Council of State Science Supervisors

CSSS REMOTE, DISTANCE, AND HOME-BASED SCIENCE & STEM SAFETY GUIDANCE

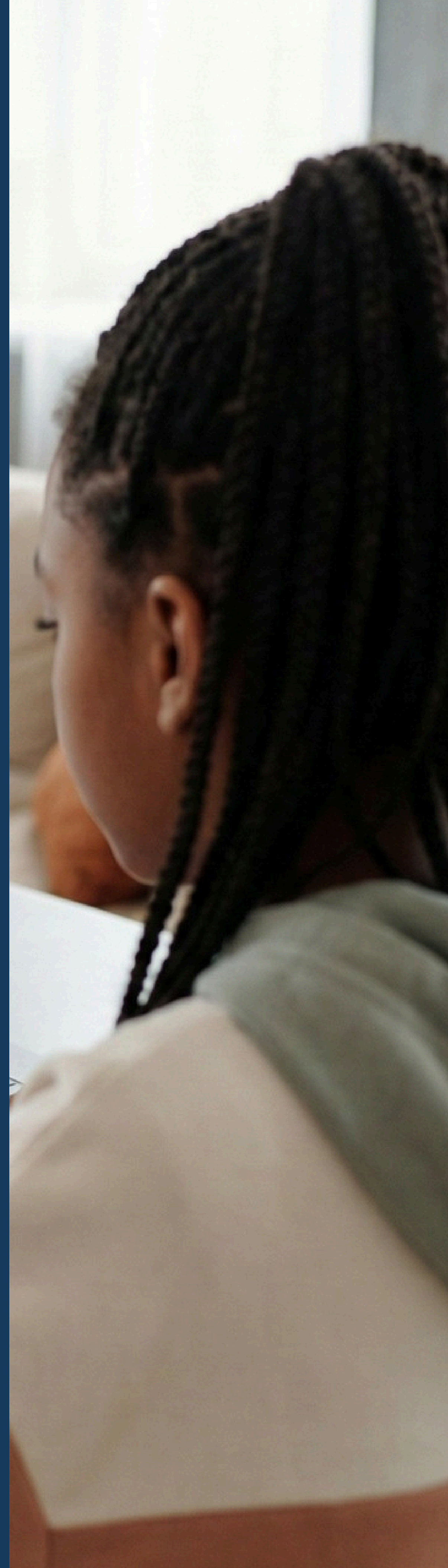
Safer Practices for U.S. Remote, Distance, and Homeschooling Instruction

A nationally aligned framework supporting professional judgment, hazard elimination, and defensible science instruction outside regulated school science / STEM instructional spaces.

Authors
James Palcik, CHO
Brian P. Collins, Ph.D.
Edward Charles Cohen, Ed.D.

In Partnership With
Council of State Science Supervisors (CSSS)

Edition 2026



CSSS
COUNCIL OF STATE
SCIENCE SUPERVISORS

CSSS REMOTE, DISTANCE, AND HOME-BASED SCIENCE & STEM SAFETY GUIDANCE

2026

James Palcik, CHO, is the Chief Executive Officer of Safer STEM and a nationally recognized authority in K–12 science safety, risk management, and professional duty of care across traditional and non-traditional learning environments.

Brian P. Collins, Ph.D., is Chief Innovation Officer at Safer STEM, specializing in the design of instructional learning systems and decision-support tools for educators.

Edward Charles Cohen, Ed.D., is Associate Director of the Center for Mathematics, Science, and Computer Education at Rutgers University and a leader in science curriculum implementation and program oversight.

ACKNOWLEDGMENTS

The Council of State Science Supervisors (CSSS) extends appreciation to the lead authors James Palcik, CHO (Safer STEM), Dr. Brian P. Collins (Safer STEM), and Dr. Edward Charles Cohen (Rutgers University) for their leadership in developing this guidance for remote, distance, and home-based science instruction.

This document was developed in response to the expansion of virtual, hybrid, and homeschooling models across the United States. It reflects the shared responsibility of educators, administrators, and science leaders to ensure that instruction remains aligned with recognized safety standards, even when it occurs outside traditional school laboratory facilities.

The authors and the Council of State Science Supervisors gratefully acknowledge Ward's Science, a division of VWR, for their valued partnership in supporting the development of the CSSS Safety Reference Manuals. Their sustained commitment to advancing science education and strengthening laboratory safety continues to benefit STEM classrooms nationwide. We are especially appreciative of their collaboration in providing high-quality scientific illustrations, imagery, and technical insight, which enhance clarity, reinforce safer STEM practices, and support effective, engaging instruction across Science, STEM, and CTE programs.

State science supervisors, district leaders, and classroom educators also contributed insights regarding real-world implementation challenges during remote and hybrid instruction.

About CSSS

The Council of State Science Supervisors is a national organization composed of leaders responsible for science education at the state level. CSSS members guide statewide standards implementation, policy alignment, professional learning systems, and instructional oversight across K–12 education.

CSSS provides a forum for states to share emerging challenges, research-informed solutions, and standards-aligned professional practice. This includes strengthening safety systems in both traditional laboratories and non-traditional instructional environments.

TABLE OF CONTENTS

LIST OF FIGURES

EXECUTIVE SUMMARY

Distance does not eliminate responsibility. It changes how responsibility must be exercised in Science and STEM learning spaces without the supervision of a certified, safety-qualified, and experienced instructor.

When science and STEM instruction occur remotely, asynchronously, or in home-based learning environments, potential hazards and resulting safety risks do not disappear. They shift location, supervision, and control. The absence of engineering controls, emergency equipment, and in-person supervision fundamentally alters the risk profile of instructional activities and elevates the hazards and resulting risks exponentially.

The CSSS Remote, Distance, and Home-Based Science & STEM Safety Guidance establishes clear professional boundaries for instruction outside regulated school laboratory facilities. It emphasizes that hazard elimination, not disclaimers, is the primary risk control strategy in non-traditional learning environments.

The framework presented in this document is grounded in recognized standards, including OSHA's General Duty Clause, the Laboratory Standard, NFPA fire safety codes, ANSI protective equipment standards, and NIOSH hazard prevention research.
While written primarily for workplace environments, these standards define reasonable and prudent professional expectations that apply to education when foreseeable hazards are present.

Key principles include:

- Remote instruction is not equivalent to in-person supervision in any circumstance
- Elimination is the default control strategy outside of formal, regulated lab facilities
- Substitution preserves learning goals without introducing physical risks
- Engineering controls cannot be assumed in home environments
- Administrative controls and disclaimers do not replace hazard elimination
- PPE cannot substitute for supervision or engineering safeguards
- Clear instructional boundaries reduce foreseeable misuse
- Documentation and reflective practice strengthen defensibility

The guiding question for educators is not whether an activity can be assigned remotely. It is whether the learning goal can be met without introducing foreseeable hazards in environments where controls are absent.

This requires careful balancing by educators and school districts when selecting materials, equipment, and activities

Activities involving open flames, hot plates, or chemical reactions that generate heat should be avoided in home environments. Unlike regulated science / STEM instructional spaces, home settings lack consistent fire protection systems, increasing the likelihood of injury or property damage.

Effective remote science instruction protects intellectual rigor while eliminating unnecessary physical risk.

When educators apply structured risk management and align decisions with recognized standards, safer instruction becomes sustainable, defensible, and professionally sound.

I UNDERSTANDING THE STEM INSTRUCTIONAL SPACES

> **Distance does not eliminate responsibility. It shifts how responsibility must be exercised.**
> — James Palcik, CHO, Safer STEM

Safer science and STEM instruction does not end when students leave a school building. When science learning occurs remotely, asynchronously, or in home-based settings, risk does not disappear; it changes location, supervision, and control. This section establishes the foundational understanding educators and school leaders must have regarding how learning environments directly influence hazard exposure, supervision expectations, and institutional responsibility.

Remote and home-based science instruction introduces predictable, foreseeable risks that must be addressed through intentional instructional design, clear boundaries, and prudent professional judgment. Failure to recognize these differences can expose students to possible harm and educators and institutions to potential shared liability.

1.1 Remote Learning (Synchronous, Teacher-Led)

Characteristics

Remote learning environments are defined by:

- Real-time instruction delivered through collaborative video conferencing platforms
- Teacher presence that is instructional but physically removed from the learner
- Students working independently in varied, uncontrolled home environments
- Limited ability for the teacher to intervene physically during unsafe behavior

Although instruction is live, direct digital supervision is not equivalent to in-person supervision. The teacher cannot confiscate materials, shut off utilities, or physically stop potentially unsafe acts or behaviors.

> **If you cannot physically intervene, you must eliminate the hazard.**

Primary Safety Risks

Foreseeable risks in synchronous remote science instruction include:

- Misuse or overuse of household materials not designed for laboratory purposes
- Inadequate adult supervision within the home
- Electrical hazards related to improvised circuits, appliances, or chargers
- Fire risks from heat sources, open flames, or overloaded outlets
- Ergonomic strain from prolonged device use or poor workstation setup
- Unauthorized experimentation beyond teacher instructions

These hazards are predictable and documented. When foreseeable risks are not mitigated, incidents may be interpreted as failures of professional judgment rather than unavoidable accidents, increasing potential liability.

Professional Safety Expectations

For synchronous remote instruction:

- Hands-on laboratory activities using chemicals, flames, sharps, pressurized systems, or powered equipment must NOT be assigned for at-home investigation.

- Demonstrations should be teacher-performed only and use professional laboratory setups, including controls and PPE when necessary, not home simulations, and be digitally shared with students to observe and analyze.

