James Lindsay – Layton High
Science Education Safety Module
Worksheet 3: Safety Plans

1. What are the common themes to School Safety Plans?

Everyone cooperating and knowing their part in school safety ie Administration, Teachers, Students And Parents

Preventing of accidents
Basic First aid
Chemical spills
Properly maintaining equipment
Proper storage of materials
How to dispose of waste
Hygiene plans
Proper record keeping
Having and knowing how to use the MSDS (Material and safety Data sheets)

2. What are the common themes to Student Safety Contracts?

Type of clothing to wear,
How to handle animals,
How to properly use the lab equipment,
How to properly use the emergency equipment
Wearing and utilizing safety devices,
No Horseplay,
How to use sharp objects like scalpels,
Do not eat or drink in the lab, keep work areas neat,
Work areas must be clean and organized,
Proper disposal of waste, glass etc,
How to handle spills,
Fire safety,
Reporting of any accidents,
Do not smell, taste or touch chemicals.
How to work with electricity and water (Water Pumps) .
Use eye protection when using glass or Rotating Objects
Minimize personal gear off of the table.
Working with hot plates and hot items to prevent burns.
Be careful in dynamic experiments. Projectile or Trajectory experiments should be carefully monitored.
No open toe shoes.

3. What do you think are essential points for a School Safety Plan?

1. Everyone cooperating and knowing their part in school safety. For instance: Administration, Teachers, Students and Parents.

2. Basic common sense as it relates to anything that will prevent accidents such as making sure equipment is properly maintained and materials are properly stored.

3. The plan should also include what to do when accidents do occur. For instance knowledge of basic First aid, what to do for chemical spills

4. What do you think are essential points for a Student Safety Contract

Type of clothing to wear,
How to handle animals,
How to properly use the lab equipment,
How to properly use the emergency equipment
Wearing and utilizing safety devices,
No Horseplay,
How to use sharp objects like scalpels,
Do not eat or drink in the lab, keep work areas neat,
Work areas must be clean and organized,
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Reporting of any accidents,
Do not smell, taste or touch chemicals.
How to work with electricity and water (Water Pumps) .
Use eye protection when using glass or Rotating Objects
Minimize personal gear off of the table.
Working with hot plates and hot items to prevent burns.

5. Create a generalized School Safety Plan:

We liked the one provided on the following site:

www.sde.ct.gov/sde/lib/sde/pdf/curriculum/science/safety/science_safety.pdf

A. Animal Care:

The use of animals in the science classroom can be a very rewarding educational experience. With animals comes humane care and appropriate animal husbandry practices. Abuse, mistreatment and neglect of animals are unacceptable. The following safety precautions should be addressed when dealing with animals in the laboratory:

1. Provide adequately sized cages.
2. Make sure cages are cleaned on a regular schedule.
3. Cages should be locked and in an environmentally comfortable location.
4. Check with the nurse for student allergies and make accommodations as needed.
5. Use gloves when handling vertebrates.
6. Always wash hands with soap and water after handling animals in the laboratory.
7. Immediately report and have medical examination of animal bites.
8. Should an animal die unexpectedly, a veterinarian should be contacted to evaluate the animal.
9. Never have poisonous animals in the laboratory.
10. Only secure animals from reputable suppliers.
11. Dispose of animal waste and cage materials in a hygienic manner.

B. Biotechnology:

Biotechnology is an exciting relatively new area for course work in high schools. The following procedures for working with biotechnology foster a safer learning experience:

1. DNA and microbes should be handled as if they can cause infections.
2. Handwashing hygiene is required before and after laboratory work by washing with antibacterial soap and water.
3. Gloves, chemical splash goggles and aprons are required.
4. Keep fingers away from eyes, nose and mouth.
5. Decontaminate work surfaces before and after laboratory activities and accidental spills.
6. Use only mechanical pipetting. Never use mouth pipetting techniques.
7. Decontaminate all labware such as glassware that was used in laboratory work by soaking in a 10 percent bleach solution for several hours.
8. Prior to disposal of biologicals, destroy all experimental microorganisms.

