Safety Recommendations for Opening the New School Year
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As more and more states contemplate the new school year following the Coronavirus lockdown, teachers, supervisors, and administrators have to determine strategies to safely open their schools. It is hoped that the advice will help guide stakeholders in their decision-making process to be better prepared to meet the current pandemic challenges in starting the new school year with health and safety as the priority.

This article was written with the full awareness that governmental guidelines vary from state to state and can change between the publication of this article and the opening of your school. Please follow all local, state, and federal guidelines as they become available.

There are two areas that we want to focus on as follows:

1. What are the safest strategies for opening up schools, including but not limited to health, safety and security, curriculum and instruction and facilities.

2. What specific educational strategies can be used to foster effective teaching/learning activities in Science, STEM, and technology education/engineering.

It is our intention to gather credible information and provide examples of how this information can be used. This is not a be-all-end-all guide. It is based on the best available information that addresses the challenges of this unprecedented situation.

Schools, working together with their communities, have an important role in slowing the spread of diseases and protecting vulnerable students and staff. Schools must use their resources to help ensure students have a safer and healthy learning environment. Therefore, it is incumbent upon schools to use the best protocols to prevent the spread of COVID-19.

Opening the schools

In some cases, school buildings will have been closed to students and teachers for over five months before teachers and students are allowed to re-enter the buildings. School leaders have to consider the health of the building, as well as the students and staff.

Though most schools are closed for 10 weeks in the summer, there is usually plenty of activity going on in the school building to keep the infrastructure working. This has not been the case in many states. Here is a series of steps that schools should include in their reopening strategies:

• Clean the water pipes that students and staff will use.
  • Most of the water systems in the buildings have not run in a few months. This leads to the buildup of bacteria in the stagnant water. This can lead to afflictions such as Legionnaires Disease. It also can cause buildup of lead and copper in the water.
  • Follow standard practices for flushing the stagnant water from your pipes.
  • It is also suggested that school districts encourage students and staff to bring their own water to drink. The alternative is to have the school provide access to bottled water for students and employees.

• Make sure all safety devices are in working order, including but not limited to the following engineering controls in science laboratories:
  • Emergency eye wash stations (require flushing once a week for several minutes.)
  • Emergency showers (require flushing once a week for several minutes.)
  • Goggle cabinet sanitizers (inspect to make sure UV bulb is operational.)
  • Gas line shut-off systems
  • Fume hoods (inspection and testing by certified technician for proper operation once or more/year.)
  • Fire extinguishers (monthly checks are to be made and documented. Also, the fire extinguisher should be inspected and certified annually by a fire protection equipment company technician.)
  • Ventilation systems (preventative maintenance—e.g. quarterly changing of filtration system.)

When school is open

One of the major principles guiding our instructional planning is to do everything in our power to make sure our students and staff return home as safe, if not safer, than when they arrived at school. This is a difficult task to complete in normal times; during this pandemic, it has be-
come even more difficult. The following are some ideas that can help you develop guidelines for your school that will keep your students and staff safe.

**Health Issues**

The first idea to keep in mind when developing your fall school schedule is the level of risk that your students and staff will encounter. The following three risk levels for school personnel according to the CDC’s website:

- **Lowest Risk:** Students and teachers engage in virtual-only classes, activities, and events.
- **More Risk:** Small, in-person classes, activities, and events. Students remain at least 6 feet apart and do not share objects (e.g., hybrid virtual and in-person class structures, or staggered/rotated scheduling to accommodate smaller class sizes).
- **Highest Risk:** Full sized, in-person classes, activities, and events. Students are not spaced apart, share classroom materials or supplies, and mix between classes and activities.

Administrators and other stakeholders also need to consider those people who are at greater risk from the virus. The health services department in your schools can provide support and assistance. Students and staff at increased risk include those who suffer from the following, per “Implementation of Mitigation Strategies for Communities with Local COVID-19 Transmission.”

