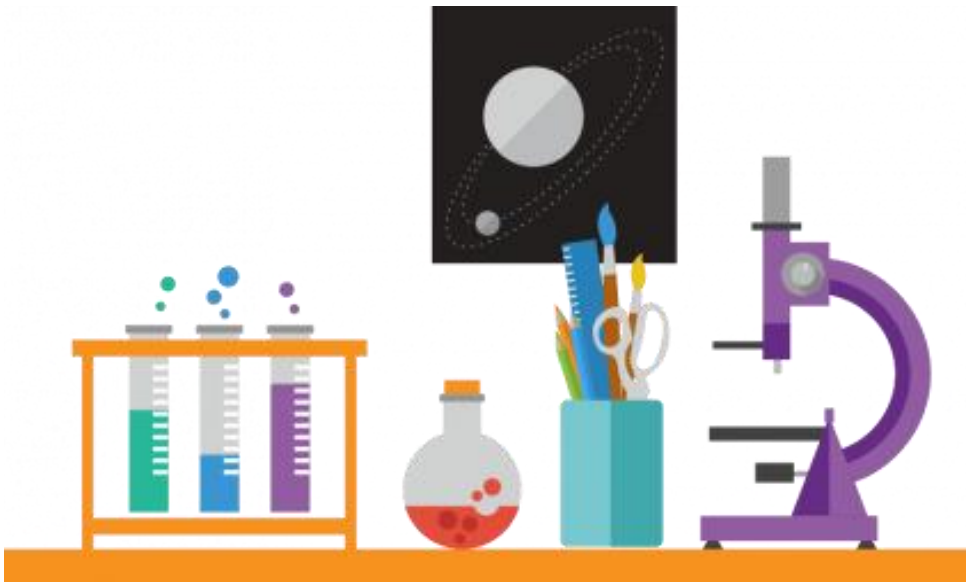
SCIENCE SAFETY DURING COVID

Guidelines for Science Courses during COVID in Maryland Public Schools



A Collaborative Project between the Maryland State Department of Education and the Maryland Science Supervisor Association

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Overview

Background

The COVID-19 pandemic has changed the way Maryland local school systems (LSS) deliver instruction. MSDE recognizes that science instruction must adjust to ensure that all students receive a rigorous and inquiry-based science education as LSS transition from virtual instruction to hybrid and/or face-to-face instructional models. The suggested modifications were designed to supplement the Maryland Strong: Roadmap to Recovery and the Maryland Together: Recovery Plan for Education.

Purpose

Hands-on science and laboratory work are important parts of the learning experience for all students. This document provides guidelines for science and laboratory work in both in-person and hybrid settings under the safety demands necessitated by COVID. Additional guidelines relevant to the school setting can be found at the Centers for Disease Control and Prevention Coronavirus (COVID-19) Schools and Child Care Programs site. The guidance provided by this document is to be applied in conjunction with all previously released MSDE reopening guidance as well as local, state, and federal public health safety guidelines. These science guidelines were originally released in October 2020. This update is occurring in February 2021 based on considerations from the CDC related to Operational Considerations for Schools that were updated in January 2021. This guidance may be further revised as the state continues to monitor COVID-19 trends, the latest medical research, and state guidelines. Teaching K-12 Science and Engineering During a Crisis and Keep Teaching Science!: Successful Strategies to Adapt K-12 Science Experiences for Distance Learning can also be used as resources to help plan high-quality science education during this time of great uncertainty.

Liability

Laboratory-based activities in any setting have the potential for injury. Science teachers must receive specific training in laboratory safety and must follow all safety rules and guidelines to ensure the safety of students to the best of their ability. Pursuant to Ed. Art. § 4-106 and Courts Art. 5-518, school personnel have immunity from liability if their conduct is within the scope of their employment. Teachers should consult their LSS leadership for further guidance should questions about liability arise.

In the Science Classroom

The science classroom and lab provide a set of challenges different from other classrooms. In a science classroom, students are frequently working in groups to complete a project or lab. Often time students are engaged in working collaboratively to answer questions and find solutions. Students should be participating in hands-on learning activities and actively experiencing science. These strategies should continue to be used in the science classroom but will look different during the pandemic.