C. Bloodborne Pathogens:

Bloodborne pathogens are bacteria, viruses and parasites found in human blood and other body fluids (Other Potentially Infectious Materials, or OPIMs). They can infect and cause disease in humans. The two pathogens recently receiving the greatest attention are the Hepatitis B virus (HBV) and Human Immunodeficiency Virus (HIV). Other pathogens that can also be of concern are herpes, meningitis, tuberculosis, Epstein-Barr virus, Lyme disease, malaria and syphilis, to name a few.

Bloodborne pathogens can be transferred by four different ways — direct, indirect, airborne and vector-borne. Direct and indirect are the biggest threat:

Direct — by touching body fluids from an infected person. This includes contact with lesions, open wounds or sores on the skin. Skin lining of the mouth, nose or throat, and eye contact/invasion, are additional avenues.

Indirect — by touching objects that have touched the blood or another body fluid of an infected person.

Allowing students to do blood work is not a prudent laboratory practice, given the risks involved. The Centers for Disease Control, OSHA and other regulatory agencies have clear prudent practices for this purpose.

Based on the means of transmission, life-threatening implications and an individual's right to confidentiality, the potential for bloodborne pathogen infection raises several issues for science teachers in laboratory situations. Although OSHA protects employees and not students, students involved in blood work create an unsafe working environment for employees. The OSHA Bloodborne Pathogen Standard states (29 CFR 1910.1030(d)(1): "Universal precautions shall be observed to prevent contact with blood or other potentially infectious materials." Teachers as employees can just as easily be exposed to bloodborne pathogens from students as they can from other employees. Bloodborne pathogens don't discriminate!

OSHA's Bloodborne Pathogens Standard addresses the blood hazards in the workplace. This standard covers all employees who can "reasonably be anticipated" to have contact with blood and other potentially infectious materials. Science teachers certainly fall under this category and are therefore covered under the bloodborne pathogens standard.

Science teachers, supervisors and their employers need to secure safe alternatives to laboratory activities such as human blood typing, cheek cell sampling and urinalysis.

D. Dissections:

Should plant or animal dissections be used in a class for a laboratory or demonstration, the following safety precautions should be observed:

1. Share the MSDS information with students on the preservative prior to doing any dissection activity.
2. Contact the school nurse to determine if any students have allergies relative to specimen preparation chemicals.
3. Always used chemical splash goggles, gloves and aprons when doing dissection work.
4. Review emergency eye-wash procedures for chemical exposure prior to doing dissection work.
5. Always have the specimen completely rinsed prior to dissection to avoid contact with preservative chemicals.
6. Mount specimens on a dissecting pan in lieu of holding the specimen.
7. Use sharps such as dissection scalpels and blades with caution.
8. Cut away from the body — never toward the body.
9. Never remove any dissected parts from the laboratory.
10. Discard dissected parts in appropriate and labeled waste containers.
11. Always wash hands with soap and water after completing the dissection and cleanup.

E. Electrophoresis:

Electrophoresis is a great opportunity for the laboratory study of DNA sequencing and more. However, electrophoresis units tend to operate at relatively high voltages. The following general safety procedures need to be addressed in dealing with this technology:

1. Avoid physical contact to unintentional grounding points and conductors like metal, water sources and jewelry.

2. Work should be located on nonconducting benches and floors. Rubber mats can serve as an insulating surface.
3. Use only ground-fault circuit interrupt (GFCI) protected electrical receptacles for power.
4. Locate the equipment in places where wires will not cause a trip and fall hazard.
5. Prior to use of equipment, inspect and correct items such as cracks, leaks and frayed wires.
6. Use caution making any physical contact with the apparatus. A thin layer of moisture acts as an electrical conductor.
7. Some electrophoresis devices have cooling components or apparatus. Do not contact any cooling apparatus with a gel as the tubing can be a current conductor. Always directly supervise the use of the equipment.
8. Exercise caution in working with power supplies that produce high voltage surges when first energized. Should the electrophoresis buffer spill or leak, stop the operation and clean up the spill immediately.
9. Use and post appropriate "Danger – High Voltage" warning signage on power supply and buffer tanks.
10. Upon completion of work, always wait 15 seconds for capacitor discharge after shutting off the power supply before making any disconnections or connections.

