FLINN ELEMENTARY SCIENCE AND STEM SAFETY

FLINN SCIENTIFIC

THE COMMON SAFETY CONCERNS IN ELEMENTARY SCIENCE AND STEM

2020

Science in Elementary School is all about DISCOVERY and EXCITEMENT!

Flinn Scientific understands that the elementary has an innate curiosity about the world surrounding them.

Most students in grades 1-6 are not overly concerned with safety practices and are more focused on learning about science concepts and doing fun and cool ‘science experiments’.

With the emphasis on design-inquiry learning outcomes, sometimes students have great visions of their solutions, but are not always mindful of the safety protocols in place.

Basic Safety Protocols in Elementary School

Being proactive (prevention) is the best remedy to any situation. Teachers modelling proper behaviors in the classroom (wearing goggles or gloves) is a solid foundation towards setting the culture in the classroom. Safety exists as a standard in the workplace – and so it should be the same standard in the school classroom.

Additionally, teachers having an awareness of the potential hazards that exist with the use of tools, science equipment and apparatus, and especially with the use of chemicals is very important. Make sure that the students are washing hands often and that you sanitize all equipment and tools prior and post usage with the class. This is the new normal.

Teachers should be able to properly recognize safe procedures in the classroom and to identify areas of concern to minimize the risk of injury to students. This is often referred to as a 'Hazard Identification or Assessment' across various platforms of teaching.

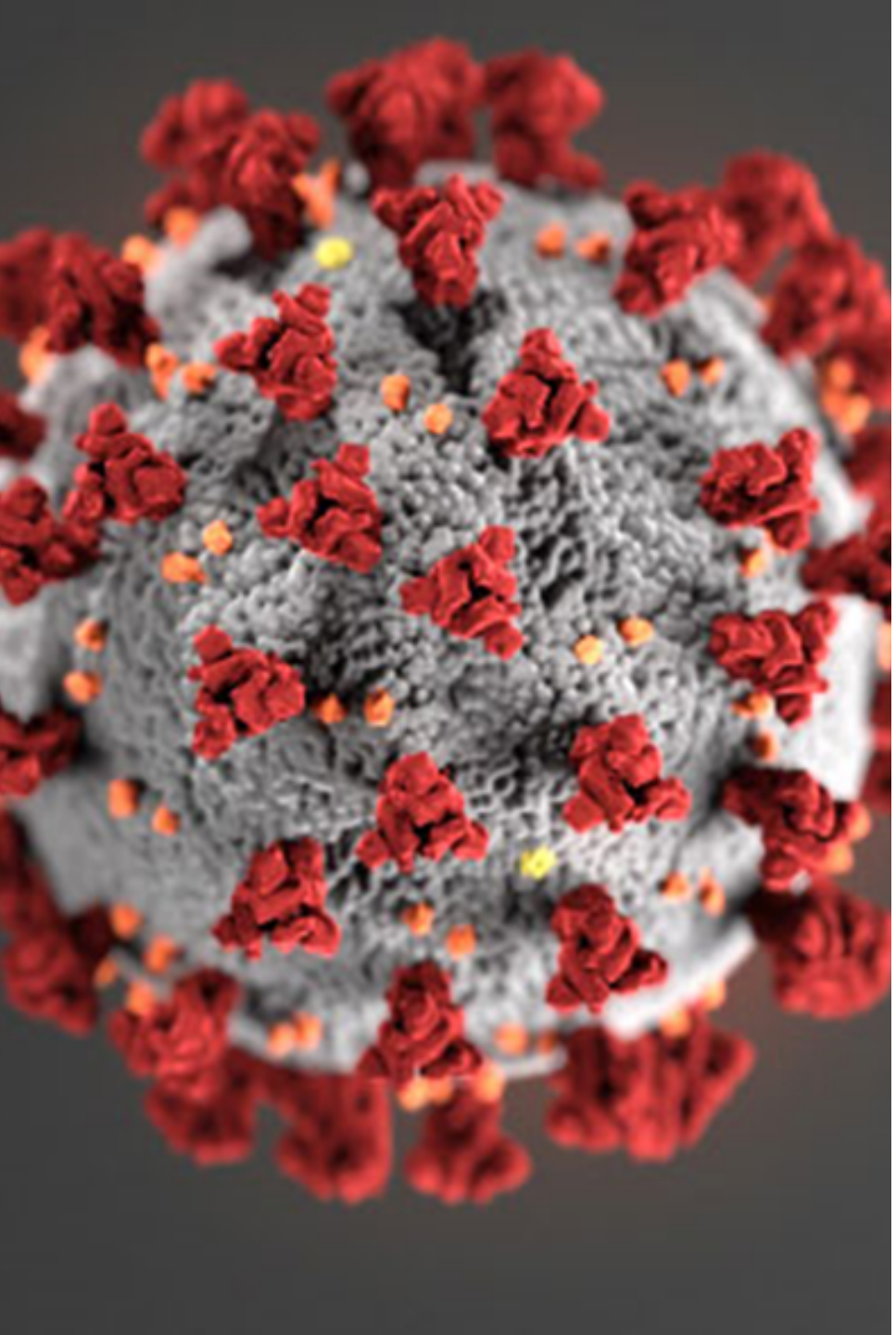
What types of preventative measures can we take to minimize the spread of a contagious virus?

Wash your hands! It seems very basic, but this is highly effective mechanism to prevent this virus from spreading through contact. 20 seconds of rigorous hand washing is the accepted amount of time. Soap and water is ideal, followed by alcohol-based sanitizer gels or liquids if you cannot access soap and water.

Sanitize your mobile phone, computer keyboard and work area. Use a disinfectant wipe to thoroughly clean your workspace before and at the end of your work or school day. Viruses can survive on surfaces for long periods of time. The same applies to the science equipment and hand tools used in the STEM classroom. Be vigilant about cleanliness.