Guidelines for students

Students should:

- wash or sanitize hands before and after each class, touching shared objects, eating, or touching one's face. Wash hands after using the bathroom, coughing, sneezing, and blowing one's nose.[1] Frequent handwashing is likely the best way to protect against transmission of the disease.
    - follow good handwashing technique of wet, lather, scrub for at least 20 seconds, rinse and dry.[2]
- maintain at least 6 feet of distance from others when possible.[3]
- wear masks at all times that cover the nose and mouth when inside the science classroom.
- keep belongings separate from each other's during class and labs. Belongings should be put into individually labeled containers, cubbies, lockers or assigned areas.[4]

Guidelines for teachers

Teachers should:

- wash or sanitize hands before and after each class, touching shared objects, eating, or touching one's face. Wash hands after using the bathroom, coughing, sneezing, and blowing one's nose.[1] Frequent handwashing is likely the best way to protect against transmission of the disease.
- maintain at least 6 feet of distance from others when possible.[3]
- wear masks at all times that cover the nose and mouth.
- model safe COVID practices for the students.

Guidelines for the classroom

Modify classroom layouts to:

- space student seating/desks at least 6 feet apart, when feasible. [3]
- provide physical cues such as tape or chalk to guide spacing.
- have students all face the same direction.
- have students sit on only one side of the table.

Equipment

Science classrooms contain a variety of scientific and protective equipment. Personal Protective Equipment (PPE) act as shields or barriers designed to protect teachers and their students in science/STEM labs and classrooms from exposure to biological, chemical, and/or physical hazards. These include items such as safety goggles or glasses, gloves, aprons, face masks, face shields, and footwear. A face mask should never be used in place of any regularly used or required PPE in the science classroom or laboratory. Teachers should have their own safety equipment that is not shared with the students.

Minimize and modify shared equipment usage

- Consider lesson plans that minimize the use of shared equipment.[5]
- If feasible, reduce class sizes for courses requiring equipment to reduce the need for equipment sharing.
- Do not share equipment or objects that are hard to clean and disinfect (e.g., any materials with fabric or irregular surfaces).[6] Equipment that does not come into contact with the mouth (e.g., beakers) can be shared if cleaned by students or teachers between uses. See the next section for cleaning guidelines.
- Consider staggering lab days to allow for cleaning of shared equipment.
- If there is not enough equipment for each student to have his/her own, consider creating cohorts, e.g., having students work in pairs or small groups and keeping those groups the same.
    - One student can physically touch the equipment (e.g., microscope) and the other students can conduct activities that do not involve physically touching the equipment (e.g., recording results in a lab journal).
- Wipe down/clean the equipment part of the way through class and have students switch roles. Otherwise, students can change roles in the next class session.
- Assign specific students to specific pieces of equipment or workstations for each class session. This is similar to having assigned seats in classrooms so that specific students are always near the same other students. Keep a record of these assignments for possible contact tracing if needed.
- Equipment that touches the eyes (e.g., microscopes) can be shared **only** if a disposable plastic wrap cover is added. Plastic wrap covers can be made with most clear kitchen plastic wrap; avoid using microwavable plastic wrap as they have microscopic holes. Rubber bands can be used to hold the plastic wrap in place on the eyepieces. Disposable plastic wrap covers should be removed, disposed of, and replaced with a new cover between uses, and the equipment should be cleaned between uses as well. Plastic wrap could also be used on other high touch points such as the knobs, light switch, nose piece. See the next section for cleaning guidelines.
- Do not allow students to share goggles during a class. All goggles should be sanitized/disinfected between each use. See the next section for cleaning guidelines.