F. Field Activities:

Field experiences in biology classes help provide applications to classroom curriculum studies. In preparing for a field experience, the following safety preparations and precautions should be taken:
1. In planning for field work, review board of education field trip policies.
2. Secure information from parents and the school nurse relative to student medical needs, allergies and contact information.
3. Written permission to obtain help for special needs should also be secured in advance.
4. If laboratory chemicals are used during the field work, MSDS sheets are required on the trip.
5. Communications are essential during field work. Bring a cell phone or two way long range radio to keep in touch with the school.
6. West Nile virus, Lyme disease and other insect-borne diseases are real threats. Use appropriate dress (long sleeve shirts, pants, closed-toe shoes or sneakers) and repellents for insects. Make sure that you've informed parents in advance about the use of repellents, so that potential allergies can be avoided.
7. Have a behavior contract that everyone understands, with consequences that everyone will support.
8. Use chemical splash goggles and gloves when working in the field with river, pond or lake water, water testing chemicals and any other materials/activities that may prove hazardous to the eyes.
9. Use good sun sense by having students and teacher wear long sleeves, long pants, large-brimmed hats, sunglasses and sunscreen (SPF 30 minimum).

G. Heat Sources:

1. Autoclaves/Pressure Cookers

Autoclaves can be dangerous given high pressures and temperatures. Apply the following safety precautions when using autoclaves:
a) Inspect the autoclave door and gaskets to make sure they are firmly locked in place.
b) Post signage on autoclave warning of "hot surfaces, keep away."
c) Never place combustible or flammable materials near or on the autoclave.
d) Wear heat-resistant gloves, apron and chemical splash goggles.
e) Do not leave the autoclave unattended during operation.
f) Shut down the autoclave should there be any indication of a leak.

Pressure cookers are less expensive than autoclaves and may be useful in simple laboratory sterilization procedures. They can be equally as dangerous as autoclaves at high pressures and temperatures. When using pressure cookers, follow these safety hints:
a) Older pressure cookers have fewer safety features and have the potential to explode if not operating correctly. Always inspect the device to make sure clamps are securely attached, the gasket seal is in place, and the vent tube is clear.

b) Make sure the vent tube is clear and operational.
c) Never touch the cooker until it is cooled down.
d) Never leave the cooker unattended during operation.

2. Bunsen Burners

Bunsen burners can be dangerous as a heat source, given their hot flame. Use the following safety hints for a safer operation:

a) Make sure hair is tied back.
b) Always wear chemical splash goggles.
c) Light the burner at arms length using an igniter or splint.
d) Do not operate the burner with acrylic nails.
e) Never leave the burner unattended.
f) Do not touch the burner until it has had time to cool off.
g) Do not operate the burner while igniting it.

3. Hot Plates

Hot plates are a major heat source in biology laboratories. They are easy to operate and less dangerous than gas burners.

a) Always inspect wiring on hot plates before use. Make sure insulation is in place and all prongs are on the plug.
b) Plug the hot plate into a GFCI protected wall receptacle.
c) Never touch a hot plate that has been in operation until it cools.
d) Never tie the cord around a heated hot plate.
e) Never leave a hot plate unattended.

