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# Why Strong Safety Cultures Use Hazard Analysis

# Not Again, and Again, and …!

- ***Graduate students conducting research – same institution, department***
- *1st Student* Reaction – exploded; acid splash in eyes, severely cut arm
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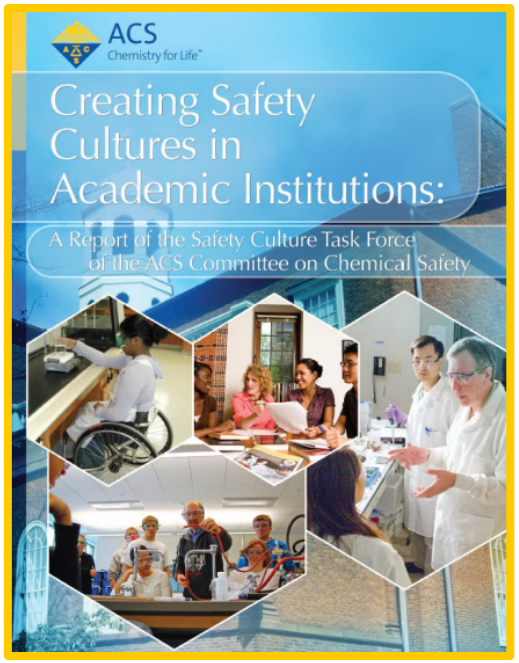
# Strong Safety Cultures

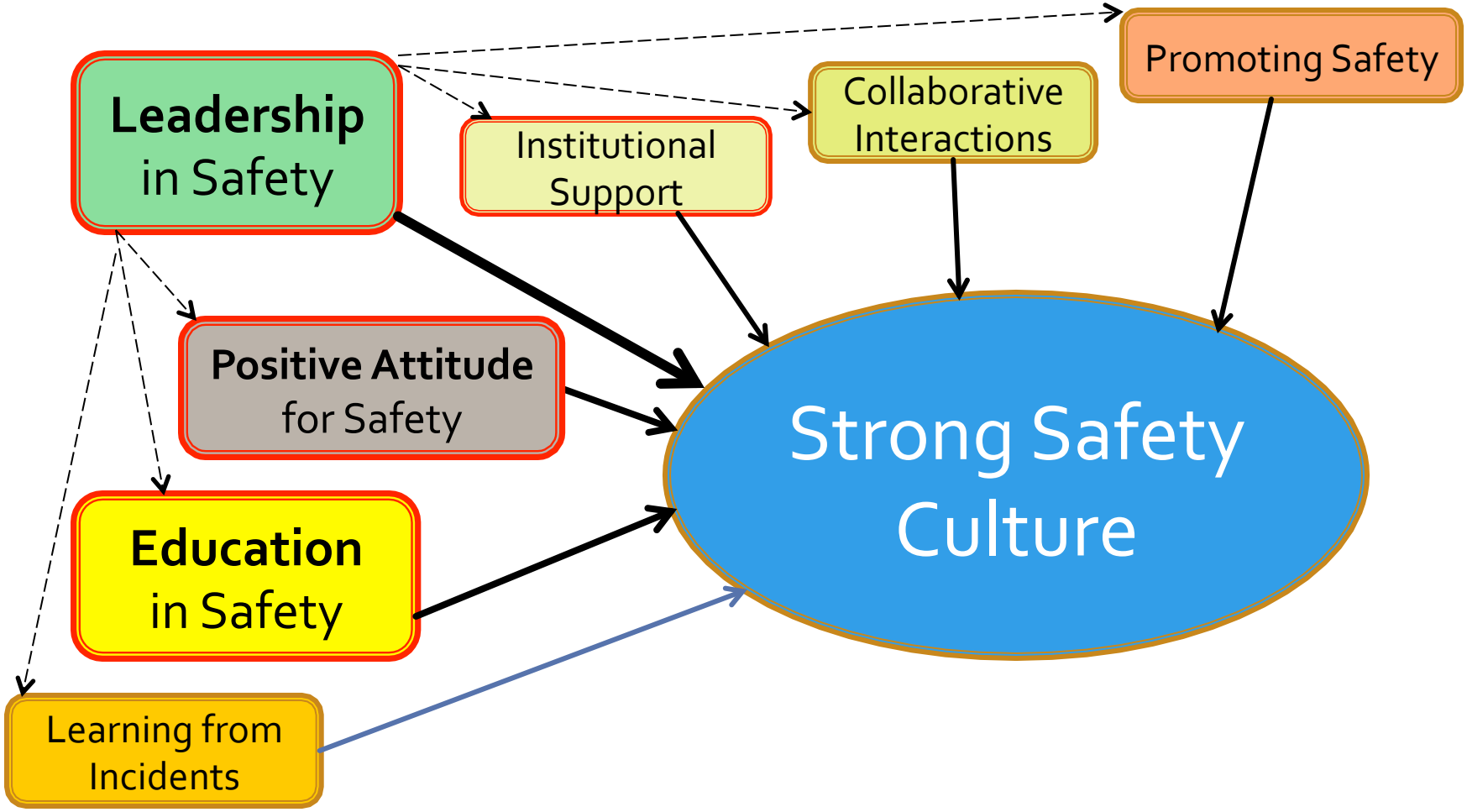
- CCS Task Force 2012
  - *Creating Safety Cultures in Academic Institutions*
- Defines safety culture
- Identifies critical elements
- Recommendations



