Council of State Science Supervisors

CSSS MIDDLE SCHOOL STEM SAFETY REFERENCE MANUAL

Safer Practices for Grades 6–8 Integrated Science, Engineering, Robotics, and Makerspaces

A nationally aligned framework supporting developmentally appropriate supervision, hazard recognition, and safer hands-on STEM instruction in U.S. middle schools

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ACKNOWLEDGMENTS

The Council of State Science Supervisors extends its appreciation to James Palcik, CHO, Dr. Brian Collins, Dr. Edward Cohen, and Dr. Kenneth Roy for their leadership in developing the CSSS Middle School STEM Safety Reference Manual.

This manual was written with a clear purpose: to support high-quality, inquiry-based middle school STEM instruction while reinforcing the professional responsibility educators hold to protect young learners. It reflects the insight of classroom teachers, school leaders, state supervisors, and safety professionals who understand that safety is not separate from instruction. It is part of it.

The authors are grateful for the guidance of national organizations, including OSHA, NFPA, ANSI/ISEA, NIOSH, NSTA, NASBE, and NAEYC. Their standards and position statements inform the professional expectations that shape this work. The authors also recognize the contributions of safety leaders and reviewers across K–12 education whose feedback strengthened the clarity and practicality of this manual.

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 practices, and support effective, engaging instruction across Science, STEM, and CTE programs.

About CSSS

The Council of State Science Supervisors is a national organization made up of the people who oversee science education at the state level. Its members are responsible for guiding how science is taught across K–12 systems, from setting policy and supporting standards implementation to shaping professional learning and statewide initiatives.

CSSS provides a space for states to learn from one another, share emerging challenges, and exchange practical solutions grounded in classroom reality.

Through collaboration, research-informed guidance, and partnerships with national organizations, CSSS helps states strengthen science education so that it remains rigorous, inclusive, and connected to real-world learning, while supporting educators in meeting their professional responsibilities, including student safety.

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EXECUTIVE SUMMARY

Hands-on STEM instruction in middle school occurs during a period of rapid developmental change. Students in Grades 6–8 are increasingly independent, curious, and capable, yet they do not consistently anticipate risk or regulate behavior without structured adult oversight.

The CSSS Middle School STEM Safety Reference Manual provides developmentally aligned, standards-informed guidance for safer instruction in integrated science, engineering, robotics, and makerspaces. It reflects the professional understanding that safety failures rarely occur because educators lack care or commitment. They occur when hazards are not anticipated, supervision is diluted, or systems are inconsistent.

This manual emphasizes that safety in middle school STEM is not a secondary consideration. It is foundational to instruction.

Key themes include:

- Developmentally appropriate supervision and structure
- Clear adult duty of standard of care and responsibility
- Hazard identification and risk assessment before instruction
- Alignment with recognized legal safety standards (e.g., OSHA, NFPA) and better professional safety practices (e.g., NSTA, ACS, NIOSH)
- Structured tool and technology access
- Explicit PPE enforcement
- Emergency preparedness and documentation systems
- Ongoing training and continuous improvement

Middle school STEM spaces are not scaled-down high school laboratory instructional spaces. They are environments designed for early adolescents who require explicit expectations, repetition, and active adult oversight.

When safety systems are deliberate, consistent, and reinforced daily, middle school STEM programs become more focused, more equitable, and measurably safer.

I SAFETY IN THE MIDDLE SCHOOL STEM ENVIRONMENT

At the middle school level, safety systems must account for development, not assume maturity.
— James Palcik, CHO, Safer STEM

Middle school STEM instruction occurs during a period of rapid cognitive, physical, and social development. Students are curious and increasingly independent, but they do not yet consistently anticipate consequences or regulate risk without informed adult guidance. In STEM instructional spaces that involve tools, materials, movement, and shared workspaces, this developmental reality must shape instructional design (CDC).

Safer STEM instruction at the middle school level depends on intentional structure, explicit expectations, and continuous adult supervision. Curiosity is an asset. Uncontrolled exposure to hazards and risks is not (NSTA).

1.1 Purpose, Scope, and Legal Context

Purpose

The purpose of this manual is to provide clear, developmentally appropriate, standards- aligned guidance for creating and maintaining safer STEM learning instructional spaces in middle schools.

