year Grad student making 1 g diazonium perchlorate
- Explosion, Serious Injuries
- Working alone using metal spatula on open bench
- Wearing ordinary prescription (non-safety) glasses
- Explosion shattered glasses, fragments in cornea.
- Required eye surgery (no permanent damage); lacerations treated

[1] The Safety Zone: More on the UC Berkeley Diazonium Explosion, Sept 15, 2015; Berkely EHS Lessons Learned, May 2015; C&EN, Aug 24, 2015 (V93, #33, p.36

Eye Injury from Explosion

- Graduate student not wearing safety glasses
- Did not follow SOP (signed documentation)
  - Work in hood
  - No metal spatula
  - Not working alone
- Corrective actions
  - ID hazards, use GHS “H” codes;
  - ID controls for high risk
  - Use of perchlorates requires PI’s written advance approval

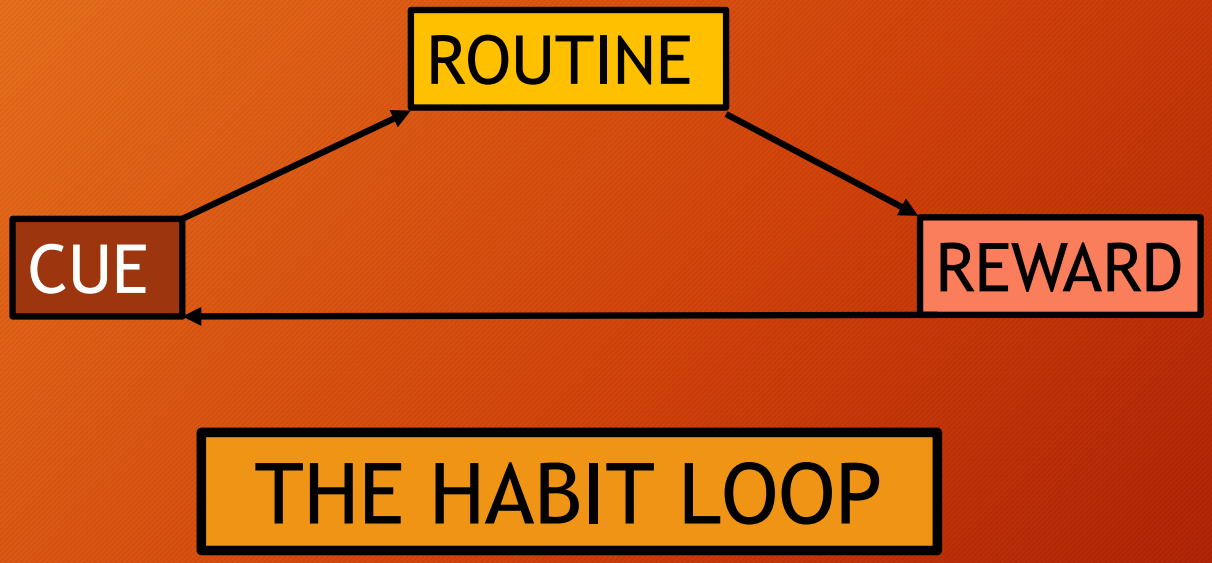
Safety Ethics and Safety Culture

- Underlying (Root) Causes– Not reported but implied
- Student lacked safety knowledge; weak safety ethic
- "Systemic Failure" - Weak safety culture
- PI: How do we make safety "second nature"?
- "*How can we make safety a habit*?"

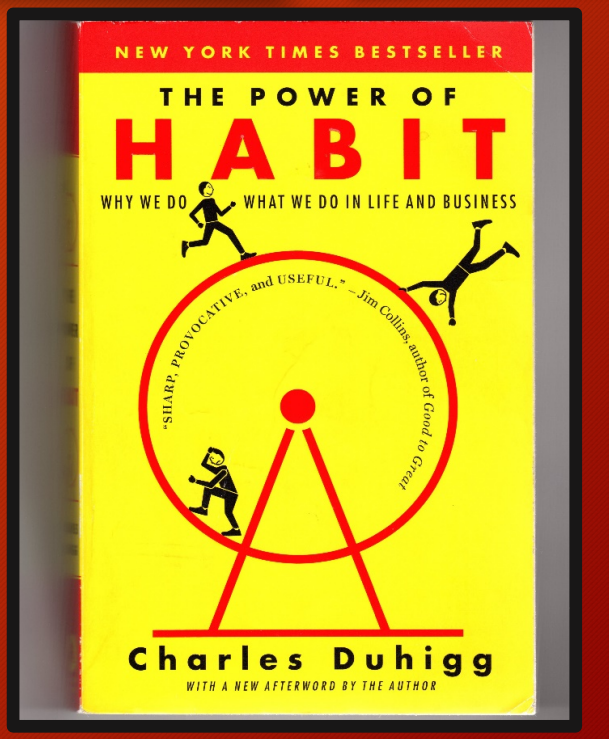
"It's not to the student's benefit if we restrict hypothesis- and curiosity-driven research. But we have to change the culture so that it's second nature to always put on safety glasses and other PPE and to check the SOPs."