# Strong Safety Cultures

- U.S. Nuclear Regulatory Commission (NRC)
  - *A reflection of the values, which are shared throughout all levels of an organization, and which are based upon the belief that safety is important, and it is everyone's responsibility.*
  - *An organization's collective commitment, by leaders and individuals, to emphasize safety as an overriding priority to competing goals and other considerations to ensure protection of people and the environment.*

# Elements of Strong Safety Cultures



# Selected Recommendations from Safety Culture Resport

- *Encourage every **leader** to become proponent of safety and safety education, to demonstrate this care for safety in their actions with other staff members and students*
- *Build **awareness and caring** for safety by emphasizing safety throughout the chemistry curriculum*
- *Ensure graduating chemistry undergraduates have **strong skills in laboratory safety** and strong safety ethics by teaching safety lessons in each laboratory session, and by evaluating and testing skills throughout the educational process*
- *Implement **hazards analysis** procedures in all new lab work, especially laboratory research*

# Safety Leadership

*"Leadership is influence."*

**John C. Maxwell**

*"Leadership is the art of getting someone else to do something you want done because they want to do."*

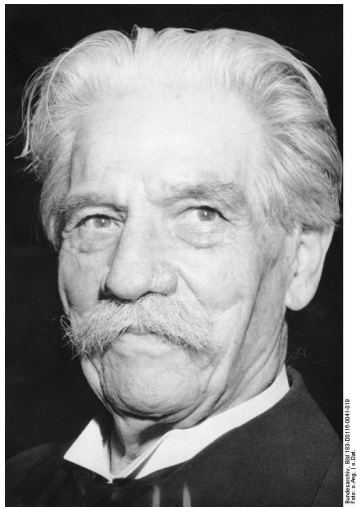
**Dwight D. Eisenhower**

*"Leadership is practiced no so much in words as in attitude and actions."*

**Harold S. Geneen**

# What Leaders Do

- **Leaders – Keys to building strong safety cultures**
  - Lead by example
  - Inspire others to value safety
  - Build trust with open communications
  - Determine direction/emphasis
  - Show active commitment to safety
  - Set safety policies addressing responsibilities, accountability

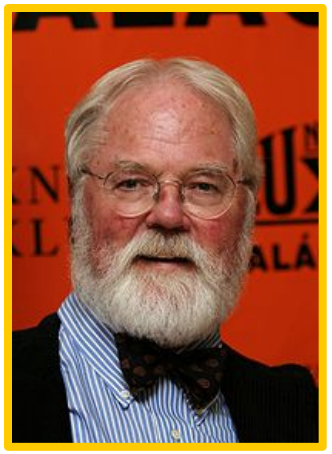


*"Example is the not the main thing in influencing others. It is the only thing."*

**Albert Schweitzer**

# What Academic Leaders Do

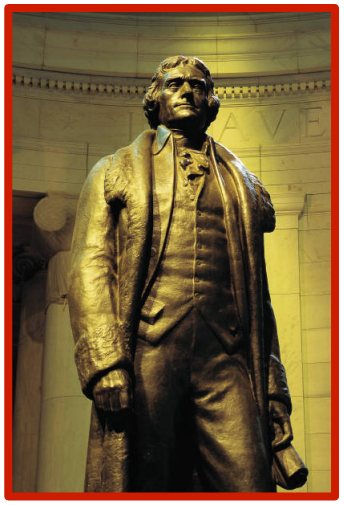
- **Faculty, Lab supervisors, Staff**
  - Responsible for teaching safety
  - Set examples for students
- **Ensure students**
  - Develop strong safety knowledge, skills
  - Learn how to apply the safety process and principles of safety throughout curriculum
  - Learn safety continually during educational process to build strong positive attitude, awareness
  - Use lab safety skills to work independently
  - Test safety knowledge frequently