It supports teachers and school leaders in reducing preventable injuries, strengthening professional practice, and making sound instructional decisions in hands-on STEM settings for teachers and, by extension, for their students. Hands-on learning is central to middle school students' understanding and connections to prior learning (NSTA).

It addresses instructional design, supervision, equipment selection and use, student behavior, emergency readiness, and continuous improvement in Grades 6–8 STEM programs (CSSS).

Scope

This manual applies to middle school instruction involving:

- Integrated science investigations
- Engineering and design challenges
- Robotics and electronics activities
- Makerspaces and fabrication environments
- STEM instructional space demonstrations and supervised investigations
- Preparation, setup, transitions, and cleanup from planned STEM activities

Intended Audience

This manual is intended for:

- Middle school science and STEM teachers
- Engineering, robotics, and makerspace instructors
- Instructional coaches and science supervisors
- School and district administrators, as well as Chemical Hygiene Officers (CHOs)

If students are building, testing, moving, or using tools, safety planning is part of the lesson.

In today's middle school classrooms, an increasing number of students have identified additional needs through an Individualized Education Program (IEP), 504 Plan, or documented medical condition. Providing these students with safer, meaningful access to STEM experiences is not optional; it is a legal responsibility under the Individuals with Disabilities Education Act (IDEA) and the Americans with Disabilities Act (ADA) (U.S. Department of Education; U.S. Department of Justice).

However, this work goes beyond compliance. It is about equity through safer access. As emphasized by the American Chemical Society, students with disabilities must never be viewed as "unsafe." Instead, they must be supported through thoughtful planning, appropriate accommodations, and a strong, proactive safety culture (ACS). This manual serves to support students with additional needs in middle school STEM instructional spaces.

Figure 1

This image shows a structured robotics workspace where materials, tools, and student movement are intentionally organized. It helps teachers visualize how layout and supervision work together to support both engagement and safer instruction.

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1.2 Developmentally Appropriate Safety Expectations

Middle school students require explicit instruction, repetition, and active adult oversight to behave safely in STEM instructional spaces. Expectations must be stated clearly, modeled consistently, reinforced frequently, and enforced without exception at the middle school level (NASP; NSTA).

Early adolescents:

- Are still developing impulse control and regulation strategies
- Are highly influenced by peers
- Often overestimate their physical or technical ability
- Respond strongly to novelty and social attention
- Often underestimate genuine risk

Safer STEM instruction is designed with these realities in mind. Independence is earned through demonstrated responsibility, not assumed.

> **Middle school students test limits. Structure keeps testing from becoming an injury.**

Implications for Middle School STEM

Developmentally appropriate safety practices include:

- Short, focused instructions supported by visual cues
- Clearly defined work zones and movement expectations
- Step-by-step procedures with teacher checkpoints
- Limiting the number of simultaneous hazards in an activity
- Immediate correction of unsafe behavior

Open-ended learning does not mean open-ended risk.

Discipline-Specific Context

- **Integrated Science:** Tools and materials are introduced gradually and used under close supervision
- **Engineering:** Prototypes rely on age-appropriate tools and materials
- **Robotics:** Electrical components require controlled access and defined procedures
- **Makerspaces:** Flexible projects require firm boundaries and routines

Middle school students with additional needs represent a wide range of abilities, including learning and attention differences, sensory and communication needs, mobility challenges, emotional or behavioral needs, and medical conditions such as asthma, epilepsy, allergies, or diabetes. This is not an exhaustive list. Each student brings a unique safety profile that must be considered within the specific context of the STEM activity.