Social distancing has also proven effective since maintaining a safe distance from a person who is coughing or sneezing (1m or 3 feet or more) minimizes the potential that the small liquid droplets released by the sick person will be inhaled or absorbed by you. The COVID-19 virus could be inside the droplets – so be mindful for your sake!

1. CDC Considerations for Schools



Prevention – continued

Don’t touch your face, eyes, ears, nose or mouth. Your hands are in contact with many surfaces and these are all potential sources of the Coronavirus or similar virus. By then touching your face and other organs, you increase the chance of contaminant transmission to your body and getting sick. It’s amazing how often you touch your face in an average day. This is why sanitizing your classroom is important and non-negotiable in the STEM environment including items used. Students are not always the most sterile people.

Make sure you and your students cough or sneeze into your elbow or some tissues. Seems simple, but it minimizes the droplets being distributed and increasing the chance of viral spread. Employing common sense hygiene techniques are effective. The virus can survive on your hand, clothing smartphone and work area tools and utensils for hours and potentially days just waiting to be transmitted through touch. Ensure your students follow your lead in this action.

1. CDC Considerations for Schools

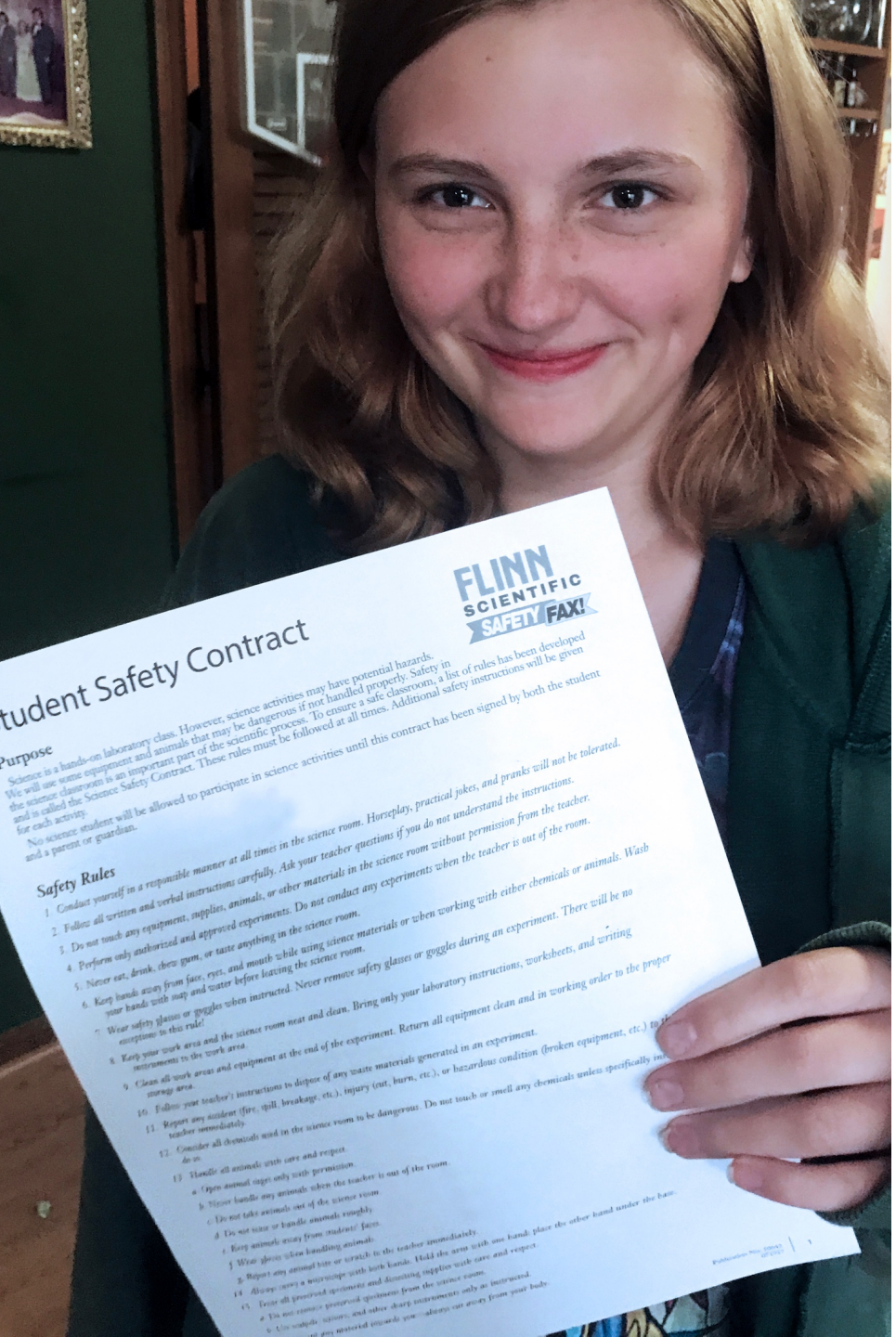
How Can You Minimize Potential Risks/Injury in the Classroom?

1. Teacher training and planning-ahead for science / STEM activities can help to mitigate possible risks/hazards/injury.
   - Could you identify the safety hazards in the activities you have planned?
   - Did you sanitize/disinfect the tools and equipment prior to use?
2. By planning for the classroom materials you will use and where they will be placed/handed out to the class
   - Do you typically leave materials in one area and let students work independently or do you employ station-based learning?
   - Did you sanitize/disinfect the tools and lab equipment prior to storing them away?
3. Teachers need to demonstrate proper safety practices (scissors, tools, sharp blades, goggles etc.) and tell students why these are critically important rules to be followed.
   - Do you review the instructions with your classroom prior to the activity?
   - Demonstrate washing hands and sanitizing work spaces often and ensure students do the same.
4. Teachers should also plan for potential problem situations and how to manage them.
   - Do you practice fire drills? How about safety rules if a student was injured? Consider a role-play activity for students around safety.