Grad Student's PI

The Power of Habit: Why we do what we do in life and business. *Charles Duhigg*



THE HABIT LOOP

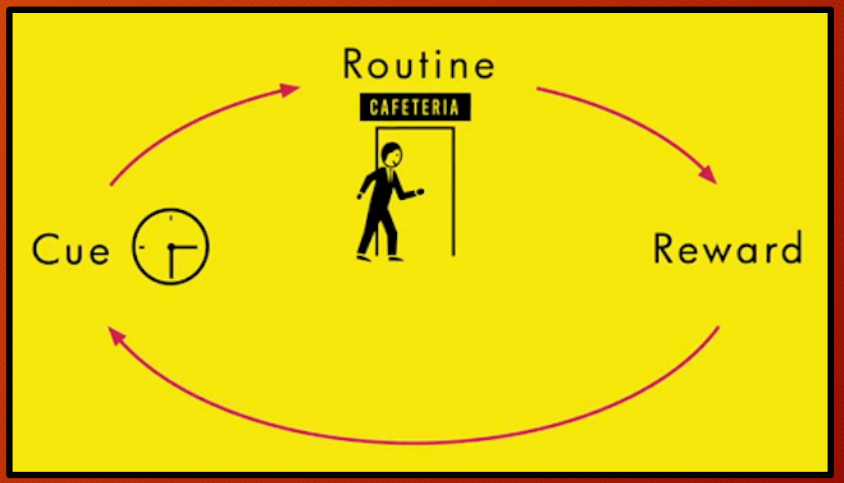


The Habit Loop

- Most “choices” we make are not decisions but habits.
- Duke study: >40% of actions are habits (not decisions)
- Brain wants to reduce effort:
  - Encodes habits
  - Seeks to make any routine a habit, so it can ramp down
- Brain’s dependence on automatic routines can be dangerous
  - Does not recognize habits as “good” or “bad”
- Habits:
  - More automatic with time;
  - Never disappear, but can be ignored, changed, or replaced

THE HABIT LOOP

- Habit loop: 3 steps
  - CUE OR TRIGGER
  - ROUTINE OR ACTION
  - REWARD
- Cues: visual; thoughts sequences; emotion
- Routines: complex or simple
- Rewards: physical or emotional sensations

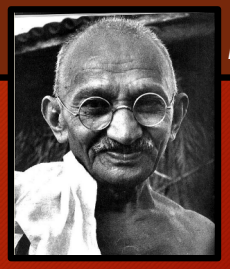


Cue: Time for break
Routine: Go to café for snack
Reward: Food, drink, chats

Creating or Changing Habits

- Creating new habits
  - Create a craving, need for new habit (neurological)
  - Find simple, obvious cue
  - Clearly define reward(s)
- Changing old habits
  - Don't change cue or reward
  - Find alternate routine
  - Must believe change will make a difference (believing critical)
  - Does not mean this is easy; requires determination

Your beliefs become your thoughts,
Your thoughts become your words,
Your words become your actions,
Your actions become your habits,
Your habits become your values,
Your values become your destiny.



Mahatma Gandhi

MAKING SAFETY A HABIT

- Teaching Labs - Rules
  - CUE: Entry to lab
  - ROUTINE: Wearing safety eyeware, closed toed shoes, no shorts, no short skirts, no mid-drifts, tied up hair,….. Etc.
  - REWARD: Allowed to do lab exercises; Completing lab for grade; Not being injured

Making Safety A Habit

- Researchers, Independent Lab Workers Need:
  - More than rules
  - To know WHY!
  - To care about safety beyond basic PPE
  - To understand safety principles, practices
  - To work in a strong, positive safety culture – where safety is continually reinforced by PIs, supervisors, managers
  - To build good safety habits

Making Safety A Habit

- Safety glasses
  - Cue: Box of glasses w/ names at lab entrance
  - Routine: Put them on when entering lab
  - Reward: Keeping themselves safe; following desires/requirements of leaders?
- Lab Coats
  - Cue: Lab coats w/ names at lab entrance
  - Routine: Put them on when entering lab
  - Reward: Keeping themselves safe; following desires/requirements of leaders?