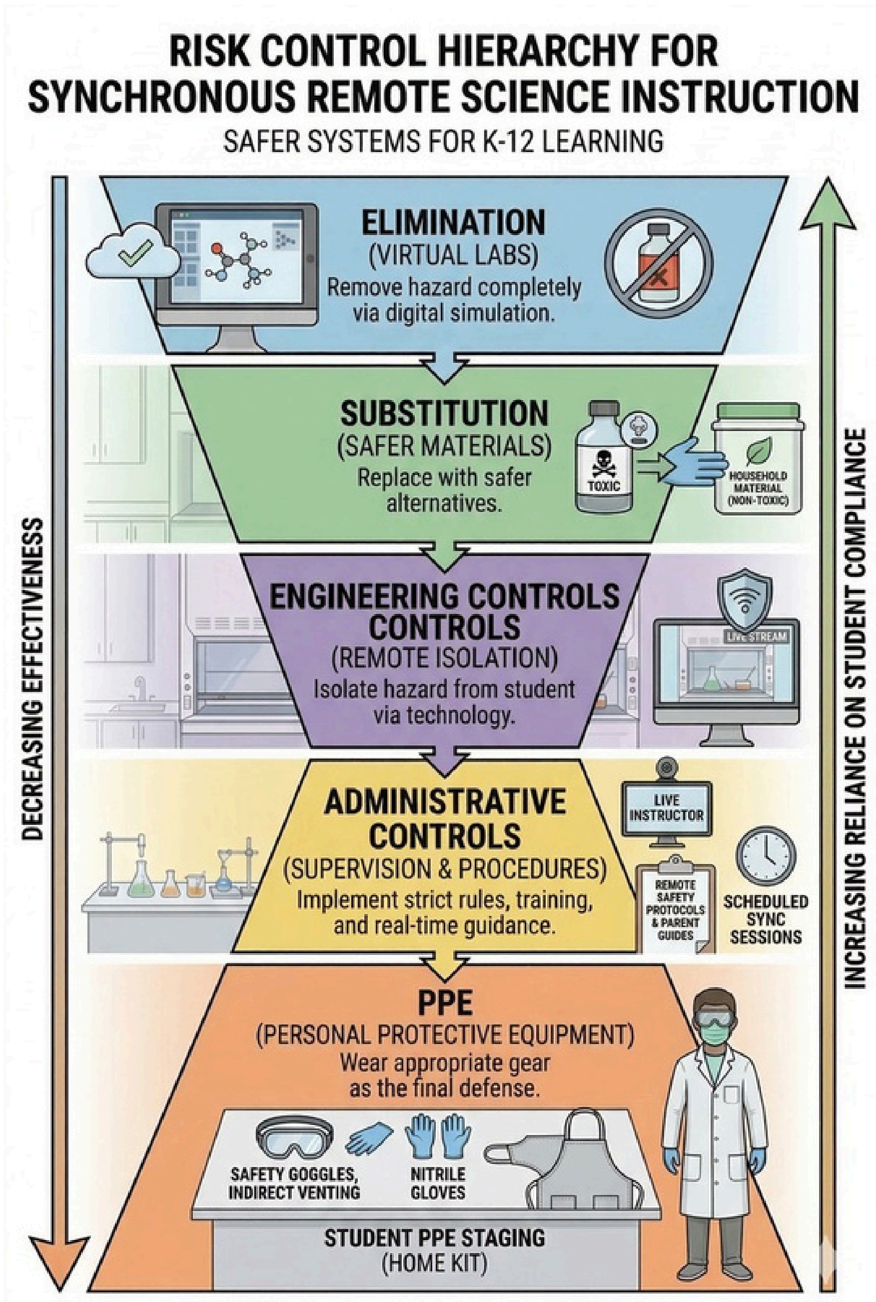
- Student activities should be limited to observation, data analysis, simulations, and virtual labs vetted for accuracy and safety.

- Clear, written boundaries must be provided, stating what students are not permitted to do at home, and reinforced with documentation and safety acknowledgement forms specific to distance and remote learning modalities.

- Do not rely on PPE as the default safety mechanism to prevent hazards and risks.

Figure 1

This figure illustrates how traditional lab safety controls must be re-prioritized in remote learning, emphasizing elimination and substitution over reliance on PPE or supervision. It reinforces that when teachers cannot physically intervene, designing out hazards becomes the most effective and professionally defensible strategy.



1.2 Distance Learning (Asynchronous or Hybrid)

Characteristics

Distance learning environments typically include:

- Pre-recorded lessons or modular online instruction
- Self-paced student engagement
- Delayed or minimal real-time teacher interaction
- Increased student autonomy and decision-making

While flexibility may increase, safety control decreases significantly.

Primary Safety Risks

Key risks associated with asynchronous science learning include:

- Misinterpretation or selective reading of written instructions
- Lack of immediate intervention during unsafe actions
- Increased likelihood of students "improvising" materials or tools
- Repetition of unsafe behaviors without corrective feedback
- Inaccurate replication of demonstrations seen on video

Students may unintentionally escalate risk in an attempt to "make it work." This is especially concerning when instructional materials resemble experiments rather than demonstrations or simulations during unsupervised learning in remote or distance environments.

When asynchronous activities invite hands-on manipulation of materials without direct supervision, educators and districts may assume potential liability for foreseeable misuse, harm and damages.

Professional Safety Expectations

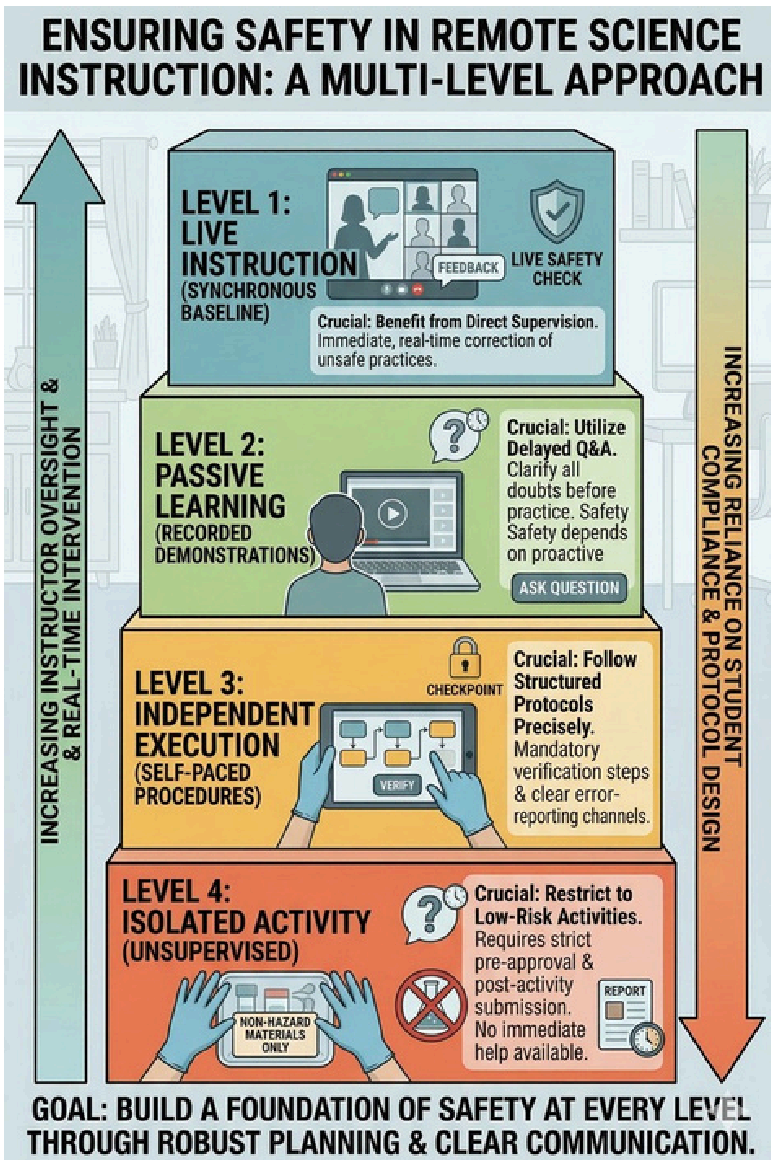
For asynchronous or hybrid science and STEM instruction:

- No student-directed experimentation using physical materials should be assigned
- Activities must be explicitly non-experimental in nature
- Language such as "try," "test," or "investigate" should be avoided when hands-on action is implied. Be specific and use planned and purposeful activities and procedures
- Safety disclaimers do not replace hazard elimination or recognition
- Students should not substitute materials, modify procedures, or improvise equipment without explicit teacher approval. Changes to materials or procedures can introduce unanticipated potential hazards and resulting safety risks.

If instructions can be misunderstood, they will be. (Murphy's Law)

Figure 2

This visual highlights how safety risks increase as instruction shifts from live supervision to independent student work, where misinterpretation and lack of intervention are more likely. It underscores the need for highly structured, low-risk activities and clear protocols when students are working without real-time teacher guidance.



1.3 Homeschooling / Home-Based Instruction

Characteristics

Home-based science / STEM instruction is characterized by:

- Parent or guardian serving as the primary supervisor
- Highly variable facilities, tools, and safety infrastructure
- Inconsistent access to professional-grade equipment
- Often limited formal safety training for adults overseeing instruction

Unlike school instructional environments, home settings are not designed, inspected, or regulated for laboratory use. Do not underestimate the conditions that exist in homes.

Primary Safety Risks

Foreseeable hazards in home-based science / STEM include:

- Inadequate ventilation for possible fumes or particulates
- Improper chemical storage and labeling, as well as access to others in the home
- Fire hazards from cooking appliances or open flames
- Tool and equipment misuse without appropriate training
- Absence of emergency equipment such as eyewash stations or fire extinguishers

Schools and programs that provide any curricular materials to homeschool settings must exercise extreme caution. Supplying activities that assume laboratory infrastructure can expose institutions (school or school districts) to potential liability if injuries or damages occur. Most school district jurisdictions do not supply hands-on materials for students in order to reduce potential liability from misuse in the home learning environment.