How Can You Minimize Potential Risks/Injury in the Classroom?

Teachers should make sure there are first aid kits, fire extinguisher, adequate PPE (goggles/gloves/aprons/ear plugs), hand sanitizers & soap available and ready prior to conducting any science/STEM investigation.

- Do you know how to use each of these safety items? Insist on proper handwashing and sanitizing of equipment and spaces.
- The best teachers look at the cradle-to-grave aspect of the activity including how/where/when the materials are distributed / collected / wastes disposed / post-activity procedures such as hand washing and return of all PPE (personal protective equipment)
- Do you plan your lessons with an emphasis on safety? Do you structure your learning as stations or desk-based locations?



Use of a Safety Contract (Rules) with Students

Please review a copy of the Flinn elementary science & STEM safety contract. One has been provided to you. You can download a complimentary version here: **Lab Safety STEM Contract**

You should adopt the practice of providing and reviewing a safety contract with your students that is age and grade-level appropriate.

Make sure that you discuss each safety point with your class and also reiterate these prior to conducting the science / STEM activities that these specific safety rules apply.

You may need to make accommodations for certain students based on their learning styles, skill sets, abilities and more. Make sure that safety remains a primary concern for the class and activity.

Other safety considerations for Elementary Teachers

Teachers and students both love the excitement that accompanies the exploration of the natural world – biology – ecology – geology – chemistry – physics – engineering – technology and more. The innate curiosity in students is inspiring and fuels future innovation and understanding!

This is the baseline for problem-solving and scientific discovery for years afterwards. That reason alone is the driving force for elementary science and STEM programs.

Teachers need to be mindful about activities that they see online and when considering what lessons will be the most impactful in the classroom, they should only use trusted, reliable sources for activities or use of kits. Responsible school suppliers will always identify safety concerns and clear usage instructions that are student friendly and safe.

Know your Personal Protective Equipment (PPE)

Goggles – different kinds for different applications (Impact vs Chemical Splash type)

Gloves - for different purposes

Aprons / Lab Coats

Ear protection

Student behavior in the lab

Handwashing & Sanitizing as well as Social Distancing need to be considerations in your classroom / lab now.

Bubble suits are highly ineffective as protective equipment

Goggles—One Pair for Each Person in the Room!

Ensure that you are using the correct goggles for the application. If you are not using any chemicals or liquids, and only observing phenomena, you can use certified impact goggles.

Once you do start using or looking at chemicals, liquids, or biologicals, please use ANSI Z87.1 certified indirect vent chemical splash goggles for safety. This is a requirement under OSHA.

Wearing goggles for any science activity naturally makes students consider some element of safety. Flinn recommends always wearing goggles when performing any aspect of science inquiry.

Goggles for Everyone!!!

Gloves

It is a best-practice to wear gloves for certain activities in the science program, just make sure that they are the correct ones for the application.

Vinyl gloves are typically fine for many investigations. Nitrile gloves are better than latex and do not have the associated allergy concerns.

Sometimes you need gloves to offer protection from cold / heat and you should use appropriate gloves for these activities. Ask if you're unsure.

When handling any plant or animal specimens, it is recommended to wear gloves to prevent any accidental exposure and as a best-practice against contamination etc.

Aprons and Lab Coats

Flinn highly recommends using a lab coat or an apron when conducting activities that have any potential for spills or that involve the use of chemicals. In the workplace, these are non-negotiable!

The aprons should be age and grade level appropriate and not necessarily the same ones used in a high school or a college level laboratory. There are rolls of ‘re-useable’ aprons available from reliable suppliers that will work for most elementary applications or light-duty versions that can be purchased as well.

Ear Protection & Common-Sense Safety

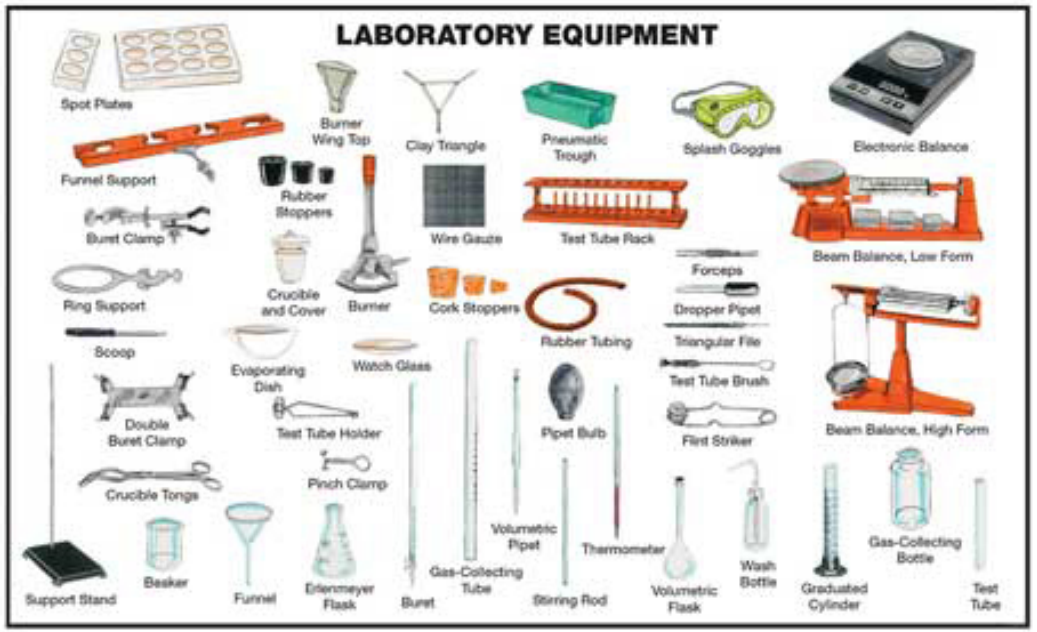
Ear protection is necessary as a safety item when there will be loud or noisy situations above 85 decibels. Most schools use ear plugs or purchase a few pairs of ear muff style protectors for these situations.