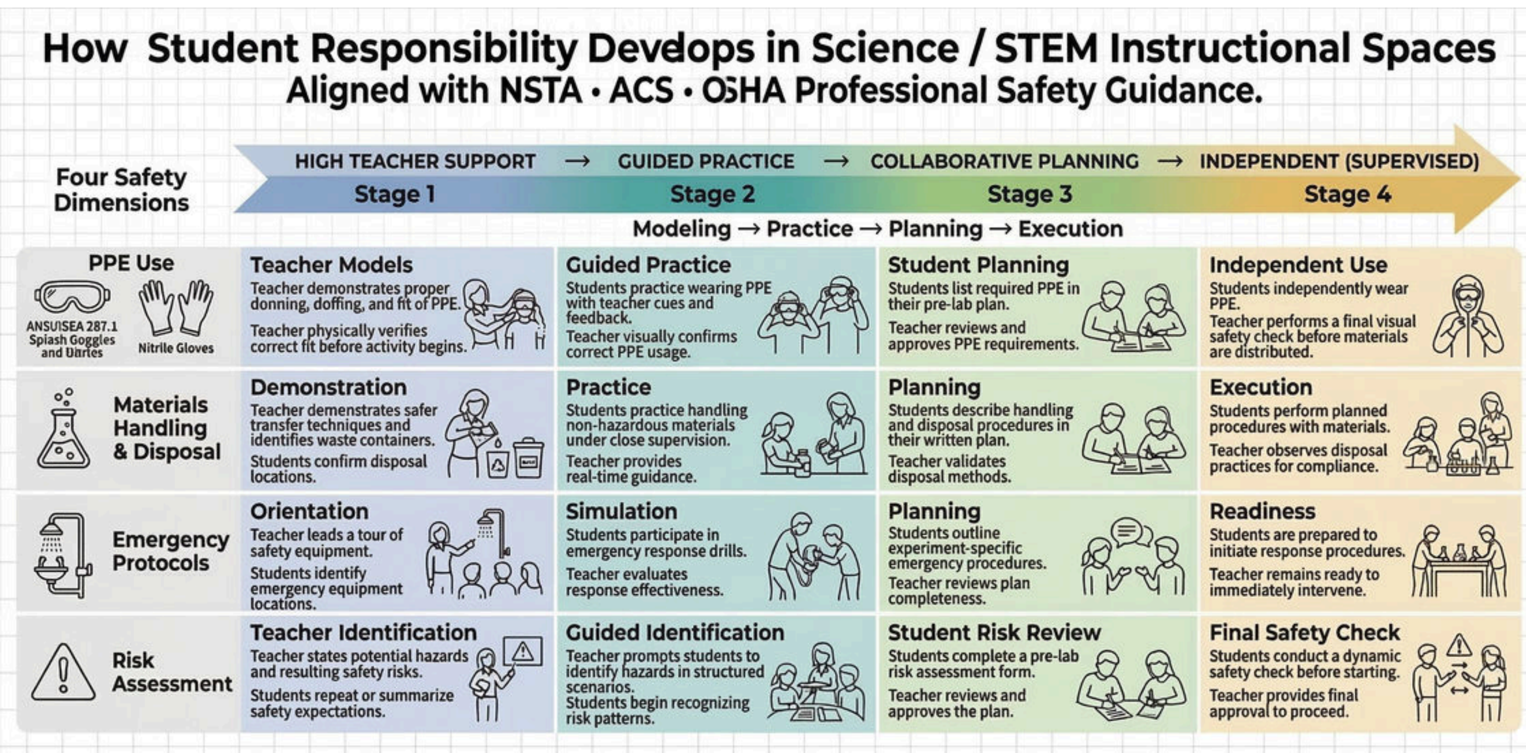
From a safety perspective, educators must ask:
“How does this hazard and resulting risk look from the student’s point of view?”

For example:
- A standard lab setup may be difficult to access or see clearly
- Fine motor tasks may increase material handling risks
- Verbal-only instructions may not be fully accessible

A one-size-fits-all approach does not meet duty-of-care expectations.

Figure 2

This figure illustrates how student responsibility for safety develops over time with consistent teacher guidance. It reinforces that safety skills must be taught, modeled, and gradually released, not assumed.



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1.3 Safety Culture for Early Adolescents

A safer STEM culture in middle school is built deliberately and maintained daily. Students at this age learn safety through adult modeling, consistent enforcement, and routine practice, not through rules alone. A planned and purposeful approach is needed to build a safer foundation in STEM and prepare students for high school science (NIOSH; NSTA).

Safety culture is established when:

- Adults model correct behavior every time
- Expectations are consistent across STEM classroom and laboratory instructional spaces
- Unsafe behavior is addressed immediately and calmly
- Students understand safety as part of doing STEM work correctly

Inconsistency creates confusion. Confusion increases risk.