Professional Safety Expectations

For homeschooling contexts:

- Schools should provide guidance, not experiments
- Curricular resources must default to simulations, models, and analysis
- Any suggested activity must clearly state required supervision and prohibited
- Substitutions using very specific items commonly found in the home
- Do NOT assume that all homes have the consumer commodities that you are planning to use regardless of how common or basic these may appear.
- Many home-based STEM activities involve food materials such as vinegar, baking soda, oils, or dairy products. Teachers should consider student allergies and sensitivities and review available health information before assigning activities.
- Written communication with families should clarify that authentic school-based science / STEM instructional space activities are not transferable to home environments for safety and compliance reasons.

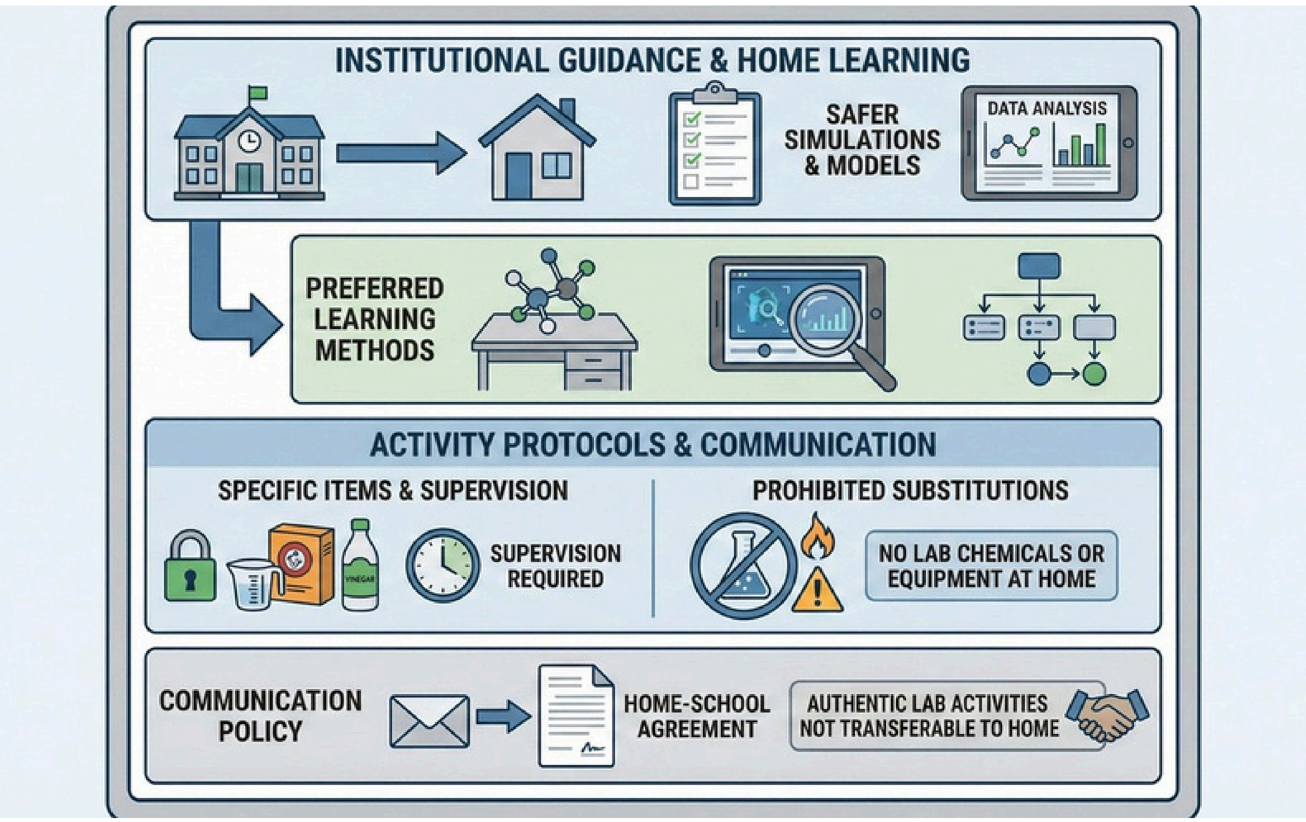
> **Homes are not considered a laboratory, and it should never be treated as one**

Annex B provides model language for clearly communicating supervision expectations, prohibited activities, and instructional boundaries to families.

It promotes transparency, reduces foreseeable misuse, and strengthens defensible professional practice in non-traditional learning environments such as in remote and distance learning settings at home.

Figure 3

This figure contrasts the controlled, safety-equipped school lab with the unpredictable and unregulated home environment. It emphasizes that instructional expectations must change accordingly, with a shift toward simulations, clear communication, and restricted materials.



1.4 OSHA / NFPA / ANSI / NIOSH Crosswalk

Applying Recognized Safety Standards to Non-Traditional Science Learning Environments (Science & STEM Instructional Spaces)

Safer science instruction, regardless of location, must be grounded in recognized safety standards.

Although regulations are written primarily for workplace environments, recognized standards are routinely used by courts, investigators, litigators, and professional organizations to define accepted professional practice in educational settings.

Remote, distance, and home-based science instruction do not exist outside these expectations.

There is a large responsibility to meet curricular expectations and outcomes while in a non-traditional teaching and learning modality, yet the safety standards exist regardless of the location, making this very important for all stakeholders.

> **Standards do not disappear just because instruction moves online.**

When foreseeable hazards are introduced without alignment to recognized safety standards, incidents may be reclassified as preventable, increasing potential liability for educators, administrators, and institutions (OSHA, NFPA).

1.4.1 Why a Safety Standards Crosswalk Matters

Persistent misconceptions in education include:

- OSHA does not apply to schools
- NFPA codes are only for facilities personnel and are "recommendations" only
- 1.4 OSHA / NFPA / ANSI/ISEA /NIOSH Crosswalk
- NIOSH guidance is advisory only

In practice, these standards collectively establish what a reasonable and prudent professional should anticipate and control.

The General Duty Clause and Laboratory Standard requires protection from recognized hazards likely to cause harm, even when no specific regulation exists **(OSHA)**.

Fire and electrical safety expectations are established through recognized safety and prevention codes **(NFPA)**.

Protective equipment requirements are defined through consensus standards (ANSI), and research-based guidance on hazard recognition, exposure prevention, and ergonomics is provided through federal occupational health research (NIOSH).

Failure to consider these standards when assigning remote or home-based science activities may be interpreted as a lapse in professional judgment, increasing potential liability following injury or damages **(OSHA, NFPA)**.

> **If a hazard is recognized by OSHA, NFPA, ANSI/ISEA, or NIOSH, it is foreseeable in education.**

1.4.2 Safety Standards Applicability in Non-Traditional Learning Spaces

Standards do not disappear when instruction moves online. They simply become less visible and therefore easier to potentially overlook.

In remote, distance, and home-based science instruction, we lose the physical cues of safety infrastructure: the fume hood in the corner, the eyewash station by the sink, the posted emergency shutoff. What remains are professional, safer expectations.

Figure 4 makes those expectations explicit. It connects widely recognized standards (OSHA, NFPA, ANSI, and NIOSH) to the realities of non-traditional learning environments for science and STEM.

Think of it as a translation guide. The language of workplace safety does not change when students log in from home. But its application must be interpreted carefully.

Figure 4

This diagram connects established safety standards (OSHA, NFPA, ANSI, NIOSH) to practical decisions in remote teaching contexts. It helps educators translate professional safety expectations into actionable classroom guidance, even outside traditional lab spaces.

Safety Domain	OSHA Reference	NFPA Reference	ANSI / NIOSH Guidance	Application to Remote & Home Learning
Hazard Identification	General Duty Clause (OSHA)		Risk assessment (NIOSH)	Educators must identify foreseeable hazards before assigning activities[1]
Chemical Safety	Hazard Communication (OSHA)	Flammable & combustible codes (NFPA)	Exposure limits (NIOSH)	Household chemical use must be restricted, defined, and never substituted
Electrical Safety	Electrical Work Practices (OSHA)	NEC (NFPA 70)	Electrical safety standards (ANSI)	Personal devices, cords, and chargers require explicit limits
Fire Safety		Fire Prevention Codes (NFPA)	Fire risk research (NIOSH)	No open flames, heating, or ignition sources
PPE	Eye & Face Protection (OSHA)		ANSI/ISEA Z87.1 D3 2020 indirectly vented chemical splash goggles	PPE must be explicitly stated; absence prohibits activity
Ergonomics	Guidance (OSHA)		Ergonomics research (NIOSH)	Screen time and workstation setup must be addressed

1.4.3 Interpretation and Instructional Implications

Hazard Identification

The General Duty Clause and Laboratory Standard establishes that professionals must protect individuals from recognized hazards **(OSHA)**. In remote instruction, hazard analysis must occur before activities are assigned, not after an incident occurs. Statements such as "students were told to be careful" do not satisfy this obligation **(NFPA / OSHA)**.

Failure to conduct a documented hazard analysis prior to assigning remote activities increases potential liability, particularly when safer alternatives were **available (NFPA / OSHA)**.

Chemical Safety

Hazard communication principles and exposure research confirm that chemicals commonly found in homes still present health risks when misused **(OSHA, NIOSH)**. Laboratory safety standards illustrate that school laboratories rely on engineering controls that do not exist in home environments **(NFPA)**.

Accordingly:

- Students must not mix, heat, or alter chemicals at home
- Substitutions ("use whatever you have") are unacceptable for activity selection
- Parent / guardian supervision does not replace professional safety controls

Household does not mean harmless.

Electrical and Fire Safety

Electrical work practices and fire safety codes make clear that untrained individuals should not engage in electrical work or operate ignition sources **(OSHA, NFPA)**. Home environments lack the engineering and emergency controls assumed in traditional brick-and-mortar school facilities.