- Blood disorders (e.g., sickle cell disease or on blood thinners)
- Chronic kidney disease as defined by your doctor. The patient has been told to avoid or reduce the dose of medications because kidney disease or is under treatment for kidney disease, including receiving dialysis
- Chronic liver disease as defined by your doctor. (e.g., cirrhosis, chronic hepatitis) The patient has been told to avoid or reduce the dose of medications because of liver disease or is under treatment for liver disease.
- Compromised immune system (immunosuppression) (e.g., seeing a doctor for cancer and treatment such as chemotherapy or radiation, received an organ or bone marrow transplant, taking high doses of corticosteroids or other immunosuppressant medications, HIV or AIDS)
- Current or recent pregnancy in the last two weeks
- Endocrine disorders (e.g., diabetes mellitus)
- Metabolic disorders (such as inherited metabolic disorders and mitochondrial disorders)
- Heart disease (such as congenital heart disease, congestive heart failure, and coronary artery disease)
- Lung disease including asthma or chronic obstructive pulmonary disease (chronic bronchitis or emphysema) or other chronic conditions associated with impaired lung function or that require home oxygen
- Neurological and neurodevelopmental conditions (including disorders of the brain, spinal cord, peripheral nerve, and muscle such as cerebral palsy, epilepsy (seizure disorder), stroke, intellectual disability, moderate to severe developmental delay, muscular dystrophy, or spinal cord injury

Keep in mind that due to a person’s HIPAA rights, an administrator may not know if a member of their staff suffers from any of the above. The Human Resources Department should reach out to staff and let them know about the increased risk they may have due to the Coronavirus. The Health Services Department should do the same for students and their parents.

**Sick day guidelines**

We have many teachers who will do anything for their students. Some of them are so dedicated that they come to school when they are sick because they feel that a sick-teacher lesson is better than a substitute-teacher lesson. This cannot happen during the pandemic. Students and staff need to stay home when they are sick, even if they are exhibiting the most minor of symptoms. This also includes any parents, guardians, or other visitors wanting to enter the facility. Be aware that visitors should be strictly limited or prohibited. Administration must make this very clear and enforce protocols to keep any symptomatic person out of the building and away from the school community. The health of the community depends on sick people staying home.

If you are sick, stay home. Even if the illness is mild, you may have COVID-19. In addition to safety and cleaning protocols, individuals should stay hydrated, sleep well, eat a balanced diet, and, in consultation with their doctor, make sure that they are getting the right nutrients and vitamins.

If you think that you might be sick, contact your doctor right away. Explain the symptoms and follow the doctor’s advice. Do not venture out of your apartment or house until your doctor thinks that it is safe.

The symptoms that you should be looking for include the following:

- Fever or chills
- Cough
- Shortness of breath or difficulty breathing
Masks
The CDC recommends that individuals working in laboratories wear cloth face coverings/masks. They also state that it is not known if face shields provide any benefit as source control to protect others from the spray of respiratory particles. CDC does not recommend use of face shields for normal everyday activities or as a substitute for cloth face coverings.

One problem with just using a face shield is the open areas on the sides of the face (cheek areas) and lower portion (chin) are wide open. This provides an avenue for droplets and particles to gain entrance to the mouth and nose. The nose is the primary entrance portal for the virus, based on current research.

There is also the proviso that cloth face coverings (masks) should NOT be worn by children under the age of 2, or by anyone who has trouble breathing, is unconscious, incapacitated, or otherwise unable to remove the mask without assistance.

The bottom line is that both cloth face cover/mask and safety goggles need to be worn during laboratory activities, except for instances where there are health-related breathing issues. In those cases, safety goggles and face shields should be worn, though again there is considerably less defense against exposure to the virus.