Implications for Middle School STEM

Effective safety culture practices include:

- Beginning activities with brief, focused safety reminders
- Using common language across STEM courses
- Reinforcing correct safety behaviors publicly
- Treating safety corrections as instruction, not punishment
- Referencing Student Safety Acknowledgment expectations

A strong safety culture reduces behavior problems and protects instructional time.

> **Students follow the expectations that adults enforce, not the ones posted on the wall.**

Middle school students are capable, curious, and increasingly independent. They are also still developing impulse control and risk awareness. Designing STEM instruction without accounting for that developmental reality is like designing a highway without guardrails and assuming drivers will self-correct. Structure is not a constraint on curiosity. It is what keeps curiosity from becoming injury.

The most effective approach to safety is proactive, not reactive. Universal Design for Learning (UDL) supports safer STEM instruction by presenting information in multiple formats, allowing varied methods of engagement, and providing flexible options for demonstrating understanding. This is especially beneficial to students with additional needs and for those who will be in the STEM instructional space in the future.

Figure 3

This visual highlights the interconnected elements, such as communication, preparation, and continuous improvement, that build a strong safety culture. It reminds teachers that safety is a system sustained through daily routines and expectations.

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Closing Note from the Safety Desk

Middle school STEM environments succeed when curiosity is matched with purposeful structure. When adults design instruction around student development, model expectations consistently, and enforce boundaries calmly, learning environments become safer, more focused, and more productive.

II LEGAL AND PROFESSIONAL FRAMEWORK

At the middle school level, adults carry responsibilities that students cannot yet manage.

— James Palcik, CHO, Safer STEM

Middle school STEM programs operate within a legal, ethical, and professional framework designed to protect students, educators, and institutions. Understanding this framework allows teachers to make sound instructional decisions and enables supervisors to establish consistent, defensible expectations across schools and districts (NSTA).

2.1 Duty and Standard of Care in Middle School STEM

Educators and institutions have a legal duty of care to anticipate foreseeable hazards and take reasonable steps to prevent harm. In middle school STEM environments, this duty is heightened due to students' developmental stage, impulsivity, and limited capacity to regulate risk independently (NSTA; NASBE).

Duty of standard and care is the legal and ethical obligation to protect others from unreasonable risk of harm. In practical terms, it means a teacher or organization has a responsibility to act in a way that prevents foreseeable injury to those under their supervision. A STEM teacher has a duty of standard and care to supervise students and provide a reasonably safer teaching/ learning environment.

Standard of care describes how well that duty must be carried out. It refers to the level of care, skill, and judgment that a reasonably competent professional in the same situation would use. A STEM teacher following accepted instructional space safety practices (proper PPE, chemical storage, supervision).

Duty of care is evaluated through:

- Foreseeability of potential risk
- Adequacy of supervision
- Appropriateness of instruction, tools, and materials selected for STEM activities
- Alignment with recognized standards and professional practices

> **If a hazard is foreseeable for a middle school student, it must be controlled before the activity begins.**