Therefore:

- Circuit construction using household power is inappropriate
- Candles, burners, and heating elements are prohibited
- Fire suppression and emergency response controls cannot be assumed

Assigning such activities exposes educators and institutions to potential liability when injury is foreseeable **(OSHA, NFPA)**.

Personal Protective Equipment (PPE)

Standards define what qualifies as appropriate eye and face protection **(ANSI)**.

Improvised PPE does not meet consensus standards **(ANSI)**.

If required PPE is not present or cannot be verified, the activity must not be assigned **(OSHA)**.

Supplying certified PPE does not guarantee that it will be used appropriately and that it will be present when there is not formal supervision from a safety qualified instructor.

Most people over emphasize PPE as a hazard control when it should be substitution and elimination as the first approach to activity and material selection.

Ergonomics

Research confirms that prolonged poor posture, inadequate lighting, and excessive screen time contribute to musculoskeletal strain and injury **(NIOSH)**.

Educators are responsible for addressing these risks through instructional pacing, workstation guidance, and structured breaks.

Encourage age and stage appropriate scheduled times for virtual interaction and twist.

1.4.4 Professional Responsibility and Potential Liability

Post-incident reviews routinely examine whether:

- Recognized safety standards existed and were mitigated appropriately **(OSHA, NFPA)**
- Potential hazards and resulting safety risks were foreseeable to a prudent person.
- Safer alternatives were available and not used as possible substitutions **(NSTA)**

Standards define defensible professional practice in science and STEM programs.

When standards-based guidance is ignored, injuries are more likely to be classified as preventable, increasing potential liability for educators, administrators, and districts **(OSHA)**.

Closing Note from the Safety Desk

Supervision without physical authority is supervision with limits. If educators cannot intervene in real time, they must redesign instruction in advance. Distance shifts safety from reactive correction to preventive judgment. The use of hazard analysis and risk assessment in remote scenarios is critically important to the safety of students, their environments, and minimizes potential liability for educators and school districts.

II INSTRUCTIONAL RISK MANAGEMENT FRAMEWORK

When we move science into homes without moving the safety systems with it, we're not being innovative; we're being optimistic. The hierarchy of controls reminds us that real rigor isn't about adding disclaimers or PPE; it's about designing learning so the hazard never has to be managed in the first place.
— James Palcik, CHO, Safer STEM

Applying the Hierarchy of Controls to Distance and Home-Based Science & STEM

Safer science and STEM instruction requires more than good intentions. It requires a structured approach to identifying hazards and selecting controls that are appropriate to the learning environment. In distance and home-based instruction, traditional laboratory controls are largely absent. As a result, educators must rely on conservative, standards-aligned risk management decisions.

This section establishes an instructional risk management framework based on the Hierarchy of Controls, adapted for education, and applied specifically to remote, distance, and homeschooling contexts.

2.1 The Hierarchy of Controls Adapted for Education

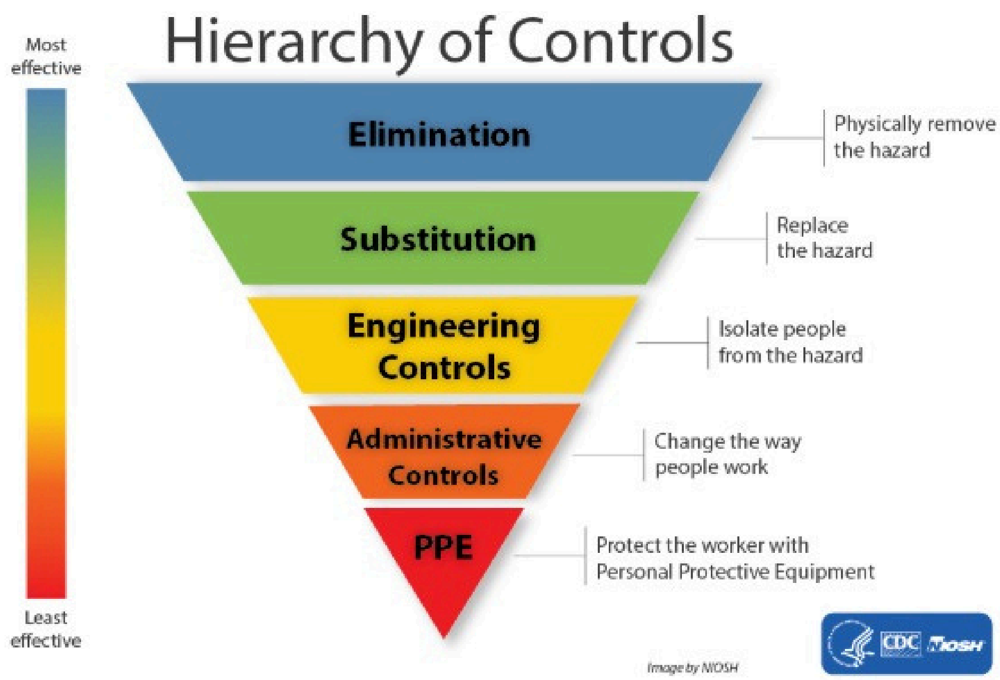
The Hierarchy of Controls is widely recognized as the most effective framework for reducing risk. It prioritizes removing hazards over relying on behavior or personal protection.

In education, this hierarchy must be adapted to reflect the realities of student learning and supervision.

In distance and home-based learning environments, the effectiveness of controls shifts significantly and you must be aware of the impacts that are possible.

Figure 5

This figure demonstrates how data analysis, simulations, and modeling can effectively replace hands-on experiments while maintaining learning outcomes. It reinforces that substitution is not a compromise but a strategic approach to preserving rigor without introducing risk.



Source: CDC

2.2 Elimination

Remove the potential hazard and resulting safety risk entirely

Elimination is the most effective control and the preferred strategy for distance and home-based instruction **(OSHA, NIOSH)**. When a hazard is eliminated, the risk no longer exists.

Examples of elimination include:

- Not assigning hands-on experiments involving any chemicals or biologicals
- Not allowing open flames, heating elements, or ignition sources
- Not requiring the use of sharps, glassware, or powered tools
- Not directing students to manipulate electrical systems

> **In remote environments, elimination is often the only defensible control. If a hazard cannot be physically managed or supervised, it must be removed from the instructional design (OSHA).**

Failure to eliminate foreseeable hazards may expose educators and institutions to potential liability, particularly when safer alternatives were readily available.

Should the selected activity have a hazard and safety risk that needs to be managed, it is already the wrong activity for home-based science / STEM learning.

2.3 Substitution

Replace with safer alternatives

Substitution involves replacing a hazardous activity with a safer instructional alternative that achieves the same learning objective using a less hazardous material **(OSHA, NIOSH)**.

Appropriate substitutions include:

- Virtual laboratories and simulations
- Teacher-performed demonstrations viewed remotely
- Data analysis using provided datasets from previous activity records
- Video-based observation with guided questioning
- Modeling and design challenges that do not involve physical risk(s)

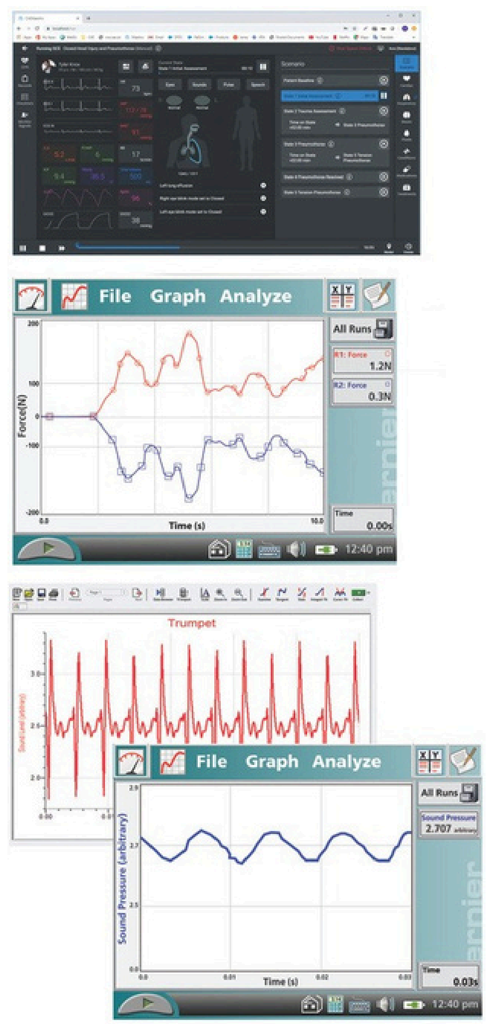
Substitution preserves instructional rigor while significantly reducing risk.

In many cases, substitution is not a compromise but an improvement in instructional clarity and equity **(NSTA)**.

Learning goals in science and STEM can be met without placing students in harm's way.

Figure 6

This figure showcases digital tools that allow students to explore scientific concepts safely without physical materials. It supports the idea that well-designed virtual experiences can promote inquiry, analysis, and conceptual understanding without exposure to hazards.



2.4 Engineering Controls

Isolate people from the hazard

Engineering controls include physical systems such as fume hoods, machine guards, emergency shutoffs, eyewash stations, and fire suppression equipment.

In home environments, these controls are:

- Rarely available
- Not standardized
- Not inspected or maintained
- Not designed for science or STEM purposes
- Not designed for student use in STEM explorations

Because engineering controls cannot be assumed, activities that depend on them are not appropriate for distance or home-based instruction **(OSHA, NFPA)**.

Assigning activities that implicitly rely on absent engineering controls may be considered a failure to anticipate foreseeable risk, increasing potential liability **(OSHA)**.

> **If the control is not present, the activity is not permitted.**

2.5 Administrative Controls

Change how people work

Administrative controls include instructions, safety rules, permission forms, and supervision expectations **(OSHA)**. While necessary, they are among the least effective controls when used alone.