B. Microbes:

Microbe study in the laboratory requires special precautions given the opportunity of pathogenic bacteria exposure. The following safety protocols should be enforced:

1. Personal protective equipment such as chemical splash goggles, lab coat or apron, and gloves are required during the laboratory activity.
2. Make sure all skin scratches and cuts are covered with bandages.
3. Before and after laboratory activities, wash the work area with disinfectant.
4. Absolutely no food or drink is allowed in the laboratory.
5. Keep sources of potential contamination such as pencils, hands and laboratory equipment away from body orifices such as mouth, ears and nose to prevent potential contamination.
6. Have disinfectant tray available for the discard of contaminated equipment such as pipettes, petri dishes and more.
7. Should there be an accidental spill of microbial organisms, immediately contain it with dry paper towels. Sterilize the paper towels and disinfect the area of the spill.
8. Report any accidents immediately to the instructor.
9. Only laboratory grade cultures from a reputable scientific supplier should be used in the laboratory. No general survey collections should be cultured given the danger of pathogenic organisms. An effective alternative can be commercially prepared slides.
10. All bacteria cultures and petri plates should be autoclaved or microwaved prior to disposal.
11. Wash hands with antibacterial soap and water after completing the laboratory work and cleaning up.

C. Microwaves:

Microwave ovens can be used as both a heating source and decontamination device. Simple safety precautions include the following:

1. Never operate the microwave oven when empty.
2. Always check the door seal prior to use to make sure it does not have a breach.

3. Persons with pacemakers should not be near the oven when operating.
4. Never place metal objects such as aluminum foil in the oven.
5. Do not put face near the oven door while operation.
6. Make sure the inside surface of the microwave is clean.
7. Post proper signage warning of microwave use.

D. Plants:

The study of plants is both interesting and relevant to everyday life from food sources, oxygen production and energy sources. However, plants can also produce toxic substances that can put human life in harm's way. Be certain to follow the following safety plan when dealing with plants in the laboratory:

1. Check with the school nurse for potential allergy issues for students. Make accommodations as necessary.
2. Wear safety splash goggles, gloves and aprons when working with plants.
3. Never have poisonous plants or plants producing allergens in the laboratory.
4. Inform about the difference between edible and nonedible plants
5. No plant part should be tasted without specific direction from the teacher.
6. No parts of plants should be burned that have allergen-type oils such as poison ivy and poison oak.
7. Wash hands with soap and water after working with plants.

E. Refrigerator:

1. Never store food in any refrigerator or freezer used to store chemicals.
2. Refrigerators and freezers should be cleaned out on a regular basis.
3. Containers placed in a refrigerator or freezer should be completely sealed or capped, securely placed and labeled.
4. Avoid capping materials with aluminum foil, corks and glass stoppers.
5. All liquid chemicals should be stored in plastic trays.
6. All specimens should be stored in plastic bags with labels.
7. All items stored are to be appropriately labeled.
8. Review inventory on refrigerator/freezer contents to ensure compatibility of the contents.
9. Store only chemicals in amounts needed over a reasonable amount of time. Each chemical has a shelf-life and decomposition products that could be hazardous.
10. Remember that power outages and technology failure can have an impact on stored contents. Be aware of unusual odors or vapors.
11. Do not use glass beakers as lids for bottles.
12. Do not stack materials too high. Petri dishes/plates should be taped together and placed in a plastic bag.
13. Do not use graduated cylinders or volumetric flasks to store materials.
14. Refrigerators/freezers should be periodically inspected (i.e., at least monthly).
15. Post an up-to-date inventory on the refrigerator door.
16. If potentially infectious material is spilled, clean immediately with a disinfectant agent such as 70 percent isopropyl alcohol. Then, wipe down the area with soap and water.
17. The refrigerator/freezer must be properly grounded and a permanent installation (i.e., no extension cords).
18. The refrigerator/freezer must be located away from lab exits.