- Having students wear gloves in place of cleaning or disinfecting guidelines is not allowed. Gloves should be used when required for lab safety or for cleaning but they will not necessarily protect students from spreading COVID-19.[7]

Increase shared equipment cleaning

Anyone, teacher or student, who is expected to clean equipment must be trained how to clean the surfaces, materials, and equipment based on LSS guidelines. A training log should be kept and any results of LSS post-training assessment must be kept on file. Consideration should be given for the age of the students in the science class. Younger students would be given simpler cleaning tasks than older students. The NSTA Safety Blog provides guidelines related to the cleaning of PPE and some lab equipment.

- Shared equipment should be wiped down before and after each use (so there are ideally two wipe-downs between each student's use). Students or teachers could wipe down/clean equipment, as appropriate.
    - An EPA approved disinfectant should be available in each room for this purpose. Sufficient inventory of disinfectant supplies should be maintained at all times. Only use sanitizers/disinfectants approved by the LSS.
    - Teachers play an important role in proper equipment hygiene. Teachers should reinforce the importance of this practice, and supervise cleaning to ensure it is done correctly.
    - Post signage in all areas with shared equipment reminding students to wipe down/clean before and after use.
- Shared equipment should be cleaned and disinfected at least daily as part of building cleaning schedules. Frequently touched surfaces (e.g., handles, buttons) should be cleaned multiple times a day.[8] [9]
- Designate a bin or space for students to place materials that need to be disinfected after being used.[10]
- Require students and teachers to wear protective googles at all times while working in a school laboratory (Code of Maryland, Education Article, Section 7-407). Extra attention should be paid to goggles, as they come into close contact with the face and eyes. Goggles must be disinfected between uses.[11]
    - Sanitizing/disinfecting goggles is a two-step process.[12]
        - Wash goggles and/or glasses with soap or dish liquid and warm water. A dishwasher with detergent could also be used to wash the goggles.
        - After washing and drying, place googles in a goggle sanitizer with UV-C bulbs and run the sanitizer for the amount of time recommended by the sanitizer manufacturer.
    - Sanitizing student owned goggles with UV is not required but should still be washed between uses to prevent the spread of COVID. These goggles should stay in the student's possession and not left in the classroom or shared with other

students. If the goggles are stored in the classroom, then the two-step cleaning process should be followed.

- Clean microscopes and high touch areas (eyepiece, nose piece, light switch, and knobs) should be disinfected after each use. Leica Microsystems provides in depth guidelines to cleaning and disinfecting microscopes.
- Disinfect shared equipment and other PPE (aprons, gloves, glassware, etc.), and allow the equipment to dry for as long as possible in an area with sufficient ventilation away from students (at least 30 minutes) before the next use.[13]
    - Consider using disposable materials and small-scale practices (e.g., micro-scale chemistry experiments, which reduce supplies needed) to reduce sanitation needs.

Science and Laboratory Work

Planning and conducting investigations is a science and engineering practice within the Next Generation Science Standards (NGSS). It is not necessary to eliminate creativity in the interest of safety; however, teachers should temper their creativity to construct well designed investigations while maintaining a safe environment either in-school or the remote learning environment. Investigations completed as part of remote learning should be conducted under the direct supervision of a parent/guardian. If the investigation is not able to be conducted safely via remote learning, consider its incorporation into in-person instructional time using the hybrid or face-to-face learning model.

In school

- Determine which laboratory experiences are highest priority for all students in a grade level or in a discipline and what experiences can be modified or removed for the year.
    - Prepare alternative methods (e.g., videos, simulations, demos) for labs as needed for students to learn the concept.[14]
- Follow the guidance on shared objects from the Maryland Together: Maryland's Recovery Plan for Education.
- See the Maryland Science Safety Manual K-12 for general lab safety guidelines.
- Remove unnecessary equipment and materials from lab spaces.
- Consider using outdoor spaces for lab work, as they provide opportunities for optimal physical distancing and maximum engagement during investigations.