In remote and home settings:

- Written instructions can be misunderstood/misinterpreted
- Students may skip safety guidance
- Supervision varies widely by household
- Teachers cannot intervene in real time to prevent potential unsafe situations

Administrative controls do not eliminate potential hazards and resulting safety risks. They rely on compliance, interpretation, and conditions outside the educator's control. As a result, they must never be the primary risk management strategy in distance science instruction.

Relying solely on instructions or disclaimers does not reduce potential liability when hazards are foreseeable **(OSHA)**.

> **Instructions do not stop injuries. Controls do.**

2.6 Personal Protective Equipment (PPE)

Last line of defense

Personal protective equipment (PPE) is the least effective safety control and should never be used as a substitute for hazard elimination or supervision **(OSHA, ANSI)**.

In-home environments:

- PPE availability cannot be verified
- Improvised PPE does not meet safety standards (ANSI)
- Proper use cannot be ensured in remote environments
- Fit and condition cannot be inspected prior to use

If PPE is required for an activity, the activity is not appropriate for home-based instruction.

Assigning activities that assume PPE use may create potential liability if injury occurs.

If PPE is required, the activity belongs in a supervised formal laboratory facility. If your jurisdiction chooses to perform hands-on activities, the school district MUST provide approved, certified PPE for all students for the planned activities and not expect to have the PPE returned when students return to brick-and-mortar schools.

Figure 7

This image shows PPE being used in a home setting, prompting critical reflection on its limitations outside controlled environments. It reinforces that PPE alone is insufficient and should not justify assigning activities that would otherwise be unsafe at home.

2.7 Instructional Decision Priority for Distance and Home Learning

In distance and homeschooling contexts, the hierarchy must be applied conservatively:

- Elimination is the default **(OSHA, NIOSH)**
- Substitution is the primary instructional strategy (NSTA)
- Engineering controls are generally unavailable in home spaces **(NFPA)**
- Administrative controls are supportive only and difficult to enforce **(OSHA)**
- PPE alone is not an acceptable safety solution **(OSHA, ANSI)**

This prioritization reflects both safer science and educational responsibility.

Closing Note from the Safety Desk

Effective risk management is not about restricting science and STEM learning. It is about selecting instructional approaches that respect the realities of the instructional and learning environment. When educators apply the hierarchy of controls thoughtfully, safer science instruction becomes sustainable, defensible, and professionally sound.

III APPROVED VS. PROHIBITED ACTIVITIES

What is not assigned is often more important than what is.
— James Palcik, CHO, Safer STEM

Safer STEM instruction in distance and homeschooling environments depends on clearly defined instructional boundaries. When activities are assigned without explicit approval criteria, students may unintentionally engage in hazardous practices. Ambiguity increases risk and may expose educators and institutions to potential liability when foreseeable hazards are not controlled.

This section clarifies which activities are appropriate for distance and home-based science instruction and which require extreme caution or are prohibited due to the absence of direct supervision and engineering controls (OSHA, NFPA).

If the risk outweighs the educational value in a regulated laboratory, it cannot occur, and that imbalance is amplified in remote, distance, and home-based environments where safeguards are limited or absent.

3.1 Generally Appropriate STEM Activities

Activities aligned with elimination and substitution strategies

The following activities are generally appropriate for distance and home-based instruction because they eliminate physical hazards or substitute safer instructional approaches for traditional laboratory work (OSHA, NIOSH). The use of the digital solutions that exist eliminates the physical hazards and risks while providing learning experiences for the learners.

Virtual Laboratories and Simulations

High-quality, vetted virtual labs allow students to explore scientific concepts without exposure to actual physical risk (NSTA). When properly selected, simulations support genuine inquiry, data interpretation, and conceptual understanding and convey the STEM topic effectively. There are many sources of these virtual labs and simulations online that can be used for various topics, grade level, and student ability, which need to be reviewed first by the teacher before distribution to the students to ensure that the activity, language used, safety protocols, and overall "fit" are appropriate. If it is not, do not use any resources with the class and search for a better digital solution that meets the expectations, including safety.

Observation-Based Demonstrations

Teacher-performed demonstrations delivered via video allow students to observe correct laboratory techniques, safety practices, and scientific phenomena without engaging directly with hazards. While not the same as actively doing the hands-on STEM activity, this is the closest substitute that imparts the authentic activity and allows for genuine scientific observations and connections.

> **Observation and analysis are legitimate science practices.**

Modeling, Design Planning, and Reflection

Model construction using non-hazardous materials, design proposals, engineering plans, and reflective writing support STEM learning while avoiding physical risks.

Choose safer and age-appropriate materials that have minimal hazard and risk associated with them, and use only student-safe tools and instruments to prevent possible injury in student-led activities in these remote instructional modalities.

Data Analysis Using Provided Datasets

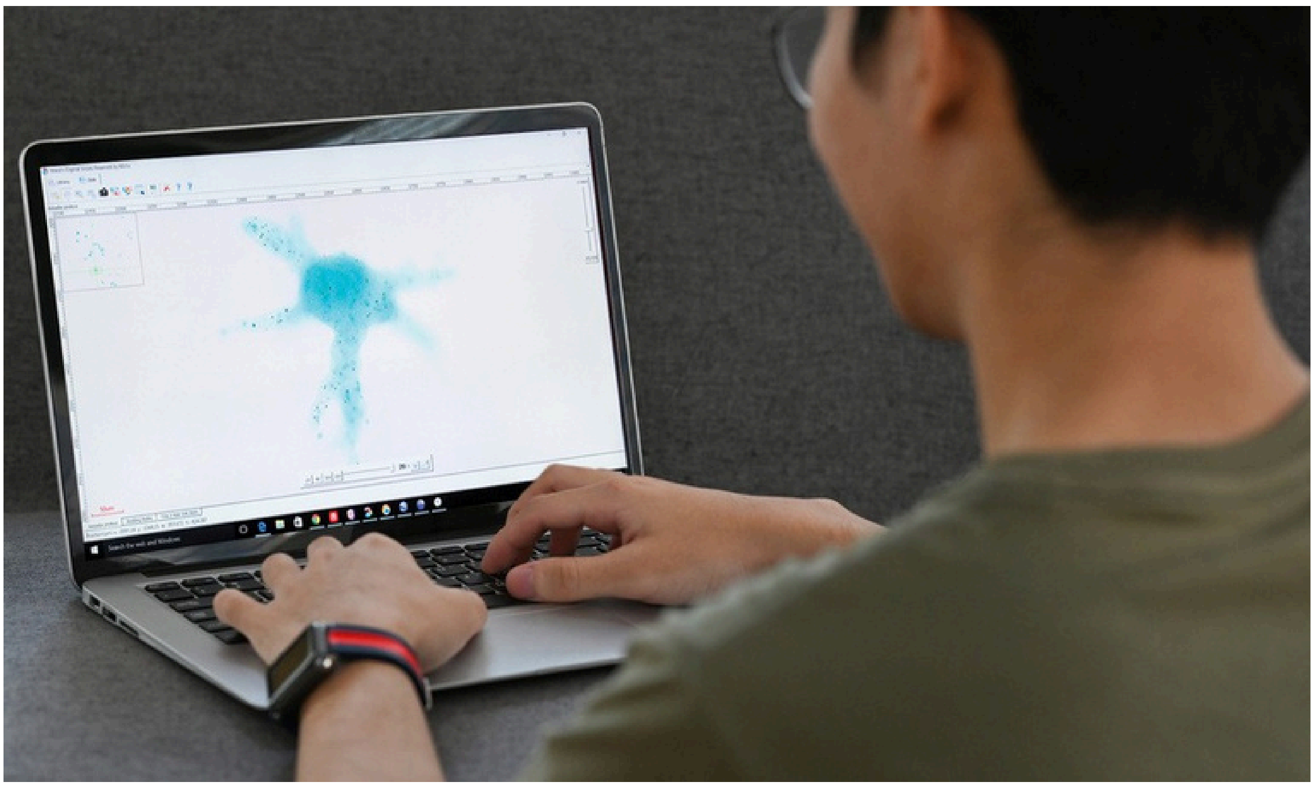
Analyzing teacher-provided or publicly available datasets allows students to engage in authentic scientific practices without handling materials. This approach emphasizes independent student critical thinking, modeling, and evidence-based reasoning.

Videos Showing Proper Laboratory Technique

Professionally produced videos showing correct laboratory setup, procedures, and safety practices reinforce expectations without requiring student participation. Do not endorse or use a video if it does not demonstrate all aspects of the lab experiment, including safer behaviors and practices. This may mean that you need to record yourself or a colleague conducting the lab activity properly.

Figure 8

Ward's Science simulations or virtual labs



3.2 Activities Requiring Extreme Caution or Prohibition

Activities incompatible with home environments

Certain activities present foreseeable hazards that cannot be adequately controlled in distance or home-based settings (OSHA, NFPA). These activities require extreme caution or are prohibited due to the absence of supervision, engineering controls, and emergency response systems. Conducting STEM activities outside of a formal laboratory adds another layer of inherent concerns from a safety perspective, and makes the hazard analysis and risk assessment that much more significant.

The guiding question remains: Does this activity have more risk than educational value? If it does, the activity must be canceled or substantially modified to mitigate associated risks.

The Remote and Home-Based Science Activity Approval Checklist in Annex A supports educators in conducting a structured pre-assignment safety review before approving any remote or home-based science activity. It reinforces hazard identification, elimination as the default control strategy, and substitution alignment consistent with recognized safety standards.

Chemical Reactions

Student-directed chemical reactions involve exposure, mixing, heat, and byproducts that cannot be safely managed at home. According to the NSTA and NSELA leadership, even common household chemicals present risks when combined or altered.

These are considered to be 'banned' activities due to an abundance of caution and potential liability.