*"Don't worry that [students] never listen to you; Worry that they are always watching you!"*
**Robert Fulghum**

# Safety Attitude , Awareness

- **Leaders profoundly affect safety attitudes**
- **Positive attitude for safety requires:**
  - Leaders who emphasize safety
  - Believing safety is important, integral to all work, worthy of time
  - Repeated, continuous safety education over the long term
  - Being held accountable for safety
- **Ambivalent, negative attitudes put all at risk**



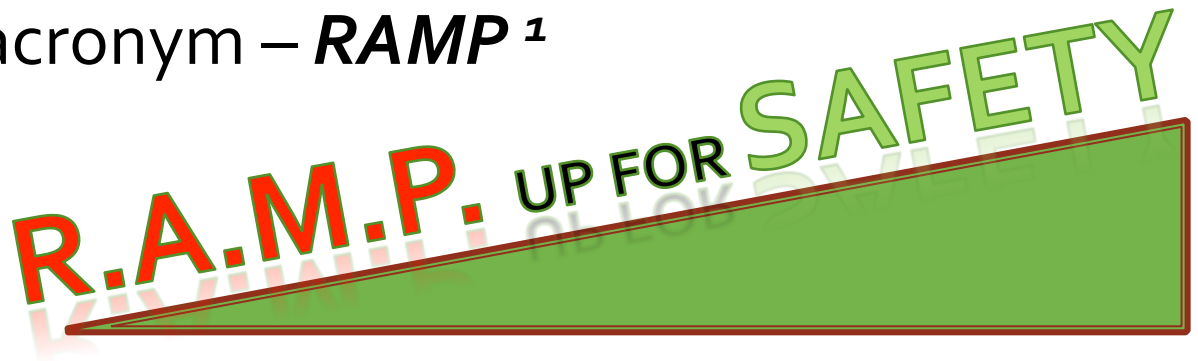
*Nothing can stop the man with the right attitude from achieving his goal; nothing on earth can help the man with the wrong mental attitude.*
**Thomas Jefferson**

# Safety Education

- **Students need in-depth safety knowledge, skills**
- **Teaching approaches**
  - Teach safety topics in each lab session throughout 4 yrs – Best! (suggested topics)
  - Stand alone lab safety course(s)
    - Integrates safety topics into lab sessions during 1st , 2nd yrs
    - Basic safety course in 3rd yr
    - Advanced safety course in 4th yr

# The Safety Process

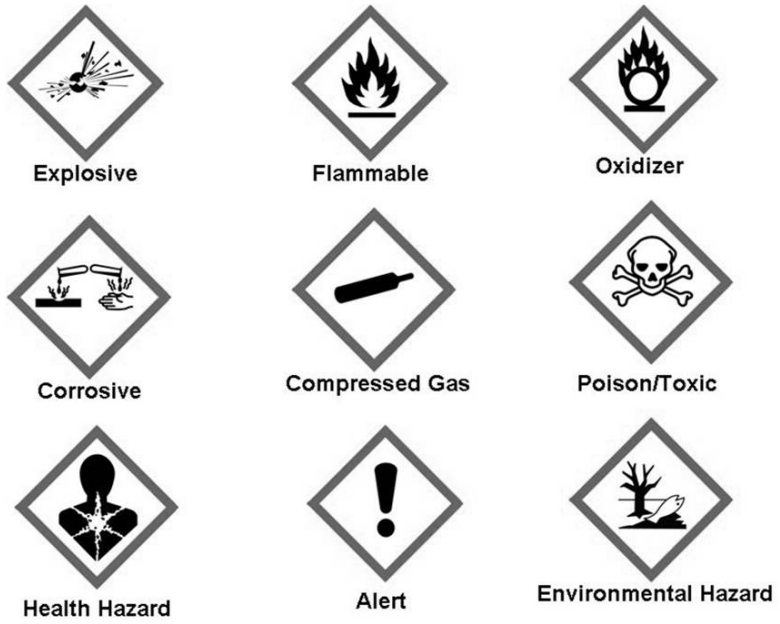
- **"***The Safety Process"* repeatedly applies the Four Principles of Safety
- **Recognize** hazards
- **Assess** the risks of hazards
- **Minimize** the risks of hazards
- **Prepare** for emergencies
- Remember the acronym – ***RAMP*** [1]