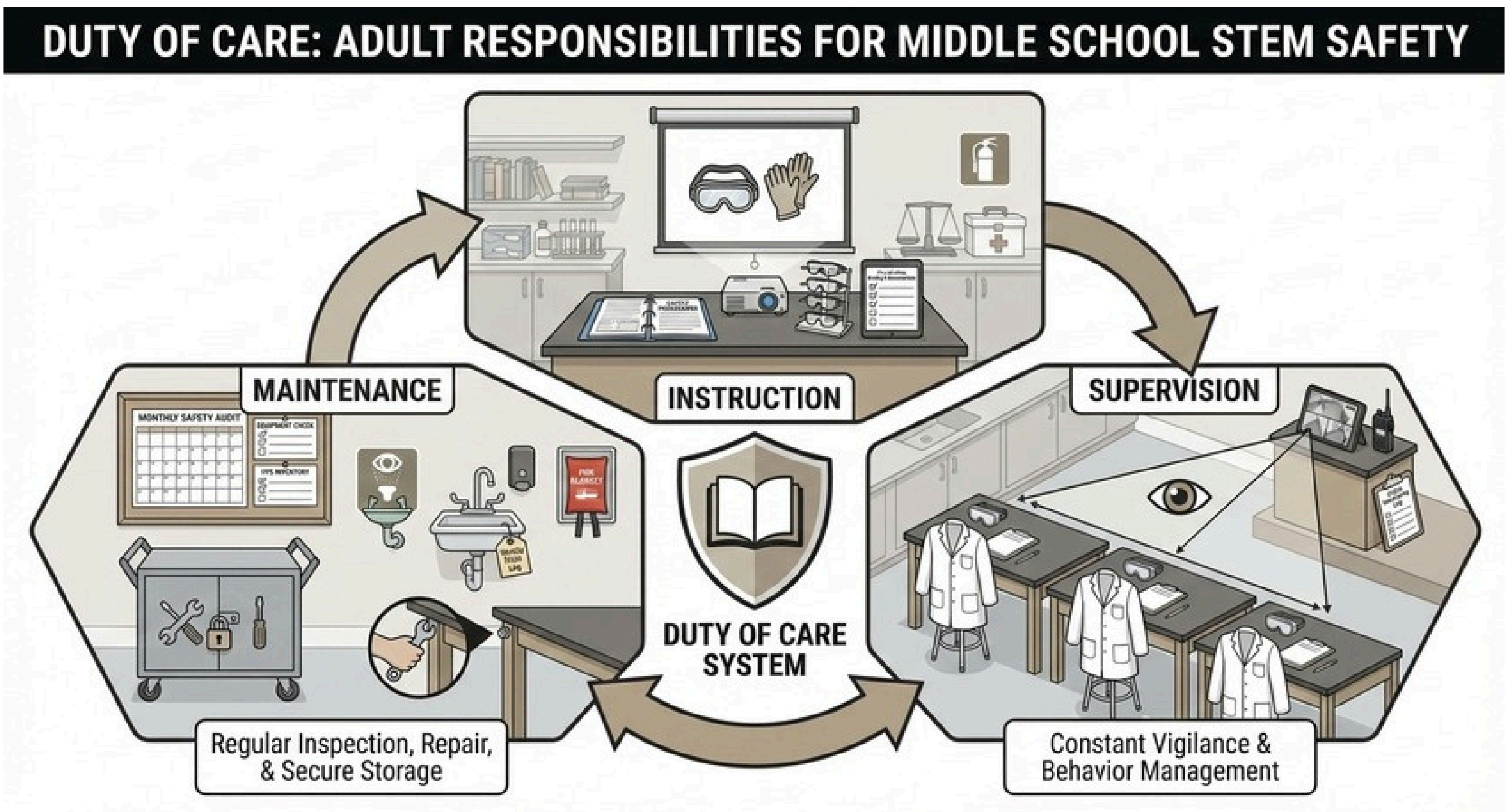
The standard of care for science and STEM educators is generally evaluated based on whether teachers fulfill these four interconnected duties:

- **Duty of Instruct:** Teach students how to work safely
- **Duty to Supervise:** Monitor students to ensure safe behavior
- **Duty of Maintain:** Provide a safe learning environment
- **Duty to Warn:** Inform students of hazards

Middle school students are not expected to manage risk. Responsibility rests with the adults who design, approve, and supervise STEM instruction.

Figure 4

This figure emphasizes that adults carry primary responsibility for anticipating hazards and designing safer learning environments. It reinforces that safety is built through intentional planning, not left to student judgment.



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2.2 OSHA, NFPA, and Best-Practice Alignment

While federal OSHA regulations do not directly apply to all public school employees or to students, OSHA and NFPA standards are widely recognized benchmarks for identifying hazards and defining reasonable professional practice in STEM learning environments (OSHA; NFPA).

In middle school STEM instructional spaces, these standards inform:

- Facility design and occupancy limits
- Fire prevention and emergency response planning
- Equipment selection, setup, use, and storage
- Chemical, biological, electrical, and mechanical hazard controls

Failure to align with recognized safety standards weakens both prevention efforts and professional defensibility.

Implications for Middle School STEM

Safer alignment includes:

- Using OSHA guidance to inform hazard analysis, training, and supervision decisions
- Applying NFPA codes to laboratory layout, egress, storage, and fire protection
- Selecting tools, materials, and procedures appropriate to students' age and maturity

Standards guide professional judgment even when they are not directly enforceable.