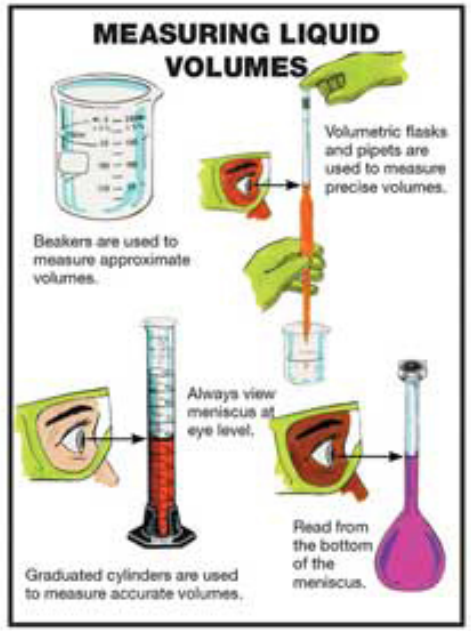
Have students with long hair keep their hair tied back to minimize the possibility of injury.

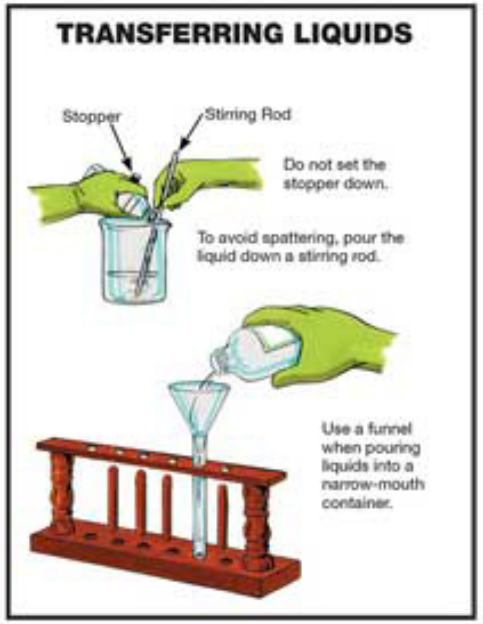
Have students with baggy or loose clothing be mindful around science equipment / tools and while doing STEM investigations.

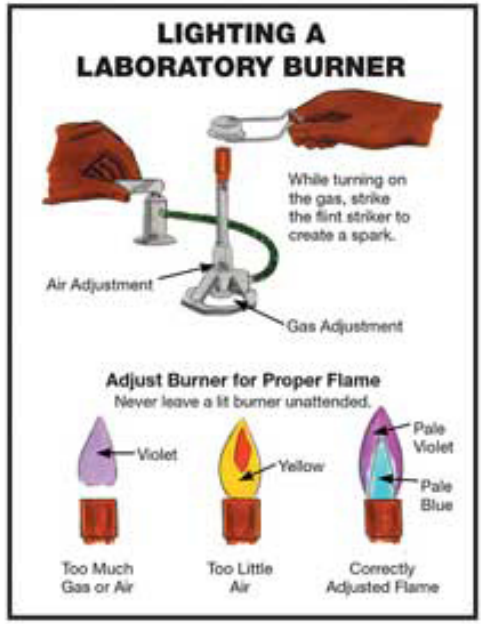
Clear away clutter and school bags, textbooks, and miscellaneous items from working areas to minimize slips, trips and falls as well as providing a clean science investigation zone for observations etc.

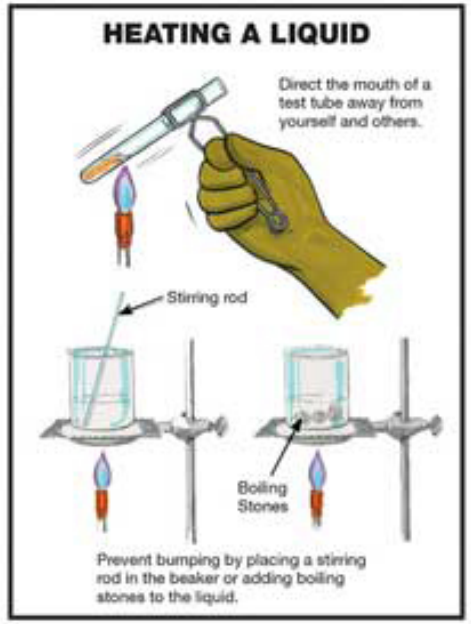
Know Your Science Equipment, Apparatus, Materials and Tools in the Elementary STEM Classroom











FLINN Laboratory Techniques Guide

Common Science Equipment Used in Elementary Science & STEM Programs

Can you identify the most common pieces of science and laboratory equipment used?

Do you know how to safely use them? Store them?

Are you comfortable letting your students use this equipment?

Would you be comfortable teaching your colleagues about this equipment and its safe handling instructions?

Can you identify if a piece of equipment is damaged or dangerous to use with the class?

Are you familiar with doing a Safety or Hazard Analysis?

Can you prevent accidental injury or hazards from looking at the procedures provided by your students? (usually common sense prevails here)

Typical Safety Concerns –Elementary STEM Students

Students are naturally curious and are not always the most ‘safety-conscious’ in the classroom.

Many students will have never used some science equipment or hand tools prior to the STEM class.

Students try to be ‘funny’ by imitating dangerous behaviors (hammering improperly / pretending to do things which are unsafe) to make their classmates laugh.

Many do not follow directions (instructions) carefully or sequentially and that is the #1 cause for concerns and accidental injury.

Common Lab Equipment which can cause risks to students if used improperly:

- Hot plates
- Thermometers
- Scalpels / blades
- Glassware (broken)
- Scissors
- Accidental Spills

Hot Plates

These can cause serious burns to students if they do not follow safety directions. Never touch the surface to determine if it is ‘Hot’. Notice the light indicator on the surface that will alert you if it is ‘On’ and or ‘Warm’ Teach this to your class!