[1] R Hill, D Finster. *Laboratory Safety for Chemistry Students*, John Wiley, Hoboken, NJ, 2010

# Recognizing Hazards: 1st , 2nd year undergraduate topics

- Safety language (terms, signs, symbols, labels),
- Hazard information resources (SDSs, other sources)
- Hazard recognition systems – GHS, NFPA
- Introductory toxicology
- Acute toxicity
- Chronic toxicity
- Corrosives
- Flammables
- Fires
- Explosions
- Incompatibles

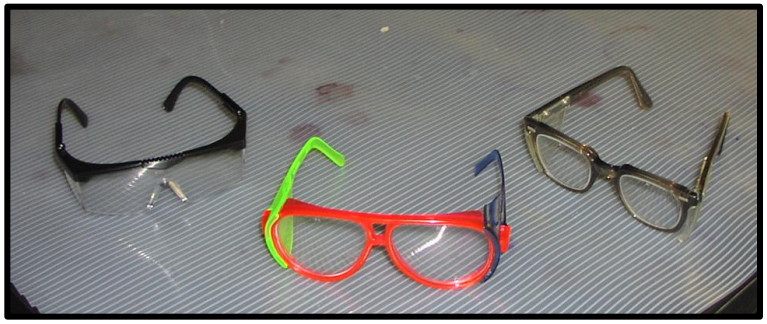


# Assessing the Risks of Hazards: 1st , 2nd year undergraduate topics

- Routes of exposure
- Basic risk assessment
- Evaluating risks of toxic hazards
- Hazard rating systems – GHS & NFPA
- Occupational exposure limits
- Learning lessons from incidents

# Minimizing the Risks of Hazards: 1st , 2nd year undergraduate topics

- Managing risks
- Eye protection
- Skin protection
- Laboratory hoods and ventilation
- Safety standards for safety equipment
- Handling chemical wastes
- Storing flammables and corrosives



# Preparing for emergencies: 1st , 2nd year undergraduate topics

- Responding to emergencies
- Evacuation actions
- Fire emergencies
- Classes of fires
- Fire triangle/fire tetrahedron
- Types of fire extinguishers
- Actions for chemical spills
- Emergency eye washes and safety showers
- Elementary first-aid
- Emergencies with gases

# Recognizing Hazards: 3rd , 4th year undergraduate topics

- How the body handles toxic chemicals
- Carcinogens
- Sensitizers
- Irritants
- Reproductive toxicants
- Peroxides
- Reactive/unstable chemicals
- Compressed gases
- Pressurized systems
- Cryogenics
- Catalysts
- Runaway reactions
- Nanomaterials
- Biological hazards
- Electrical hazards
- Ionizing and non-ionizing radiation
- Laboratory shop hazards
- Chemical hygiene plans
- Housekeeping

# Recognizing Peroxide Hazards

- Why peroxides can be dangerous
- Structure of peroxides, hydroperoxides, superoxides
- Structure activity relationships
- How do peroxides form
- Compounds forming peroxides
- Detecting peroxides
- Treating peroxides
- Storing chemicals that form peroxides
- Emergency actions for peroxide-containing chemicals

# Assessing the Risks of Hazards: 3rd , 4th year undergraduate topics

- Risk assessment tools
- Developing safety plans for experiments
- Working in a new laboratory
- Chemical exposure assessment methods

# Minimizing the Risks of Hazards: 3rd , 4th year undergraduate topics

- Safety for common laboratory procedures
- Radiation safety
- Laser safety
- Biological safety
- Biological safety cabinets
- Protective clothing
- Respirators
- Safety in research laboratories
- Conducing safety inspections
- Managing chemicals
- Chemical inventories and storage
- Advanced chemical waste management
- Process safety
- Safety laws/regulations
- Chemical security

# Preparing for emergencies: 3rd, 4th year undergraduate topics

- Planning for emergencies in experiments
- Emergency response chemistry
- Working with outside emergency responders
- Emergency drills and exercises

# Laboratory Research

- Research by nature
  - Investigates new phenomena, processes, materials
  - Fluid process
  - Changes, adapts to recent results
  - May be risky
- Research hazards:
  - Chemicals, products, processes, equipment, side-reactions


*"Research is what I am doing when I don't know what I am doing."*
***Wernher von Braun***

# What is Hazard Analysis

- *Hazard Analysis* – the process of hazard identification, evaluation, and control

- Applying *Hazard Analysis* to Research
  - Identification – Recognize hazards
  - Evaluation – Assess the risk of hazards
  - Control – Minimize the risk of hazards
  - Prepare for emergencies