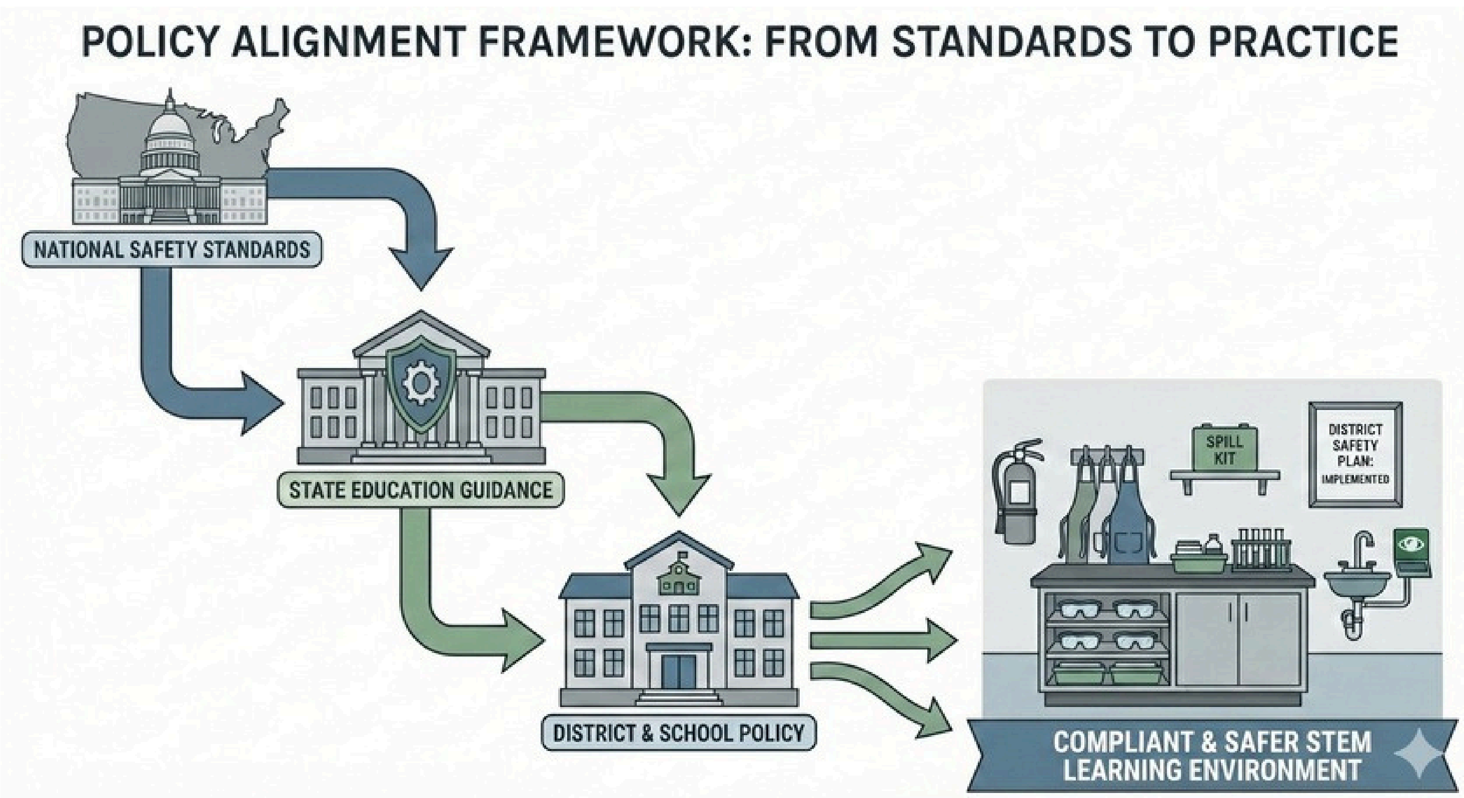
> **Standards are not constraints on instruction. They are tools for making safer decisions.**

Discipline-Specific Context

- **Integrated Science:** Hazard controls must scale to student development
- **Engineering:** Tools and materials must meet instructional and safety thresholds
- **Makerspaces:** Fire, mechanical, and cutting hazards require NFPA-informed controls

Figure 5

This illustration connects national safety standards to everyday classroom decisions. It helps teachers see how professional expectations translate into practical instructional choices.



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2.3 District Policies and State Guidance

District policies and state guidance translate national safety standards into enforceable daily practice. When state or district requirements exceed national guidance, they take precedence (CSSS).