Always supervise students in the careful use of hotplates and do not leave the classroom unattended with these plugged in and hot.

Do not use the ‘ring’ element style hotplate – only use a ceramic top or sealed top unit to prevent spills and increased safety.

These need to be plugged into a receptacle so ensure that these are on a level surface with no possibility of being accidentally pulled or unplugged.

Safely store the hotplate once it is cooled and unplugged. Do not put these items away wile they are still ‘warm’.

Use of Heat in the STEM lab

- Basic rules apply to the heating of solids and liquids in the STEM lab.
- Ensure the area where heating occurs is free from debris and combustible materials.
- Understand that alcohols and oils typically found in schools will burn from being heated improperly. Do NOT heat these substances.
- Students should not work with boiling water or open flames at these grades. Teachers may need to demonstrate certain chemical or physical changes but in a safe manner with PPE.
- Glassware is not created equally – only use heat resistant borosilicate glass such as Kimax or Pyrex for activities with heat. Regular glass will shatter under pressure and heat causing preventable accidental injuries.
- Never use alcohol burners. These are dangerous and should be disposed of.
- Only use tongs appropriate to handling the item(s) being heated. DO not use your hands or household cooking tongs or pliers. You can use oven mitts as a layer of heat safety.

Open Flame & Matches

Occasionally there are activities or investigations that require the use of open flames – typically a wooden splint, candle or a safety match. Do not use regular book style matches under any circumstances.

Do NOT allow this activity to occur unsupervised. Ensure you can use open flames in the school – many jurisdictions prohibit open flame use. MAKE SURE YOU ARE ALLOWED TO USE FLAMES FIRST.

Carefully demonstrate what you would like the students to do and enforce this rule. Label everything – including where to put waste materials.

Tea candles are great since these are wide and do not easily tip over – and use a drip tray to catch any stray wax should it overflow.

Ensure that the students are aware of the dangers of open flames, location of the fire alarm, and the school district policy on open flames in the classroom.

Do you have an ABC type fire extinguisher? Fire Blanket? Do you know how to use them in case of an emergency?

Thermometers

Use alcohol (spirit) filled thermometers only – DO NOT USE MERCURY style ones – and NEVER use the thermometer as a stirring rod!

Ideally at the Grades 1-6 level, use a plastic or metal backed thermometer for ease of use.

If you need to use the glass tube style traditional thermometer, please use the anti-roll triangle on the end or purchase impact resistant versions.

Broken thermometers need to be disposed of and cleaned up carefully with a small broom and dustpan. Broken glass is very sharp!

Glassware Concerns

Make sure that you use appropriate glassware for the activity. That means select the proper style & volume needed and be aware that glass will be accidentally broken. Test tubes, beakers, flasks and funnels are common glassware used.

Clean up broken glass immediately and dispose of it in a broken glass receptacle. Only use a small broom and dustpan to clean up the shards of glass – do NOT use paper towels or handouts!

Make sure that the glassware purchased or used is reputable – Pyrex, Kimax or borosilicate treated glass only! Do not use soda bottles, jam jars, retail jars or containers for any reason.

Usage of Plasticware in the STEM Classroom

Whenever possible, you should use plastic versions with your students of the following products since they are safer alternatives for elementary applications: (ALL are readily available)

- Beakers
- Graduated Cylinders
- Flasks
- Bottles
- Petri Dishes

Scissors, Blades and Sharp Instruments

Accidental cuts are the most common injury in the elementary STEM lab and among the most preventable.

Teachers should be modelling the proper safety procedures and behaviors when using scissors, blades, and sharp instruments.

Broken glass is another leading cause of accidental injury – follow safe clean up procedures.

Students performing lab investigations need to be shown the proper technique in using a scalpel or blade (Position of thumb and fingers) and the direction of the stroke.

Follow your CHP or SOP from the School District on these techniques and allowed activities

Accidental Spills

Only make enough of the solution for the volume required in the class activity. There is no need to create stock solutions to keep on-hand for years in the elementary school.

When a spill occurs due to accidental knock-over or breakage, please clean it up immediately. The Teacher needs to know what the solution is (ideally it is inert such as salt water, sugar water, starch solution) but it may be more hazardous.

If you have flammables or corrosive chemicals in the school, you should have a comprehensive spill kit to use in case of accidental release. Consult the SDS for the chemical for clean up procedures.

Chemicals in the Elementary Classroom

Ideally, there are no chemicals used in the elementary STEM program that cannot be purchased from a local store as a ‘consumer commodity’ which is readily available and safe to use. Remember that common products can cause toxic effects.

Baking soda (sodium bicarbonate), sugars, salts, starch, juice, ice, vinegar and such items can be obtained locally and used with care. PLEASE READ AND UNDERSTAND THE LABEL FOR THE PRODUCT as there are warnings and storage issues that need to be followed even though these are available locally in stores.

More concentrated or hazardous items such as alcohols (isopropyl, cleaners, acidic or basic substances) need to be stored properly in chemical cabinets and handled with caution. All chemicals must have the SDS with it for reference

Teachers should NOT handle, purchase or store chemicals that they are uncomfortable with. Contact FLINN for assistance when required.

Specialized Chemical Knowledge

Chemicals need to be handled and stored properly. Proper chemical cabinets are required for safe storage.

Do not store chemicals in non-chemical bottles (do NOT use soda bottles or food item containers) as these are not safe alternatives.

There are safety precautions for certain chemicals and other products such as Dry Ice which require special handling and PPE (special gloves) *Flinn suggests only having a trained person demonstrate dry-ice and to not allow students to handle it due to the risks involved *

Please refer to some online resources for safety procedures regarding chemical health & safety. Be safe and know what you are working with. www.flinnsci.com

Guidelines for the Use of Animals and Plants in the STEM Classroom

Common sense should prevail when considering whether to include live animals, dissection specimens, seeds, live plants or plant materials in your classroom.