Assigning chemical reactions for home completion may create potential liability if injury or damage occurs and safer alternatives were available. The lack of supervision and emergency response training are the reasons to not provide any chemical (including consumer commodity products) for at-home use. This includes consumer commodities including baking soda, vinegar, sugar and other commonly found household items.

Hazardous chemicals should never be assigned for use in home environments. This includes, but is not limited to, methanol (methyl alcohol), concentrated acids or bases, formaldehyde, and flammable solvents. Only low-hazard, commonly available household materials should be used in remote STEM activities.

Heating or Open Flame Use

Activities involving open flames, heating elements, or hot surfaces present significant fire and burn risks (NFPA). Home environments lack laboratory-grade fire suppression, emergency controls, and response training afforded to formal school- based STEM instructional spaces (NFPA, OSHA). Matches, candles, burners, and similar ignition sources must be prohibited for in-home activities for STEM students.

Cutting, Drilling, or Powered Tools

Tools that cut, drill, grind, or apply force pose predictable injury risks even under controlled laboratory conditions. Proper guarding, training, and supervision cannot be ensured in home settings; and therefore, power tools and abrasive cutting tools must be prohibited.

Electrical Circuit Construction Beyond Low-Risk Kits

Electrical activities involving household power sources, modified devices, or unvetted components present shock and fire hazards (OSHA, NFPA).

Only manufacturer-designed, low-risk educational kits may be considered, and only when no modification is permitted.

Activities involving batteries, circuits, or electronic components must be carefully evaluated. Only low-voltage systems using manufacturer-approved components should be used. Charging of rechargeable batteries should be monitored, and damaged or overheating devices should not be used.

There is no mechanism for teachers to inspect electrical components remotely, reinforcing the prohibition on loose electrical parts.

Mixing Household Chemicals

Mixing household substances is a common cause of chemical injury (NIOSH). Students may unintentionally produce toxic gases or corrosive solutions if combining certain chemicals accidentally. Many consumer products commonly found in homes are chemically incompatible and can create dangerous reactions if mixed or stored improperly, including bleach, ammonia, alcohols, and household cleaners.

A quick-reference matrix located in Annex D identifies activities that are incompatible with home-based instruction due to the absence of engineering controls and supervision. It provides standards-informed rationale to support consistent instructional decision-making and reduce potential liability.

Figure 9

This visual provides clear examples of hazards, such as fire, chemicals, tools, and electricity, that are inappropriate for home-based learning. It serves as a quick-reference guide to help educators identify and avoid high-risk activities when designing remote instruction.

3.3 Instructional Decision Guidance

When determining whether an activity is appropriate, educators should ask:

- Does this activity eliminate physical hazards **(OSHA)**
- Can the learning goal be met through substitution **(NSTA)**
- Does the activity assume supervision or controls that do not exist remotely **(OSHA, NFPA)**
- Would injury be foreseeable if instructions were misunderstood **(OSHA)**

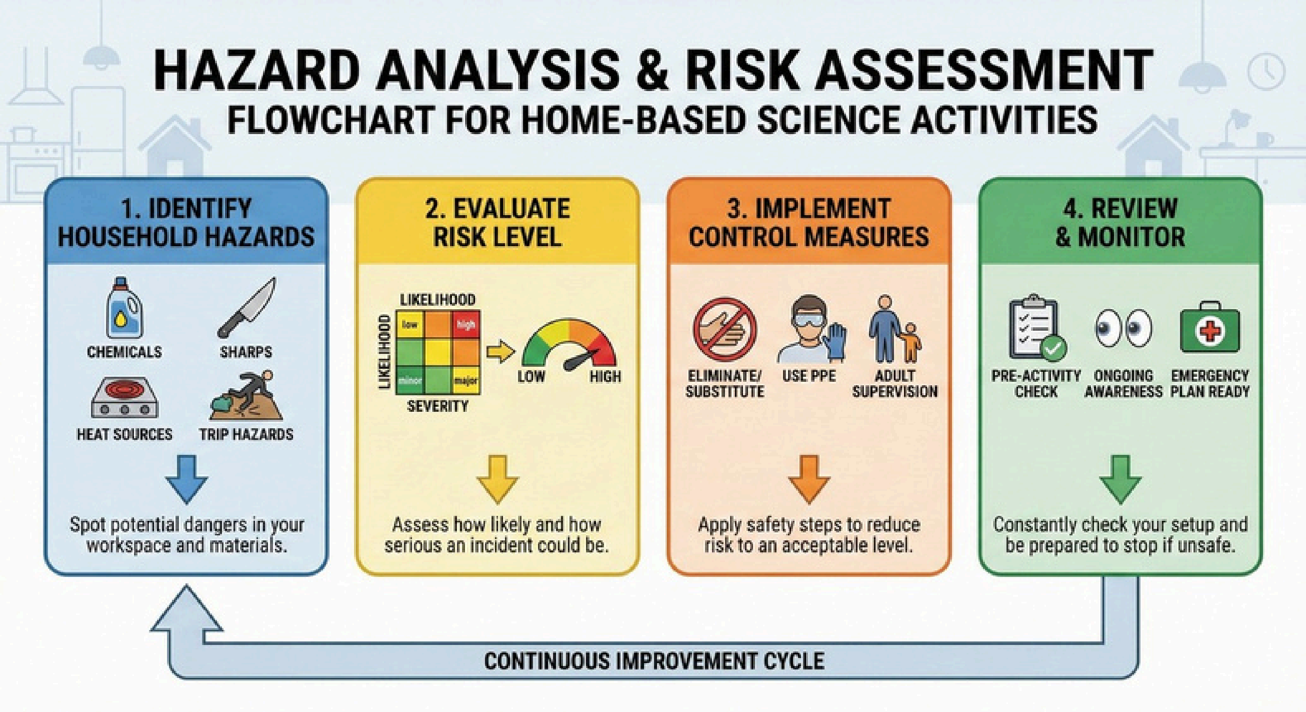
If any response indicates elevated risk, the activity should not be assigned.

Assigning prohibited activities may expose educators and institutions to potential liability when injuries occur **(OSHA).**

Annex C provides a structured hazard analysis tool guides educators through identifying foreseeable risks and applying the hierarchy of controls prior to assigning remote activities. It supports documentation of elimination and substitution decisions aligned with OSHA and NIOSH risk management principles.

Figure 10

This flowchart outlines a structured process for identifying hazards, evaluating risk, and selecting appropriate controls before assigning activities. It reinforces the importance of proactive planning and documentation in ensuring safe and defensible instructional decisions.



Closing Note from the Safety Desk

Clear boundaries protect students, educators, and programs. When approved and prohibited activities are clearly defined and consistently enforced, safer science instruction becomes predictable, defensible, and sustainable across distance and home-based learning environments.

IV EDUCATOR SAFETY CHECKLIST

Most injuries are preceded by missed questions.
— James Palcik, CHO, Safer STEM

Safer science and STEM instruction in non-traditional learning environments depends on intentional pre-planning, active monitoring, and reflective follow-up.

This checklist supports educators in making defensible, standards-aligned decisions before, during, and after instruction occurs outside of school facilities.

Checklists do not replace professional judgment. They support it.

4.1 Before Assigning an Activity

Before any activity is assigned for completion outside a regulated school STEM instructional space setting, educators should confirm the following:

Teachers are responsible for reviewing and approving all remote STEM activities prior to assignment. Activities must align with school and district safety policies and should be evaluated for appropriateness within non-regulated home environments.

- ☐ **All foreseeable hazards have been identified**

  Hazard identification must occur before instruction, not after confusion or injury arises.

- ☐ **The activity can be completed without tools, chemicals, or heat**

  If physical hazards are present, elimination or substitution has not occurred.

- ☐ **Adult supervision is not required or is realistically available**

  Remote STEM activities should require the presence of a responsible adult when procedures involve tools, heat, liquids, or any conditions that may introduce potential hazards and resulting safety risks.

- ☐ **Instructions explicitly state what students must not do**

  Clear prohibitions reduce unsafe improvisation.

- ☐ **The activity aligns with NSTA, NSELA and CSSS safety expectations**

  Instruction should reflect recognized professional practice.

Failure to address these questions increases instructional risk and may expose educators and institutions to potential liability when hazards are foreseeable.

> **If you have to hope students interpret it correctly, revise the activity.**

4.2 During Instruction

While instruction is underway, educators retain responsibility for monitoring and intervention within the limits of the instructional environment.

- [ ] **Reinforce safety expectations verbally and in writing**

  Repeated messaging clarifies boundaries and expectations.

- [ ] **Monitor student questions and submissions for unsafe interpretation**

  Confusion is an early warning sign of elevated risk.

- [ ] **Redirect or stop activities immediately if concerns arise**

  Instructional momentum must never override safety concerns.

Stopping or revising instruction is a professional safety decision, not a failure of planning.

Stopping an activity early prevents explaining an injury later.

4.3 After Instruction

Risk management continues after instruction concludes.

- [ ] **Reflect on near misses, confusion, or unexpected student behavior**

  Near misses provide valuable information for future risk prevention.

- [ ] **Revise future assignments based on observed risk**

  Continuous improvement strengthens safer practice.

- [ ] **Document safety-related instructional decisions**

  Documentation supports transparency, consistency, and administrative review.