Consistency across schools and STEM programs is essential to reduce confusion and increase compliance.

Implications for Middle School STEM

Effective implementation includes:

- Clear district-level safety procedures for STEM spaces within the Chemical Hygiene Plan
- Alignment between curriculum, facilities, supervision, and staffing policies
- Regular policy review and revision, including activity hazard analysis and risk assessment
- Supervisor support for training, enforcement, approval processes, and corrective actions

Teachers should not be expected to interpret or enforce safety policy in isolation.

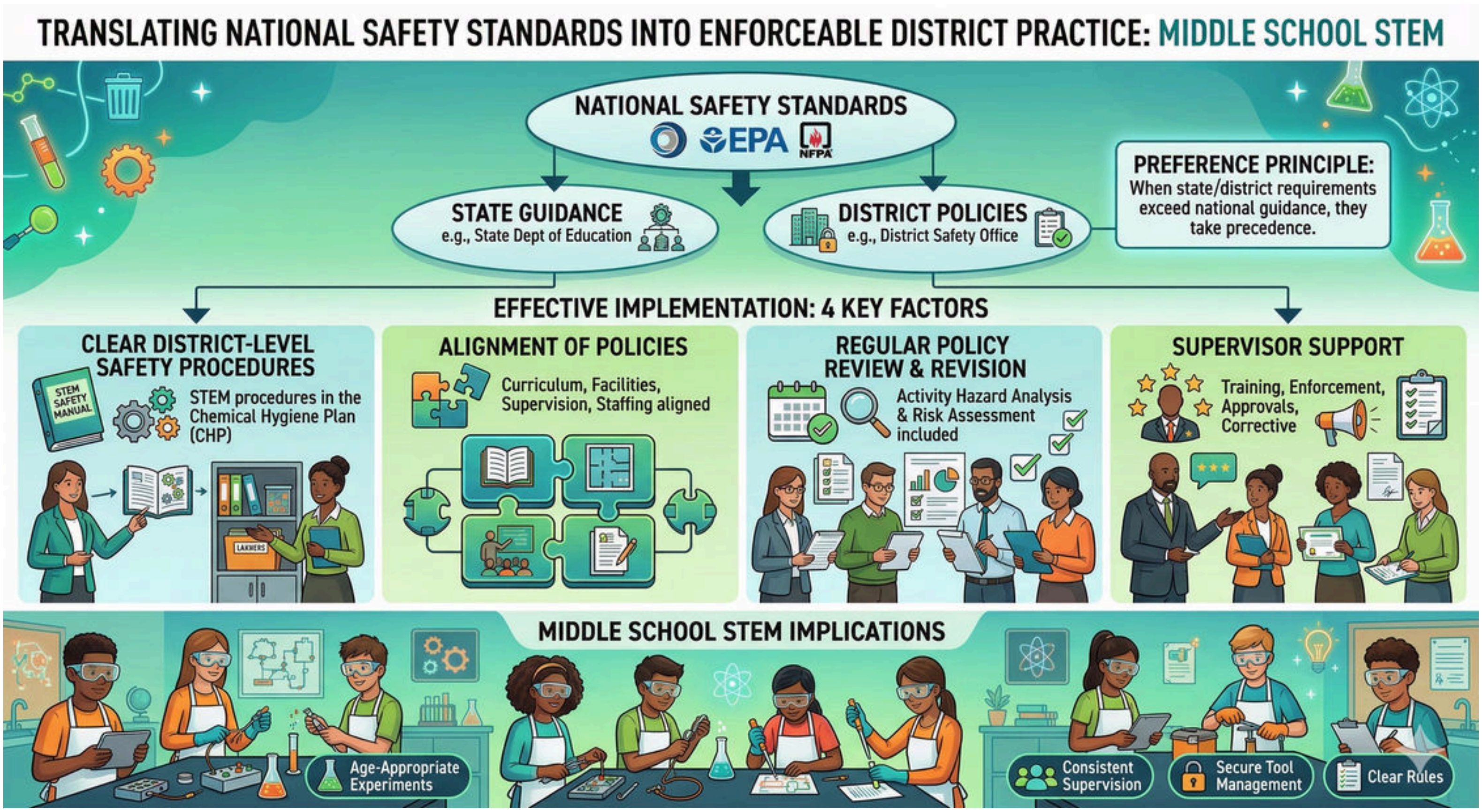
> **Local policy determines daily practice. National standards define the minimum.**

Program-Specific Context

- **Integrated Science:** Classroom and laboratory instructonal space expectations must align

Figure 6

This infographic illustrates the governance hierarchy of safety standards, showing how national and state guidelines funnel into enforceable district-level policies through key implementation factors like supervisor support and curriculum alignment. The bottom section visualizes these protocols in a middle school STEM environment, emphasizing age-appropriate experiments, consistent supervision, and clear rules to ensure student safety.