Many School Districts have rigid policies regarding the use of animals and plants in their schools – please follow your local protocols for this aspect of STEM education.

There are many educational outcomes and benefits from the use and observation of various animals and plants in the classroom however there are certain risks associated with these as well.

Be mindful and aware of what you bring into the classroom and what students may bring as well.

Use of Animals in the STEM Classroom

Never bring in any locally obtained wild animal to the classroom for any reason. There are many diseases that exist and the potential for transmission to the students is high.

Always follow the safe handling techniques for animals in the classroom (including reptiles, amphibians, and fish) and allow students to handle these animals on a voluntary basis only.

Never allow students to mistreat or mishandle animals purposely or accidentally. Reviewing proper handling and safety concerns will mitigate many potential issues and supervising carefully will prevent many animal ethical issues.

Be mindful of student allergies to animals in the classroom and monitor all activity in the classroom

Where Do You Keep Live Animals?

Ensure that you are allowed to have live organisms in your STEM lab before bringing any of the following items into the classroom:

- Aquarium
- Terrarium
- Tanks
- Ant farm Frame
- Cages

If you are, then you must follow the safe care and living instructions for the fish/reptile/insect/hamster etc. that you bring into the classroom.

Dissection Specimens in the STEM lab

Dissection specimens provide a wealth of knowledge for students to learn how various systems work and how these systems work together. The basic physiology education is paramount to a student's comprehensive understanding of health and wellness overall.

Only use commercially sourced and purchased specimens from a reliable science supplier. These specimens will be safe from disease, formaldehyde-based products, and sourced from a sustainable, licensed supplier.

Make sure to demonstrate the safe dissection techniques and use of scalpels and related lab utensils for conducting the activity.

Learn more about teaching dissection safely at flinnsci.com

1. Teaching Dissection Safely

Use of Plants in the STEM Classroom

Many classrooms incorporate activities with plants starting in the primary grades. Growing a plant from a seed and the on-going investigation of the root system, stem, leaves, and a flower are all essential scientific understandings for students.

Ensure proper hand washing occurs since many seeds are coated with various pesticides that can be dangerous for students and the teacher.

Awareness of plant toxicology is important – not only in the classroom but on field trips and local ‘citizen science’ activities. There are lots of resources available about the various plants in North America including which ones are dangerous / poisonous. Be mindful of student allergies too!

Don’t accept plants as gifts in the classroom if you are unsure of the species and the potential poison hazard associated with it. Be 100% certain that the plants are safe to use.

Tools – Common Safety Concerns in STEM

Before allowing students to use power tools or common hand tools, teachers are expected to demonstrate the safe and practical application of that tool and the corresponding personal protective equipment needed. Don’t assume that students know the names and functions of the tools you will be using.

Are you confident in how to use tools safely and demonstrate their safe use for your students? School districts are required to provide training on this under OSHA 2002 Hand & Power Tools regulations – so please ensure that you are compliant and trained in this aspect of STEM. https://www.osha.gov/laws-regs/regulations/standardnumber/1910/1910SubpartP

Your School District will have a SOP (Standard Operating Procedure) listing for the tools in your classroom and the necessary products and safety equipment in place to ensure you and your students are in the safest learning environment possible. Never use any tool you feel uncomfortable with!

Tools Used in the Classroom

Are you aware of the proper usage of various hand tools (hammer, screwdriver, pliers, hand saws, scissors, wrenches, wire cutters/strippers, sockets etc.) ?

It is REQUIRED that you demonstrate and properly model the safe use of ALL tools with your students. Typically, they like to act inappropriately at first when presented with tools to use in their quest to solve problems using engineering and inquiry.

Tools need to be used and stored appropriately in a secure location and sanitized prior and post usage.

Common Hazards with Hand Tools in the STEM Program

Hand tools are tools that are powered manually. Hand tools include anything from axes to wrenches. The greatest hazards posed by hand tools result from misuse and improper maintenance.

Some examples include the following:

- If a chisel is used as a screwdriver, the tip of the chisel may break and fly off, hitting the user or other employees.
- If a wooden handle on a tool, such as a hammer or an axe, is loose, splintered, or cracked, the head of the tool may fly off and strike the user or other employees.
- If the jaws of a wrench are sprung, the wrench might slip.
- If impact tools such as chisels, wedges, or drift pins have mushroomed heads, the heads might shatter on impact, sending sharp fragments flying toward the user or other employees.

Different tools for Different Applications….

Students sometimes don’t use hand tools for their intended use. It is this misuse that results in many preventable injuries. STEM educators realize the importance of proper tool usage and recognize that proper modelling with clear instructions are essential to the student’s overall safety.

There are four classes of common hand tools, with each presenting a unique set of hazards:

1. Cutting Tools
2. Torsion Tools
3. Shock Tools
4. Thermal Processing Tools

Cutting Tools

Cutting tools include saws, chisels, planes, files, knives, taps and dies, snips and abrasive materials. Concentration and control are essential for safe operation of all tools, cutting tools being no exception. It is very important that cutting tools are kept sharp and in good working order. The sharpness of a tool is essential for safety. Dull blades have the potential to reduce control and cause greater physical harm.

Given the material the tools are designed to cut, the cutting edge should be sharpened to the proper angle. Teachers should ensure that students are instructed in the proper selection process of each cutting tool for a variety of materials and operations. Selecting the proper size and type of tool allows students to learn and follow through with each correct procedure. Many injuries are a result of burrs and chips created while cutting. Care should always be used in chip removal – never brushing the material with their hands. Gloves may protect students' hands from accidental injury and should be a consideration for PPE when using saws, sharp instruments and other cutting tools.