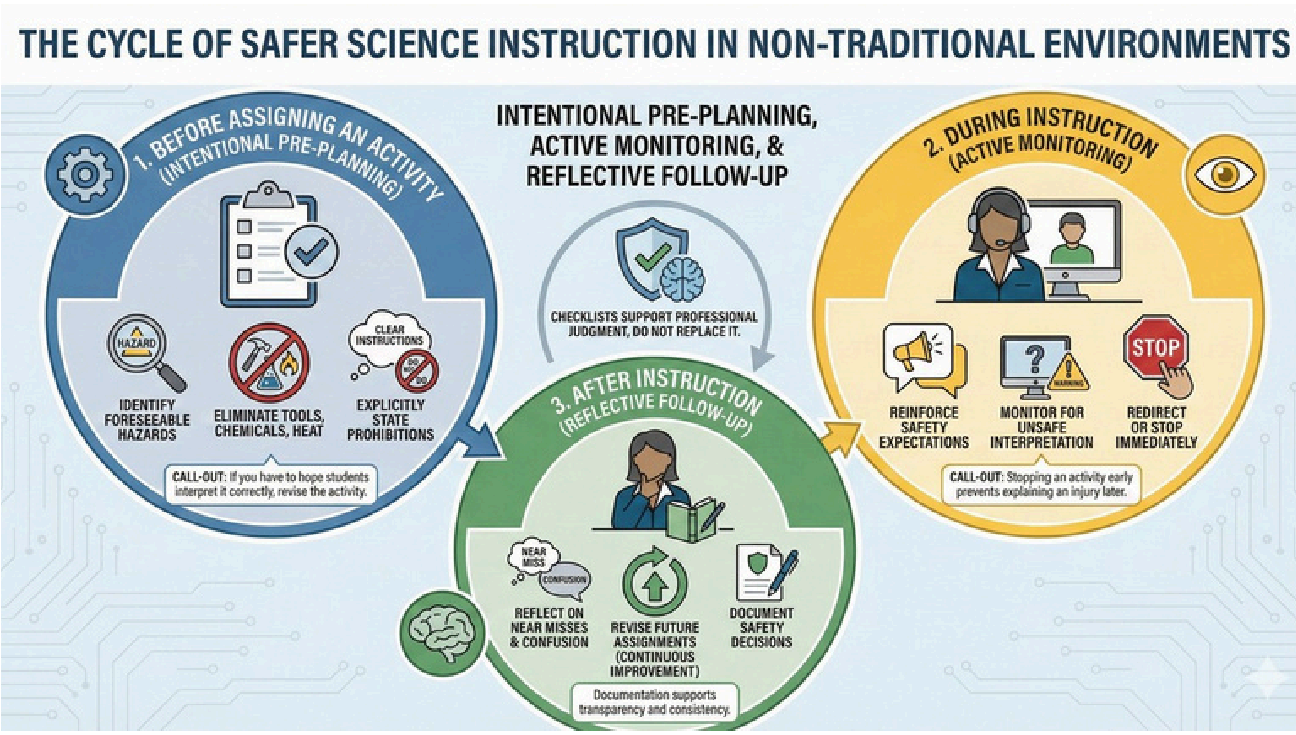
Accurate documentation may be critical if an incident is later reviewed for potential liability.

Annex E has a reflection and documentation tool that supports post-instruction review of safety decisions, near misses, and instructional adjustments.

It reinforces continuous improvement and creates a defensible record of professional judgment in remote and home-based science instruction.

Figure 11

This figure presents safety as an ongoing cycle of planning, monitoring, and reflection rather than a one-time checklist. It highlights how continuous improvement and documentation help educators refine practice and reduce risk over time.



Closing Note from the Safety Desk

Intentional reflection and documentation are core components of professional safety practice. When educators consistently evaluate risk before, during, and after instruction, safer science becomes repeatable, defensible, and aligned with professional expectations. Remember that ‘hope’ is not a strategy in remote / distance STEM education.

References

American National Standards Institute. (2020). ANSI/ISEA Z87.1-2020: American national standard for occupational and educational personal eye and face protection devices. International Safety Equipment Association. https://webstore.ansi.org

American National Standards Institute. (2014). ANSI Z358.1-2014: Emergency eyewash and shower equipment. https://webstore.ansi.org

Centers for Disease Control and Prevention. (n.d.). Cleaning and disinfecting your facility. Retrieved January 2026, from https://www.cdc.gov/hygiene/cleaning

Centers for Disease Control and Prevention. (n.d.). Guidance for COVID-19 prevention in K–12 schools. Retrieved January 2026, from https://www.cdc.gov/respiratory-viruses/prevention/k-12- schools.html

Centers for Disease Control and Prevention. (n.d.). Hand hygiene in schools. Retrieved January 2026, from https://www.cdc.gov/handwashing

Centers for Disease Control and Prevention. (n.d.). Improving ventilation in schools. Retrieved January 2026, from https://www.cdc.gov/respiratory-viruses/prevention/ventilation

National Fire Protection Association. (2023). NFPA 45: Standard on fire protection for laboratories using chemicals. https://www.nfpa.org

National Fire Protection Association. (2021). NFPA 101: Life safety code. https://www.nfpa.org

National Institute for Occupational Safety and Health. (n.d.). Hierarchy of controls. Retrieved January 2026, from https://www.cdc.gov/niosh/topics/hierarchy

National Science Teaching Association. (n.d.). Personal protective equipment in school science. Retrieved January 2026, from https://www.nsta.org/personal-protective-equipment

National Science Teaching Association. (n.d.). Safety and school science instruction. Retrieved January 2026, from https://www.nsta.org/safety

Occupational Safety and Health Administration. (n.d.). Hazard communication standard (29 CFR § 1910.1200). Electronic Code of Federal Regulations. Retrieved January 2026, from https://www.ecfr.gov/current/title-29/subtitle-B/chapter-XVII/part-1910/subpart-Z/section-1910.1200

Occupational Safety and Health Administration. (n.d.). Guidance on cleaning and disinfection. Retrieved January 2026, from https://www.osha.gov/coronavirus/safework

Occupational Safety and Health Administration. (n.d.). Occupational exposure to hazardous chemicals in laboratories (29 CFR § 1910.1450). Electronic Code of Federal Regulations. Retrieved January 2026, from https://www.ecfr.gov/current/title-29/subtitle-B/chapter-XVII/part- 1910/subpart-Z/section-1910.1450

United Nations Economic Commission for Europe. (2023). Globally harmonized system of classification and labelling of chemicals (GHS) (9th rev. ed.). https://unece.org/transport/dangerous-goods/ghs

U.S. Environmental Protection Agency. (n.d.). List N: Disinfectants for coronavirus (COVID-19). Retrieved January 2026, from https://www.epa.gov/pesticide-registration/list-n-disinfectants- coronavirus-covid-19

U.S. Food and Drug Administration. (n.d.). FDA updates on hand sanitizers consumers should not use. Retrieved January 2026, from https://www.fda.gov/drugs/drug-safety-and-availability/fda- updates-hand-sanitizers-consumers-should-not-use

ANNEX A:

REMOTE AND HOME-BASED SCIENCE ACTIVITY APPROVAL CHECKLIST

Pre-Assignment Safety Review Tool

This checklist must be completed before assigning any science or STEM activity intended for remote, distance, or home-based student learning environments.

Activity Information

Course / Grade Level ____

Activity Title: ____

Date of Review: ____

Reviewing Educator: ____

01. Hazard Identification (Required)

Start with the simplest and most common failure point: the power cord.

- ☐ All foreseeable hazards have been identified.
- ☐ The activity does not involve chemicals, reactions, heating, flames, or ignition sources.
- ☐ The activity does not require sharps, glassware, cutting tools, or powered devices.
- ☐ The activity does not require modification of electrical systems or household wiring.
- ☐ The activity does not assume laboratory-grade ventilation or emergency equipment.
- ☐ Misinterpretation of instructions would not increase risk.

If any box above cannot be checked, the activity must be revised or eliminated.

02. Hierarchy of Controls Application

Elimination

- [ ] The activity eliminates physical hazards entirely.

Substitution

- [ ] A safer alternative (simulation, data analysis, modeling, teacher demonstration) has been considered.
- [ ] Substitution achieves the same learning objective without introducing physical risk.

Engineering Controls

- [ ] The activity does not depend on engineering controls (fume hood, eyewash, fire suppression, machine guards).

Administrative Controls

- [ ] Instructions clearly state what students must not do.
- [ ] Written prohibitions are included.
- [ ] Language avoids terms such as “try,” “test,”or “experiment” when physical action is implied.

Personal Protective Equipment

- [ ] The activity does not require PPE. If PPE would be required in a school lab, the activity must not be assigned for home completion.

03. Supervision Considerations

- [ ] The activity does not assume adult supervision that cannot be verified.
- [ ] No specialized training is required to complete the activity safely.
- [ ] The activity does not create foreseeable risk to others in the household.

04. Final Determination

- [ ] Approved as written
- [ ] Approved with modifications
- [ ] Not approved for remote/home use

Reviewer Signature: ___________________

Date: _________________________________

ANNEX B:

PARENT/GUARDIAN COMMUNICATION TEMPLATE FOR REMOTE SCIENCE INSTRUCTION

Subject: Safety Expectations for Remote and Home-Based Science Activities

Dear Parent or Guardian,
As part of our commitment to safer and responsible science instruction, all remote and home-based learning activities are carefully designed to eliminate potential physical hazards.

Activities assigned for completion outside school facilities will prioritize simulations, data analysis, observation, and modeling rather than hands-on experimentation.

We recognize that students may have differing needs, abilities, and home environments. If your student requires accommodations or if any activity presents concerns related to safety, access, or supervision, please contact the teacher prior to beginning the assignment so that appropriate adjustments can be made.

Please note the following safety expectations:

- Students are not permitted to mix chemicals, use open flames, heat substances, or modify electrical devices.
- Household materials must not be substituted for laboratory materials.
- Students should not improvise tools, devices, or procedures.
- If an activity appears unclear or potentially unsafe, students should stop and contact the teacher.

Home environments do not contain the engineering controls, emergency equipment, or supervision systems present in school laboratories. For that reason, laboratory-style experimentation is not transferable to the home setting.

If you have questions regarding any assigned activity, please contact me before your student proceeds.

Thank you for supporting safe and responsible science learning.