Remote learning

- Adhere to safety procedures established by the LSS in a remote learning environment.
    - All persons conducting or observing science investigations should be following all necessary safety procedures, including use of PPE.
    - If PPE, like goggles, are required to complete an activity or investigation and they are not provided to the student, that activity should not be done remotely.
- Model (e.g., live, video, in writing) safety practices before assigning labs in the remote learning environment. All persons shown conducting science investigations on video or in a virtual environment should be following all necessary safety procedures, including use of PPE.
- Provide students and families with information on materials, procedures, and safety protocols of labs. Provide families with a lab safety acknowledgement form tailored to remote learning. Science investigations should be conducted under adult supervision.
- Support remote learning activities by using chemicals readily available in homes or provided by the district. No chemicals outside of common household items should be required for a remote learning activity
    - Safety data sheets should be reviewed beforehand. The use of household chemicals or kitchen supplies should be limited to those that are classified as non-

hazardous on the Safety Data Sheet (SDS). For example, vinegar should not be used as it requires PPE to handle and use because of the safety label of 2.
    - Proper storage and disposal of substances used in remote learning science investigations should follow the guidelines listed in the Safety Data Sheet for that substance. Be sure that local regulations allow for disposal of the substances and end products of investigations.
    - It is good practice for teachers to conduct investigations with the suggested household materials in advance of a recommendation for student remote learning use.
    - Consider scaling down the quantity of chemicals used to reduce the amount of waste generated.
- Continue the hands-on nature of science during remote learning using alternative methodologies or practices (e.g., videos, simulations, demos).
    - Teachers need to choose legitimate science demonstrations designed to educate.
    - The source and setting of the experiments conducted in these videos used should be chosen carefully to deter students from attempting to recreate these investigations at home.
- Replacing all science investigations with digital experiments produces fewer effective outcomes than conducting the investigations in person.

Using outdoor spaces for learning: Environmental education and literacy

The outdoors is a resource for learning, engagement, and health, and it should be available to all, not just a privileged few. Experiences in nature and greater access to the outdoors is associated with reduced stress, greater mental and physical health, and well-being.[15] When taking an inventory of usable space for learning, school districts should consider all available outdoor space for outdoor classrooms. While some aspects of environmental education can occur in a digital and online environment, the outdoor field experience that is at the heart of the Meaningful Watershed Educational Experience (MWEE) may need to be completed face-to-face with teachers leading instruction with small groups of students.

- Prioritize student supervision and safety. Any equipment used or shared in an outdoor setting should be cleaned and disinfected according to the appropriate guidelines.
- Maximize opportunities with environmental and outdoor education programs that are designed for outdoor learning, where the risk of infectious spread is lower.[16]
- Consult with environmental and outdoor educators who are trained to use the schoolyard and other natural environments as a context for learning across the curriculum, have expertise in group management and engagement in an outdoor setting, and are often specifically trained in addressing physical health and safety of participants in an outdoor setting.[17]
- Design outdoor learning spaces to enhance meaningful, phenomena-based learning (i.e. pollinator gardens, bird feeders, intentional outdoor habitats, produce gardens).

- Partner with outdoor environmental educators who can facilitate smaller groups of students for safe learning. Engage nonformal educators as support staff/teaching assistants/content specialists for formal classroom teachers to support outdoor learning.
- Create blended learning opportunities. Students could spend time planning the investigation through an online format and conduct the investigation in-person with teacher guidance. After the face-to-face learning experience, students can construct explanations and arguments with evidence from the investigations from distance learning measures.
- Plan virtual field trips and create opportunities for students to explore new places and interact with outdoor and environmental educators. Inventory the virtual learning opportunities with outdoor and environmental education programs in your region, the state, and beyond to provide independent virtual learning opportunities for students. Many of these are aligned with state standards.
- Incorporate lessons and activities that include opportunities for students to explore and investigate nature, either from a window or outdoors in a backyard, neighborhood, or park. Students should be supervised during any activity outdoors.

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[8] Centers for Disease Control and Prevention, Considerations for Schools. (2020, September)
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[11] Centers for Disease Control and Prevention, Considerations for Schools. (2020, September)
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[13] Lab Manager, COVID-19: What You Need to Know and What You Should Do Now. (2020, March)
[14] Flinn Scientific, Guidance on Re-Entry to Schools, K-12: Part A. (2020)
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