Remember that virus particles can be shared by speaking, singing, coughing, sneezing, etc. Masks and social distancing are the first defenses for the spread of airborne particles. Keep in mind that the masks are meant to protect those around you. You may be a carrier of the Coronavirus and not even know it. Face shields may be used for additional protection, but need to be in combination with masks.

Several colleges, universities, and K-12 schools are requiring their students to wear their masks while they are on the school campus, in common areas, in the classroom, and in the laboratory.

Air recycling and air conditioners
COVID-19 is mostly spread by respiratory droplets released when people talk, cough, or sneeze. Any meeting or classroom with poor air circulation is a cause for concern. Exposure to the virus, or someone who is sharing the virus through airborne particles in an enclosed space, over a long period of time, i.e., class, choir practice, ceremony, etc., increases the danger of infection. The more people a student or staff member interacts with, especially in close proximity and or enclosed spaces, and the longer that interaction, the higher the risk of COVID-19 spread.

In a classroom, it is vital that there is a high frequency of room air exchanges per hour to increase air circulation. Social distancing only works when you are in the vicinity of a coronavirus carrier for short periods of time. Science, STEM, and tech ed/engineering labs are at an advantage relative to the air recycling issue, given that NFPA 45 (Standard on Fire Protection for Laboratories Using Chemicals) requires ventilation systems in these instructional spaces to be designed to ensure vapors, gases, etc. originating from the lab are not to be recirculated. This NFPA 45 standard currently supports ongoing fresh air being supplied in the laboratory space with no recirculation.

The need for increased air circulation has to be balanced with the needs of those students and staff who suffer from seasonal allergies. Opening windows during the fall semester can place those with allergies at higher risks of being affected by the environment. Also, asthma can be triggered in students and staff when doors are left open. It is best to keep windows closed during air conditioning season.

Air filtration and air conditioning by themselves are not suitable methods for controlling the spread of COVID-19. Social distancing, frequently washing hands, wearing masks, cleaning, disinfecting, and staying home when someone is sick are the best methods to control the spread of COVID-19. However, be aware that HEPA purifiers will capture the coronavirus if it is airborne, and some research now suggests it is.

A word of caution. When students and staff are suspected of having COVID-19 on campus, they should be placed in a quarantined room. It is important to ensure that air is not recirculated from the quarantined room with sick individuals to other areas in the building. Like science labs, fresh air should be continuously supplied to the quarantined room. In this way, the HVAC system from the quarantined room to other areas in the building. Like science labs, fresh air should be continuously supplied to the quarantined room. In this way, the HVAC system from the quarantined room should follow professional standards.

Health care workers (e.g., school nurse) should be wearing N95 masks, gloves and protective clothing. Patients also should be wearing masks. Once pa-
Cleaning and disinfecting

Cleaning and disinfecting are important defenses against the spread of the Coronavirus, but only if it is done properly. If the Coronavirus gets on a surface, it can last from a few hours to a few days unless properly cleaned and or disinfected. This in itself is not an issue, especially if the person is following protocols and washes their hands with soap and water. However, when the person has Coronavirus on their hands, and they then place their hands in their nose or their mouth, the Coronavirus will enter the body and potentially infect that person.

As part of your cleaning and disinfecting protocols, students and staff should be instructed to frequently wash their hands with soap and water. Frequently touched surfaces to be cleaned after use:

- When washing hands, soap and water are preferred over hand sanitizers
- Clean frequently touched surfaces between uses.
- Frequently-touched surfaces to be cleaned after use:
  - Tables
  - Doorknobs
  - Light switches
  - Countertops
  - Handles
  - Desks, laboratory tables
  - Phones
  - Keyboards
  - Toilets (do not forget to continually clean your bathrooms to prevent the spread of the Coronavirus)
  - Faucets and sinks
  - Lab equipment and materials
  - Engineering controls (fire extinguisher, fume hood, eyewash, shower, etc.
  - Touch screens
  - Erasers, markers, pens, pencils

- Clean all common areas at the beginning and at the end of each period where students change rooms.
- Though staying in one room may be a possibility in elementary and even middle schools, it is impossible in most high school scenarios without limiting student course offerings.
- In science and STEM labs, do not schedule multiple groups to use the same lab station in shifts unless the entire lab station and equipment can be cleaned and disinfected between shifts.