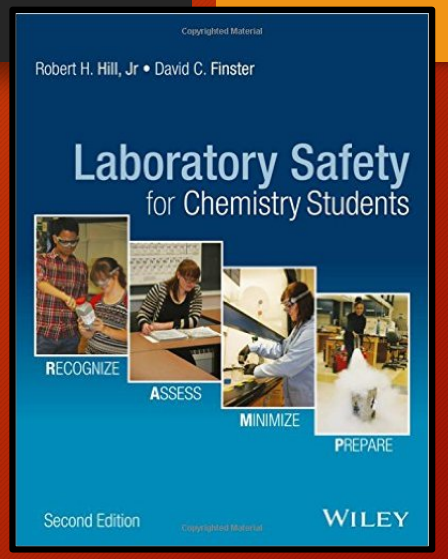
Making Safety a Habit

- Lab air flow
  - Enter lab (cue); Check air flow (routine); Safe entry (reward)
- Using a hood or BSC
  - See hood (cue); Check air flow (routine); Safe for use (reward)
- Walk around lab
  - First daily entry into lab (cue); Check to ensure all is okay (routine); Safe to work (reward)

R.A.M.P Up for Safety

Four Principles of Safety

- **R**ecognize hazards
- **A**ssess the risks of hazards
- **M**inimize the risks of hazards
- **P**repare for emergencies



R Hill, D Finster. *Laboratory Safety for Chemistry Students, 2nd Edition*, John Wiley & Sons, Hoboken, NJ, 2016

R.A.M.P. Up for Safety

- Discuss applying to their lab work
  - Recognize hazards
    - Specific hazards; Understand all hazardous properties
  - Assess the risk of hazards
    - Potential exposure; Consequences
  - Minimize the risks of hazards
    - Controls, practices prevent exposures
  - Prepare for emergencies
    - Need to know how you will respond before emergencies happen

R.A.M.P Up for Safety

- Cue: Open lab notebook
- Routine:
  - Write RAMP in lab notebook daily
  - Circle one letter
  - Add notes about RAMP
- Reward: Maintains safety at forefront

RAMP

Et_2O: peroxides, flammable

HNO_3: corrosive, oxidizer

Liquid N_2: cryogen; potential asphixant

Safety Habits for Principal Investigators

- One-on-one discussions with students/lab investigators about safety
  - Initially (expectations) [Meeting:cue]
  - Appoint mentors to 1st year students/new investigators
  - At least monthly (combine w/ research updates) [Meeting: cue]
- Demonstrate their safety is important
  - Walk arounds wearing appropriate PPE
  - Checking status of research and safety
  - Observe
  - Talk about RAMP

Safety Habits for Principal Investigators

- Have safety moments at every group meeting [cue]
  - Preassigned or impromptu
  - Discuss specific hazards, risk assessments, safety measures,
  - Discuss incidents, direct & root causes, preventive measures
- Seminars/reports (cue)
  - Safety informational moments integral at beginning (students, visiting speakers)
- Rotate safety assignments (timing cue)
  - To mentor others
  - Safety representative to safety committees

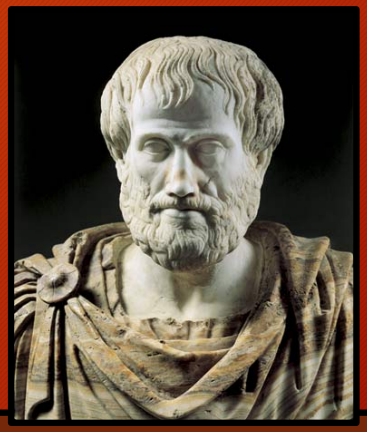
Building Blocks for Strong Safety Cultures

Building Caring Safety Attitudes, Cultures

- Positive attitude about safety
- Developing good safety habits
- Changing habits that devalue safety
- Continuous safety education builds knowledge, caring for safety
- Continuous reinforcement from leaders with expectations, guidance, discussions, requirements for safety
- Actively considering safety in all work

Making Safety A Habit

- MAKING SAFETY HABITS
  - Helps incorporate safety into daily routine
  - Keeps safety at the forefront
  - Keeps us and others safe
  - Builds Strong Safety Cultures



"We are what we repeatedly do. Excellence, then, is not an act, but a habit."

Aristole