6. Create a Student Safety Contract that you would actually use in your classroom:

Student and Parent
(flinn safety contract)

A modified Physics version:

Physics Student Safety Contract

Lab work is the key to progress in science. Therefore, systematic, careful lab work is an essential part of any science program. In this class, you will practice some of the same fundamental laboratory procedures and techniques that experimental physicists use to pursue new knowledge.

The equipment and apparatus you will use involve various safety hazards, just as they do for working physicists. You must be aware of these hazards. Your teacher will guide you· in properly using the equipment and carrying out the experiments, but you must also take responsibility for your part in this process. With the active involvement of you and your teacher, these risks can be minimized so that working in the physics laboratory can be a safe, enjoyable process of discovery.

These safety rules always apply in the lab

1. **Always wear a lab apron and safety goggles**.

Wear these safety devices whenever you are in the lab, not just when you are working on an experiment.

2. **No contact lenses in the lab.**

Contact lenses should not be worn during any investigations using chemicals (even if you are wearing goggles). In the event of an accident, chemicals can get behind contact lenses and cause serious damage before the lenses can be removed. If your doctor requires that you wear contact lenses instead of glasses, you should wear eye-cup safety goggles in the lab. Ask your doctor or your teacher how to use this important eye protection.

3. **Personal apparel should be appropriate for laboratory work.**

On lab days avoid wearing long necklaces, dangling bracelets, bulky jewelry, and bulky or loose-fitting clothing. Long hair should be tied back.

Loose, dangling items may get caught in moving parts, accidentally contact electrical connections, or interfere with the investigation in a potentially hazardous manner. In addition, chemical fumes may react with some jewelry, such as pearls, and ruin them. Cotton clothing is preferable to wool, nylon, or polyester. Wear shoes that will protect your feet from chemical spills and falling objects-open-toed shoes or sandals,
and shoes with woven leather straps are not allowed in the laboratory.

4. **NEVER work alone in the laboratory**.

Work in the lab only while under the supervision of your teacher. Do not leave equipment unattended while it is in operation.

5. **Only books and notebooks needed for the experiment should be in the lab.**

Only the lab notebook and the textbook should be used. Keep other books, backpacks, purses, and similar items in your desk, locker, or designated storage area.

6. **Read the entire experiment before entering the lab.**

Your teacher will review applicable safety precautions before the lab. If you are not sure of something, ask your teacher about it.

7. **Always heed safety symbols and cautions written in the experimental investigations and handouts, posted in the room, and given verbally by your teacher.**

They are provided for your safety.

8. **Know the proper fire drill procedures and the location of fire exits and emergency equipment.**

Make sure you know the procedures to follow in case of a fire or an emergency.

9. **If your clothing catches on fire, do not run;**

WALK to the safety shower, stand under it, and turn it on.

Call to your teacher while you do this.

10. **Report all accidents to the teacher immediately, no matter how minor.**

In addition, if you get a headache, feel sick to your stomach, or feel dizzy, tell your teacher immediately.

11. **Report all spills to your teacher immediately.**

Call your teacher rather than trying to clean up a spill yourself. Your teacher will tell you if it is safe for you to clean up the spill; if not, your teacher will know how the spill should be cleaned up safely.

12. **Student-designed inquiry investigations, such as the Invention Labs in the Laboratory Experiments manual, must be approved by the teacher before being attempted by the student**.
13. **DO NOT perform unauthorized experiments or use materials and equipment in a manner for which they were not intended**.

Use only materials and equipment listed in the activity equipment list or authorized by your teacher. Steps in a procedure should only be performed as described in the textbook or lab manual or approved by your teacher.

14. **Stay alert in the lab, and proceed with caution**.

Be aware of others near you or your equipment when you are performing an experiment. If you are not sure of how to proceed, ask.

15. **Horseplay in the lab is very dangerous.**

Laboratory equipment and apparatus are not toys; never play in the lab or use lab time or equipment for anything other than their intended purpose.