This is not a definitive list. There are items unique to each school and each individual classroom.

According to the CDC, materials and surfaces should first be cleaned with soap and water. Afterwards they can be disinfected. The people who are cleaning the surfaces should wear gloves to protect their hands. They should also wash their hands when they are done cleaning and disinfecting materials and surfaces. Also, make sure the room is well ventilated for those in the room while it is being cleaned and disinfected. Please follow the EPA and CDC guidelines for cleaning and disinfecting. Make sure that you follow directions and wear proper PPE (e.g. indirectly vented chemical splash goggles, gloves, apron, etc.).

If you have run out of EPA-approved disinfectants, it is easy to make substitutes. Once such substitute is made by mixing 1 gallon of water with 1/3 cup of bleach. This solution will be an effective disinfectant for about 24 hours. Make your batches accordingly. Do not mix chemicals and follow all instructions to the letter. Mixing chemicals can be harmful to your health. Follow approved guidelines and recipes.

For electronic devices like desk and laptop computers, tablets, power tools/equipment, etc., follow the instructions in the user manual. If there is no guidance from the manufacturer, use alcohol wipes that are at least 70% alcohol. When possible, use a cover to protect the touched surfaces of electronic devices that can be cleaned and disinfected.

Warning

Certain hand sanitizers have been recalled by the FDA. The hand sanitizers that have been recalled have been made with Methanol (Methyl Alcohol or Wood alcohol). This chemical should already be banned in your schools as part of your Chemical Hygiene Plan.

The following medical issues can result if Methanol gets into your body, such as by touching your nose or mouth with your hands after using a hand sanitizer that contains methanol:

- Nausea
- Vomiting, headaches
- Blurred vision
- Blindness
- Seizures
- Comas
- Damage to the nervous system
- Death

When purchasing hand sanitizer, make sure that you check the ingredients first. After receiving the hand sanitizers, make sure that the brands have not been switched. All chemical products, including hand sanitizers, should have an SDS sheet included in your Chemical Hygiene Plan.
Inventory file and available to all teachers. More up-to-date information can be found out the FDA website, fda.gov.

Laboratory safety
It is going to be very difficult to conduct laboratory experiments, or any group project where multiple students will be interacting with the materials and equipment. There are many obstacles that have to be overcome for the laboratory activity to be safer for the students.

The first challenge is to overcome social distancing. Students are going to struggle to make observations when everyone is at least six feet away from everyone else. Second, every item that is touched in the laboratory area has to be cleaned and disinfected before anyone else can touch it. It is one thing for every student to have their own ruler, but do you have enough goggles for every student to have their own pair? You will need extras for those students who forget their goggles. If sharing goggles, they have to be cleaned and disinfected, then placed in the UV goggle cabinet to be sanitized before the next student can use them. This may seem like overkill, but there are conflicting reports as whether UV radiation is enough to kill the Coronavirus.28

Every door handle that is touched has to be cleaned before the next student can touch it. It is unsafe to keep cabinet doors open at all times. The same is true with all of the equipment being used. This not only includes glassware, apparatus, microscopes, etc., this also includes chemicals containers. If there is any chemical residue on a container, the disinfectant can react in a negative manner, resulting in an unsafe environment for the staff and the students.

Alternative ideas
Smaller, individual lab activities can be done as a substitute. These might involve students working in shifts, where one half of the class is doing the hands-on activity while the other is working at their desks or other location on an alternating-week schedule. Non-hands-on activities might involve assignments such as viewing simulations, data gathering/processing, virtual instruction, etc. Remember the teacher’s “Duty or Standard of Care” is required for all students in instructional spaces. In this way, make sure that the teacher is able to have monitoring/supervision provided for all of the students and not just on those in the hands-on lab group. These alternations in lab scheduling may require more supplies to complete lab activities than usual. Plan on requesting additional funding for PPE, sanitizers, and more as soon as possible.