# Applying Hazard Analysis to Laboratory Research

- Hazard Analysis Tools
  - Are available
  - Can be adapted to research
  - One tool may not fit all research
  - Must find tool(s) that works best
  - CCS Website: www.acs.org/safety
  - Seek feedback: safety@acs.org

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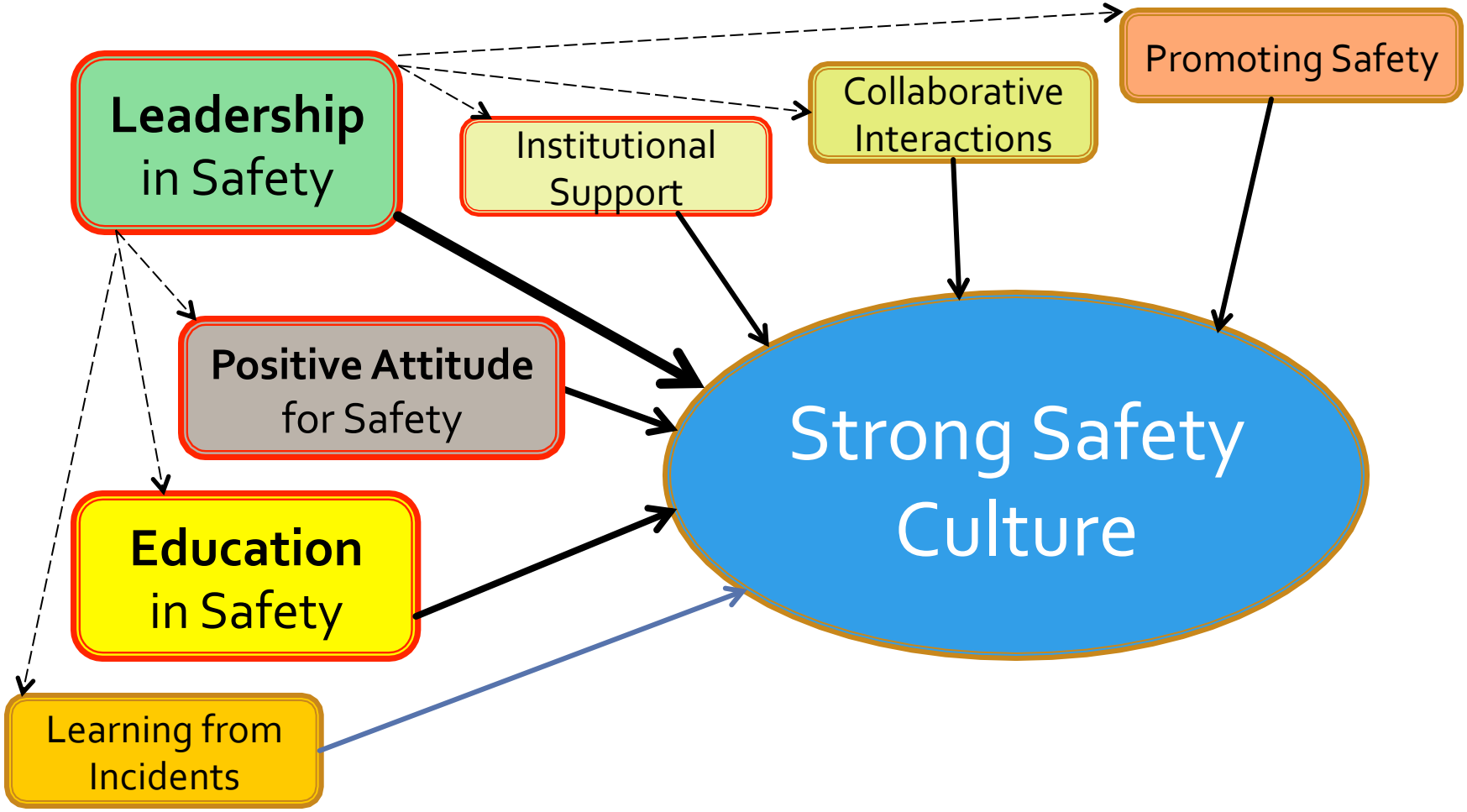
# What Might You Conclude About?



# Why Strong Safety Cultures Use Hazard Analysis

- Safety - integral part of work
- Leaders require safety
- Positive attitudes want safety
- Faculty teach safety
- Researchers apply safety – hazard analysis
- Everyone learns from safety
- **Steps to Prevention!**

*"Prevention is better than cure."*
**Desiderius Erasmus**