16. **Food, beverages, and chewing gum are NEVER permitted in the laboratory.**

17. **NEVER taste chemicals. Do not touch chemicals or allow them to contact areas of bare skin.**

18. **Use extreme CAUTION when working with.**
hot plates or other heating devices.
Keep your head, hands, hair, and clothing away from the flame or heating area, and turn heating devices off when they are not in use. Remember that metal surfaces connected to the heated area will, become hot by conduction. Gas burners should be lit only with a spark lighter. Make sure all heating devices and gas valves are turned off before leaving the laboratory. Never leave a hot plate or other heating device unattended when it is in use. Remember that many metal, ceramic, and glass items do not always look hot when they are hot. Allow all items to cool before storing.

19. **Exercise caution when working with electrical equipment**.
Do not use electrical equipment with frayed or twisted wires. Be sure your hands are dry before using electrical equipment. Do not let electrical cords dangle
from work stations; dangling cords can cause electrical shocks and other injuries.

20. **Keep work areas and apparatus clean and neat.**
Always dean up any clutter made during lab work, rearrange apparatus in an orderly manner, and report any damaged or missing items.

21. **Always thoroughly wash your hands with soap and water at the conclusion of each investigation.**

Safety Symbols

The following safety symbols will appear in the laboratory experiments to emphasize additional important areas of caution. Leam what they represent so you can take the appropriate precautions. Remember that the safety symbols represent hazards that apply to a specific activity, but the numbered rules given on the previous pages apply to all labs.

 **Waste Disposal**

· Never put broken glass or ceramics in a regular waste container. Use a dustpan, a brush, and heavy gloves to carefully pick up broken pieces, and dispose of them in a container specifically provided for this purpose.

· Dispose of chemicals as instructed by your teacher. Never pour hazardous chemicals into a regular waste container. Never pour radioactive materials down the drain.

 **Heating Safety**

· When using a burner or hot plate, always wear goggles and an apron to protect your eyes and clothing. Tie back long hair, secure loose clothing and remove loose jewelry.
· Never leave a hot plate unattended while it is turned on.

· Wire coils may heat up rapidly during this experiment. If heating occurs, open the switch immediately and handle the equipment with a hot mitt.
· Allow all equipment to cool before storing it.

· If your clothing catches on fire, walk to the emergency lab shower and use the shower to put out the fire.

 **HandSafety**

· Perform this experiment in a clear area. Attach masses securely. Falling, dropped, or swinging objects can cause serious injury.

· Use a hot mitt to handle resistors, light sources, and other equipment that may be hot. Allow all equipment to. cool before storing it.

 **Glassware Safety**

· If a thermometer breaks, notify the teacher immediately.

· Do not heat glassware that is broken, chipped, or cracked. Use tongs or a hot mitt to handle heated glassware and other equipment that may be hot.
Allow all equipment to cool before storing it.

· If a bulb breaks, notify your teacher immediately.
Do not remove broken bulbs from sockets.

 **Electrical Safety**

· Never dose a circuit until it has been approved by your teacher. Never rewire or adjust any element of a closed circuit.
· Never work ·with electricity near water. Be sure the floor and all work surfaces are dry.
· If the pointer on any kind of meter moves off scale, open the circuit immediately by opening the switch.

· Do not work with any batteries, electrical devices, or magnets other than those provided by your teacher.

 **Chemical Safety**

· Do not eat or drink anything in the laboratory.
Never taste chemicals or touch them with your bare hands.

· Do not allow radioactive materials to come into contact with your skin, hair, clothing, or personal belongings. Although the materials used in this lab are not hazardous when used properly, radioactive materials can cause serious illness.

Clothing Protection

· Tie back long hair, secure loose clothing, and remove loose jewelry to prevent their getting caught in moving or rotating parts or coming into contact with hazardous chemicals.

Eye Protection

· Wear eye protection, and perform this experiment in a clear area. Swinging objects can cause serious injury.

· Avoid looking directly at a light source. Looking directly at a light source may cause permanent eye damage.