An alternative to group hands-on laboratory work is teacher-led demonstrations in the lab. The students can watch the teacher do the experiment, make observations, draw conclusions, and complete calculations. The students will not have the opportunity to work on their own lab skills, but this is a temporary alternative until it is safer to work in groups. A student can be substituted for the teacher and perform the experiment for the class.

Finally, depending on the severity of the situation, virtual instruction may need to be readopted, as was used in many schools during the latter part of the previous school year. There are a number of computer programs for laboratory activities that can be used for virtual instruction.

Science departments, working together with their schools, administrators, and parents, have to balance between the best educational scenario for their students while maintaining safe and social distanced classrooms. During a “Socially-Distanced” education scenario, traditional group laboratories may have to be put aside for different learning methodologies.

Class size
School buildings were not designed for social distancing. If social distancing rules and regulations are in effect at the beginning of the school year, administrators need to determine the maximum number of students and staff that can fit into each room at a time.

Based on the concept that there should be at least 6 feet between each person in the room, each student and staff member will need 28.3 ft² of space. This is calculated by drawing a circle around each person that has a 6 ft diameter. The area of a circle is \( \pi r^2 \) (radius = 3 ft). Since most rooms are rectangular in shape, it may be easier to just use a square box with 6-foot sides. The area needs for each student using this model is 36 ft².

The same calculations should be done to determine how many students can work in the same lab area, can participate in Physical Education each class period, can eat lunch in the cafeteria at the same time, and can ride the bus.

Buses
The school bus is the first line of defense when trying to keep the Coronavirus from campus. The following set of guidelines can help districts to develop their own policies for students on buses:

- All students and staff on the school bus are required to wear masks
- Buses should be marked so students know where they can sit while maintaining social distancing. At 6 feet between students and staff, each person on the bus needs 28.3 ft² of space. Use this number to determine how many people can fit on each bus and plan routes accordingly.
- Staff and students, including the bus driver, should be screened to make sure that they do not have a fever or exhibit any of the symptoms of the Coronavirus. Students and staff should also sanitize before they get on the bus.29
- Buses should be cleaned and disinfected at the end of each run.
Conclusions

The health, safety and well-being of our students and staff is of primary importance during the pandemic. Protocols and guidelines have to be put in place to ensure that the district, school, staff, and students are doing everything in their power to protect themselves and each other from the effects of the Coronavirus. It is our intention that this article gave you the inspiration that you need to provide your students with the best educational experiences possible during this crisis.

Please note the content of this commentary is based on prudent professional safety practices (e.g. CDC recommendations) and on OSHA, NFPA, and other legal safety regulations, but do not purport to specify all legal standards. They are intended to provide basic guidelines in the areas of employee and employer safety, in addition to student/employee health and safety. Therefore, it cannot be assumed that all necessary warning and precautionary measures are contained in this information. Users of this information should also consult pertinent local, state, and federal laws and legal counsel for additional safety prevention program components during these challenging times of the COVID-19 pandemic.

ENDNOTES

3. https://www.mayoclinic.org/diseases-conditions/legionnaires-disease/symptoms-causes/syc-20351747#:~:text=Legionnaires%20disease%20is%20a%20severe,bacteria%20from%20water%20or%20soil. (Read June 2, 2020)
12. https://www.erinbromage.com/post/the-risks-know-them-avoid-them (Read June 2, 2020)
22. List-N lists the disinfectants by alpha order and details which virus they can be used. https://www.epa.gov/pesticide-registration/list-n-disinfectants-use-against-sars-cov-2 (read on May 9, 2020)