Sincerely,

Teacher Name Course / School Contact Information

ANNEX C:

REMOTE INSTRUCTION HAZARD ANALYSIS TEMPLATE

Aligned to OSHA and NIOSH Hierarchy of Controls

Activity Title: ____

Learning Objective: ____

Date of Review: ____

Step 1: Hazard Identification

List all foreseeable hazards (physical, chemical, electrical, ergonomic, behavioral):

Hazard Identified	Potential Harm	Foreseeable in Home? **(Yes/No)**

Step 2: Risk Evaluation

Hazard	Likelihood **(Low/Moderate/High)**	Severity **(Low/Moderate/High)**	Risk **Level**

Step 3: Control Selection (Hierarchy Applied)

Elimination

Describe how the hazard is removed entirely:

Substitution

Describe safer instructional alternative:

Engineering Controls

Are any required? If yes, activity must not be assigned.

Administrative Controls

Instructional boundaries added:

PPE

If PPE would be required in a regulated laboratory, the activity is not appropriate for home use.

Step 4: Final Determination

☐ Hazard eliminated

☐ Substituted appropriately

☐ Not appropriate for remote/home environment

Reviewer Signature: __________________

Date: ________________________________

ANNEX D:

PROHIBITED ACTIVITIES REFERENCE CHART FOR HOME ENVIRONMENTS

Quick-Reference Matrix

Activity Type	Examples	Why Prohibited	Standards Concern
Chemical reactions	Mixing household cleaners, baking soda and acids, unknown substances	Exposure, toxic gas formation, burns	OSHA, NIOSH
Heating / open flames	Candles, burners, stovetop experiments	Fire and burn risk; no suppression systems	NFPA
Electrical construction	Wiring household outlets, modified chargers	Shock and fire hazards	OSHA, NFPA(ANSI)
Sharps / cutting tools	Glass cutting, hobby knives, drilling	Laceration and eye injury	OSHA
Pressurized systems	Soda bottle rockets, compressed air	Projectile hazards	NIOSH
Improvised PPE use	Kitchen goggles, sunglasses	Does not meet ANSI standards	ANSI

Guiding Principle:

If the activity would require engineering controls or PPE in a regulated lab, it does not belong in a home.

ANNEX E:

DOCUMENTATION AND REFLECTIVE PRACTICE LOG

Post-Instruction Professional Review Tool

Activity Title: ____

Date Conducted:____

01. Student Experience

- [ ] Students demonstrated understanding of boundaries.
- [ ] No unsafe improvisation observed.
- [ ] Questions indicated confusion about safety expectations.
- [ ] Activity required clarification during instruction.

Describe observations:

Describe revision plan:

02. Near Misses or Concerns

Were any behaviors or misunderstandings identified that could increase risk in future assignments?

03. Instructional Revisions

What modifications will be made before future use?

- [ ] Clarify prohibited actions
- [ ] Revise instructions
- [ ] Replace with simulation
- [ ] Eliminate activity
- [ ] No changes necessary

04. Documentation Record

- [ ] Hazard analysis completed prior to assignment
- [ ] Parent communication provided
- [ ] Approval checklist completed
- [ ] Documentation stored per district policy

Educator Signature: ________________

Date: ______________________________

ANNEX F:

Science and STEM Must Be Accessible to All Learners

Purpose and Scope

Science and STEM instruction must be accessible to all learners, regardless of ability, environment, or instructional modality. When instruction occurs in remote, distance, or home-based settings, educators must recognize that both learning conditions and safety conditions change significantly (National Research Council [NRC], 2011; NIOSH, 2023).

For students with additional needs, these changes are not minor. They are defining.

This annex provides guidance to ensure instruction remains equitable, safer, and aligned with professional duty of care when delivered outside regulated science / STEM instructional spaces (OSHA, 2023).

Legal and Professional Expectations

Students with additional needs may be supported through:

- Individualized Education Programs (IEPs)
- Section 504 Plans
- Documented medical or health conditions

These supports remain in effect regardless of where instruction occurs.

Educators and institutions must continue to meet obligations under:

- Individuals with Disabilities Education Act (IDEA, 2004)
- Americans with Disabilities Act (ADA, 1990)

However, compliance alone is not sufficient.

The standard is not access alone. The standard is safer access.
This expectation is reinforced through national safety guidance and professional standards (NSTA, 2020; OSHA, 2023).

ANNEX F CTD:

Key Principle: Safety Must Be Student-Specific

In traditional science / STEM instructional spaces, hazard analysis focuses on materials, equipment, and procedures.
In remote learning environments, that is not enough.
Student-Specific Risk Assessment
Educators must evaluate:

- How the activity interacts with the student's abilities
- How the home environment influences risk
- Whether supervision, materials, and conditions are adequate

A "low-risk" activity in a classroom may become a high-risk activity in a home.
Hazard analysis must incorporate both environmental and learner variables to meet the standard of reasonable and prudent professional practice (NIOSH, 2023; OSHA, 2023).

Understanding the Remote Learning Context

Remote STEM learning introduces variables outside educator control:

- Inconsistent or absent adult supervision
- Variable workspace conditions
- Limited access to safety equipment
- Presence of others in the home
- Technology limitations

These variables increase potential hazards and resulting safety risks, particularly for students with additional needs (NRC, 2011; NIOSH, 2023).

Common Categories of Additional Needs

Students may present with a wide range of needs, including:

- Visual impairments
- Hearing impairments
- Mobility impairments
- Learning disabilities
- Attention-related conditions
- Autism spectrum disorder
- Emotional or behavioral conditions
- Medical conditions

Each student must be evaluated individually based on functional needs and environmental context (IDEA, 2004; CAST, 2018).

ANNEX F CTD:

Universal Design for Learning (UDL) as a Safety Strategy
Universal Design for Learning (UDL) is not only an instructional framework; it is a **preventive safety strategy** in remote environments.

Effective practice includes:

- Multiple formats for instruction
- Simplified, structured procedures
- Embedded safety cues
- Flexible demonstration of learning

When instructions are clearer, risks are lower.
UDL reduces barriers while also reducing the likelihood of unsafe interpretation or action (CAST, 2018).

Instructional Decision-Making: Assign, Modify, or Replace
Educators must apply a structured decision process aligned to the hierarchy of controls (NIOSH, 2023):

Assign
Only if hazards are eliminated and accessibility is ensured.

Modify
If supports reduce risk and maintain learning outcomes.

Replace
If hazards cannot be controlled or access introduces risk.

Preferred Alternatives

- Simulations
- Demonstrations
- Data analysis
- Modeling

If the hazard cannot be controlled, the activity must not be assigned.
This aligns with national science safety position statements (NSTA, 2020).

ANNEX F CTD:

Practical Safety Strategies by Student Need

Strategies should align with accessibility and hazard reduction principles:

- Visual supports and narration for visual impairments
- Captioning and written instructions for hearing impairments
- Structured, stepwise tasks for learning needs
- Non-contact alternatives for medical conditions

Instruction must minimize exposure to uncontrolled hazards in all cases (NIOSH, 2023).

Supervision: A Critical Limitation

In remote environments:
Supervision cannot be assumed.
Adult presence does not replace professional safety controls or hazard elimination (OSHA, 2023).
Educators must avoid assigning activities that rely on unverifiable supervision.

Family and Caregiver Communication
Clear communication with families is essential to reduce foreseeable misuse (NSTA, 2020).

Educators should:

- Define expectations and limitations
- Identify prohibited actions
- Provide alternatives
- Clarify supervision requirements

Clarity prevents improvisation. Improvisation introduces risk.

Emergency Considerations in Home Settings
Home environments lack:

- Emergency equipment
- Engineering controls
- Trained responders

ANNEX F CTD:

Therefore:

- Activities requiring emergency response must not be assigned
- Prevention must be prioritized over response

This aligns with OSHA and NFPA expectations for hazard control (OSHA, 2023; NFPA, 2021).

Equity Through Safer Practice

Remote STEM learning can widen gaps if safety is not addressed intentionally.
Equity requires:

- Flexible design
- Safer alternatives
- Intentional planning for variability

Equity is achieved when access does not increase risk.

Closing Note from the Safety Desk

Inclusive STEM instruction is not about lowering expectations.
It is about raising the level of:

- Planning
- Clarity
- Professional judgment

Because when safety is done right:
All students can participate.
All students can learn.
All students can thrive.

Disclaimer

These materials may include content provided by third parties and are made available solely for informational and convenience purposes. CSSS and Safer STEM LLC make no representations or warranties, express or implied, regarding the accuracy, completeness, or reliability of such content, and disclaim all warranties to the fullest extent permitted by law, including but not limited to implied warranties of merchantability, non-infringement, and fitness for a particular purpose.

In no event shall CSSS and/or Safer STEM LLC or its officers, employees, or affiliates be liable for any loss, injury, or damages of any kind, including incidental or consequential damages, arising from the use of these materials. Users are advised to consult applicable occupational safety and health, environmental, and laws at the federal, state, and local regulations, as well as public health and safety guidelines to ensure compliance with current laboratory and STEM instructional space safety requirements.

The contents of this safety manual are proprietary to the authors at Safer STEM LLC, and are considered intellectual property (IP). If referencing this safety manual, please include the name and authors. All content contained in this document has been attributed to the original publisher in the Reference section and every attempt has been made to provide a comprehensive, current, and compliant resource to be used by the science & STEM department educators, School Building Administrators, Chemical Hygiene Officers and/or the designate in order to elevate the level of safety awareness across the school and school district.

Almost every school in the United States must follow the OSHA 29CFR 1910.1450 Laboratory Standard (or state equivalent safety program) for their science department safety requirements. Always follow your approved Chemical Hygiene Plan (CHP) or equivalent safety plan in your local school district jurisdiction and consult with your Chemical Hygiene Officer for more details.

Safer STEM