Torsion Tools

Torsion tools include wrenches, pliers, Allen wrenches, and screwdrivers. These tools are found to be the most abused and misused set of tools. The availability of screwdrivers leads to unnecessary abuse and subsequently becomes a source of frequent injury.

Several unnecessary abuses of screwdrivers, which may be prevented, include being used improperly as punches, wedges and pry bars. The tips of screwdrivers should always be kept clean and ground to their original shape, when possible, to ensure the proper fit into a screw slot. To reduce the misuse of screwdrivers, an adequate selection of drivers should be readily available.

Torsion Tools

To safely use any wrench, the user is required to always be alert and prepared for the possibility that the wrench may slip off the fastener and cause injury. Wrenches are made in many different sizes; therefore, it is essential the proper size wrench be used.

Generally, socket wrenches are the safest to use and offer the most flexibility, while box wrenches offer greater safety over an open-ended wrench. Adjustable wrenches are recommended for light-duty jobs and should have limited applications.

It is imperative for students to learn the proper tool choice for each type of job. Torsion tools proving to be too large or too small will require extra force. Proper fit, coupled with the degree and direction of force, ensures safer procedures. The insulation of tool handles is necessary when working with electricity.

Impact Tools

Impact tools, or shock tools, are best exemplified by hammers in various types and sizes with varying degrees of hardness. Different configurations are used for specific purposes. They should be selected and used for their intended purposes only.

Discard any hammer if it is dented, chipped, mushroomed, has a loose head, split handle or shows excessive wear. As with any impact tool, discarded debris may fly readily, and every student within the work area should always wear safety glasses. Non-negotiable safety.

Thermal Processing Tools

One way to condition and assemble materials is through a process of heat energy known as thermal processing. Some commonly used thermal tools include hot glue guns, hot wire cutters, soldering irons, heat guns, strip heaters, torches, welders, lasers, kilns, furnaces and ovens.

Any heat-producing tool carries with them the potential to severely burn the user and are sources of ignition. In order to minimize impending hazards, protective safety equipment should be worn and the work area should be kept clear of all flammable materials.

Natural gas, acetylene and other energy sources are very dangerous. This increases the need to inspect equipment often and keep it in good working condition.

Tools Typically Found in an Elementary Classroom Include the Following:

- C-Clamps
- Vise & Jigs
- Hand Saws & Miter Boxes
- Hand Drills & Various Bits
- Claw Hammers
- Wire Cutters/Bolt cutters
- Allen Wrenches/Keys
- Squares—Framing / Carpenter
- Pliers—needle nose, slip joint
- Ratchet and Sockets
- Wrenches—adjustable/fixed
- Screw Drivers—Philips, Slot
- Standing Drills—Bit/Brace Style
- Files—Triangular and Regular
- Glue Guns—Safety Style/Low Heat
- Knives & Sharp Edges—Grade 4 and Above

Considerations for Using Tools in the STEM Classroom

Instruction and supervision must be provided by a qualified instructor. Teachers who are uncertain about the safe use of a particular tool or material with students should first consult with someone having the appropriate science or technology expertise. Do NOT use anything that you are unfamiliar with.

Hand tools should be introduced by the teacher, including its proper use and demonstrate the safety precautions needed before each lesson/activity.

Students must be at the proper developmental level and possess adequate motor skills for individual use of tools. Tools should be the proper size for the age and size of the students. ENSURE THAT THESE TOOLS ARE SANITIZED OFTEN.

Considerations for Using Tools in the STEM Classroom

Students should demonstrate understanding of safe tool and equipment use to the instructor before working independently. Make sure they are using it safely.

Wherever possible a jig or vise should be used to hold materials, allowing students to have both hands free. This is a skill set that students should know.

Classroom hand tools must be kept in good working order (e.g., saws kept sharp, hammers with intact handles and secured heads, glassware without cracks or sharp edges). Inspect ALL tools prior to and before storing them away.

More About Tool Safety

There are some basic rules that should be followed to prevent the hazards associated with hand and power tools as directed by **OSHA**:

- Keep all tools in good condition with regular maintenance.
- Do not put tools in your pockets.
- Do not run with tools in your hand.
- Use the right tool for the job / task at hand.
- Examine each tool for damage before use and do not use damaged tools. Notify the teacher if it seems broken or damaged.
- Operate tools according to the manufacturer’s instructions.
- Provide and use properly the right personal protective equipment.

1. **OSHA**

Risk or Hazard Analysis for Activities

Are you aware of what to look for when students bring you an outline of their inquiry-based activity?

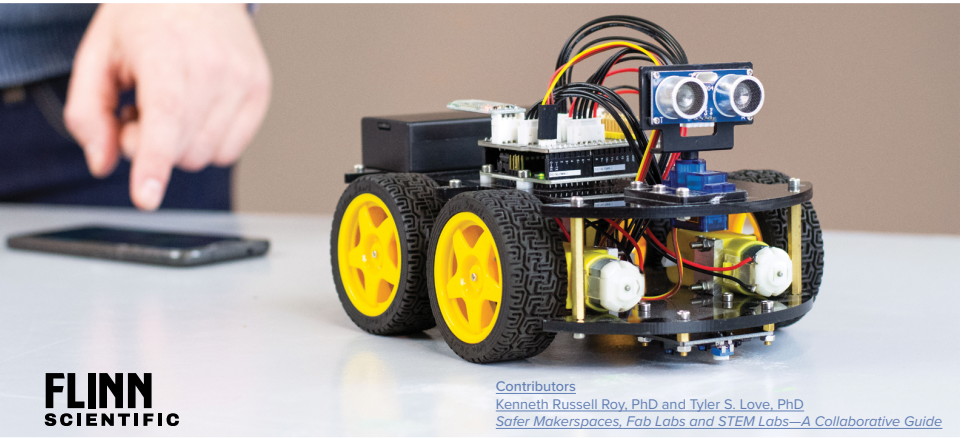
Looking at the procedures, there are a handful of red flag items or processes that you should recognize and prevent students from continuing onwards in their planned pursuit of knowledge.

Students often develop a plan or sequence of procedures that do not always align with the safety protocols in place on their quest to solve an inquiry or design problem. Reminders are a good way to start this conversation without dampening their innate curiosity as a student into studying the world around them. Once you establish benchmarks, it gets easier.

Things That Should Not Be Found in Your Stem/Science Classroom:

- Aerosols with organic propellant
- Alcohol burners
- Bacterial cultures
- Body fluids - blood/saliva/urine etc.
- Common allergens—pollens, animal furs, treenut/peanut products, mold, etc.
- Flammable liquids—methyl alcohol, acetone, carbon disulfide, ether, etc.
- Formaldehyde-preserved animal specimens & homemade jars
- Glues—“instant,” epoxy, airplane, Superglue, etc.
- Mercury thermometers—replace with alcohol-filled thermometers
- Nail polish remover solutions
- Oil-based paint thinners and turpentine
- Organic-based craft dyes & paint strippers (harsh solvents)
- Poisonous plants—poison ivy, mistletoe, poinsettia, azalea, invasive species etc.
- Poisonous animals—spiders, stinging insects, centipedes, millipedes, some snakes and lizards
- White-out type solutions—Liquid Paper
- Strong acids—undiluted hydrochloric, nitric, sulfuric; boric acid powder
- Strong bases—undiluted ammonia, sodium hydroxide (lye), chlorine bleach

8 Tips for a Safer STEM Lab



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Contributors
Kenneth Russell Roy, PhD and Tyler S. Love, PhD
Safer Makerspaces, Fab Labs and STEM Labs—A Collaborative Guide

Entry and Exit
Labs over 1,000 sq. ft. need two outward-opening doors in the event an emergency exit is needed. Avoid blocking doors.

Lighting
Include a mixture of natural and atrificial light for safer lab operation.

Sound
Place noise-producing equipment in a dedicated lab space and provide acoustical treatment on ceilings and walls within the lab.

Temperature
Keep chemical storerooms within your lab between 60—80 °F along with continuous airflow to prevent or reduce rate of decomposition of chemicals.

Ventilation
Ventilation that is directly at the source (e.g. a dust collector hose hooked directly to a belt sander) protects against hazardous particulates, gases or vapors.

Electrical Power Sources
Keep outlets at least three feet away from any water source and unplug any cords when the lab is not in use to avoid a fire hazard.

Showers and Eyewashes
A must in any STEM Lab, Makerspace or Fab Lab to minimize effects of accidental exposure to chemicals, specimens, particles and other airborne objects.

Safety Zones
Safer operator zone markings, the appropriate Personal Protective Equipment, machine guards and instructor supervision reduce accidents and injuries.

www.flinnsci.com/stem

Checklist for STEM Classroom Safety

Flinn has created a poster with 8 Tips for STEM Safety and we encourage you to use this resource for your classroom activities.

Take the time to consider to the safety & risk assessments for the activities and investigations involved with your curricular framework in your local jurisdiction.

Planning your STEM program and activities will take some thought and time, but the results will be much richer learning and deeper understanding (safely) for your students.

1. Flinn 8 Tips for a Safer STEM Lab

How to incorporate STEM into your Lessons/Student Activity Remotely?

This can be as simple as using on the provided “Flinn At Home” activities to your students (ensuring that it is age and subject appropriate) as part of the weekly assigned tasks. There doesn’t need to be an activity each day. Strive for balance and progression in your program.

STEM activities are also great ‘critical thinking or inquiry’ models that many students enjoy participating in. See our **STEM Activities for Intro Courses** video for ideas.

Be careful to not provide too many activities and also to provide too few. There is a balance that happens when you collectively work to achieve common goals and apply these to your own students.

Call FLINN for support on how to use STEM activities remotely and safely

Home-Based Science Activities

FREE At-Home Activities from Flinn

Use this link to access over 50 great and safe home-based activities for your students using commonly available materials in the home to encourage real science investigation and inquiry. These are organized by grade and topic to make it easier for you and your students. A great resource for parents to use remotely as well.

You can send these context-based learning activities out to your students, or you can incorporate them into your lesson planning. Students will be able to complete these activities on their own and follow-up with a summary of their observations and findings.

We are adding activities regularly so please keep checking back or contact us if you have questions/requests.

1. Available at: https://www.flinnsci.com/athomescience/at-home-activities/

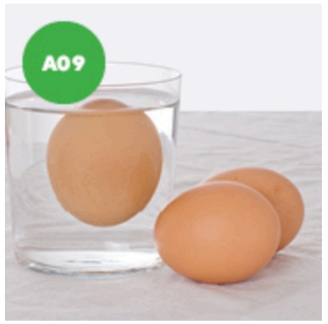
FREE Activities from Flinn for STEM

STEM

Cartesian Diver Design Challenge

Chromatography Challenge

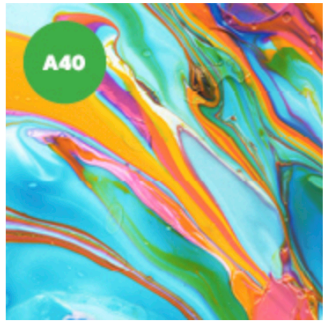
Density Challenge



Egg Float

Egg-streme Parachuting

Iodine Clock Challenge



Marbling Paper with Oil Paints

Measurement Challenge

Medieval STEM from FlinnSTEM, powered by IMSA Fusion

Mousetrap Cars

1. Available at: https://www.flinnsci.com/athomescience/at-home-activities/

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Ask about our custom district solutions designed to support a safe return to school:

- Custom safety and professional development/learning proposals to ensure full school safety
- Full PPE for students, faculty, and support staff
- Blended science learning solutions that provide continuity of lab instruction for both onsite & remote learners

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