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2.4 Understanding the Globally Harmonized System (GHS) for Chemical Safety

The Globally Harmonized System of Classification and Labeling of Chemicals (GHS) is an internationally adopted framework developed by the United Nations to ensure that chemical hazards are classified consistently and communicated clearly. GHS establishes a shared structure for chemical labels and Safety Data Sheets (SDS), allowing potential safety hazards and resulting risks to be recognized and understood regardless of location, industry, or instructional setting (UNECE).

In middle school science instructional spaces, GHS serves as the foundation of chemical hazard communication. It supports informed professional judgment by educators and enables students to recognize, interpret, and respond appropriately to potential chemical hazards encountered during instruction. GHS is not an abstract regulatory concept. It is the system students encounter on compliant chemical containers, secondary labels, and SDS used in school laboratory instructional spaces (OSHA).

Implications for Middle School Science Courses

When hazardous chemicals are present, educators are responsible for ensuring that potential safety hazards and resulting risks are clearly identified, communicated, and addressed before instruction begins. GHS provides the standardized language and symbols that make this possible.

Most industry onboarding safety programs include explicit GHS training. Introducing these concepts in middle school science courses strengthens continuity between instructional practice and professional laboratory environments (OSHA; NSTA).

Effective application of GHS in middle school science laboratory instructional spaces supports:

- Consistent interpretation of chemical hazards
- Safer handling, storage, and disposal practices
- Alignment with the OSHA Hazard Communication Standard
- Preparation for postsecondary laboratory instructional spaces and workforce safety expectations

> **If students cannot identify the hazard, the safety system has failed.**

GHS Pictograms and Visual Hazard Communication

GHS uses standardized pictograms to communicate the potential safety hazards and resulting health and safety risks visually. Each pictogram consists of a black symbol on a white background framed by a red diamond. These pictograms appear on chemical container labels and SDS and provide immediate, nonverbal hazard recognition (UNECE).

Figure 7

This chart introduces standardized hazard symbols used on chemical labels. It helps teachers and students quickly recognize and interpret potential hazards through visual cues.

GHS Pictogram	GHS Pictogram Name	Hazard Type	Hazards Communicated (Plain Language)
	**Flame**	Fire hazard	Flammable gases, liquids, or solids; self-reactive substances; materials that ignite easily
	**Flame Over Circle**	Oxidizer	Chemicals that can cause or intensify fires even without an ignition source
	**Exploding Bomb**	Explosion hazard	Explosives, self-reactive substances, organic peroxides that may detonate
	**Gas Cylinder**	Gas under pressure	Compressed, liquefied, or dissolved gases that may rupture or explode if heated
	**Corrosion**	Corrosive	Causes severe skin burns and eye damage; corrodes metals
	**Skull and Crossbones**	Acute toxicity	Highly toxic substances that can cause serious harm or death after short exposure
	**Health Hazard (Silhouette)**	Chronic health hazard	Carcinogenicity, respiratory sensitization, reproductive toxicity, organ damage
	**Exclamation Mark**	Irritant or harmful	Skin or eye irritation, allergic reactions, drowsiness, respiratory irritation
	**Environment**	Environmental hazard	Toxic to aquatic life; included in GHS though not required in all regulatory systems

Note: *The environmental hazard pictogram is part of GHS but may not be required under all regulatory systems.*

Pictograms never stand alone. They must be interpreted together with the signal word, hazard statements, and precautionary statements on the label and SDS.

Safety Data Sheets (SDS)

Safety Data Sheets are standardized documents supplied for potentially hazardous chemicals and are required to follow a 16-section format. This consistency allows educators and students to locate critical safety information efficiently and supports hazard analysis before instruction (OSHA).

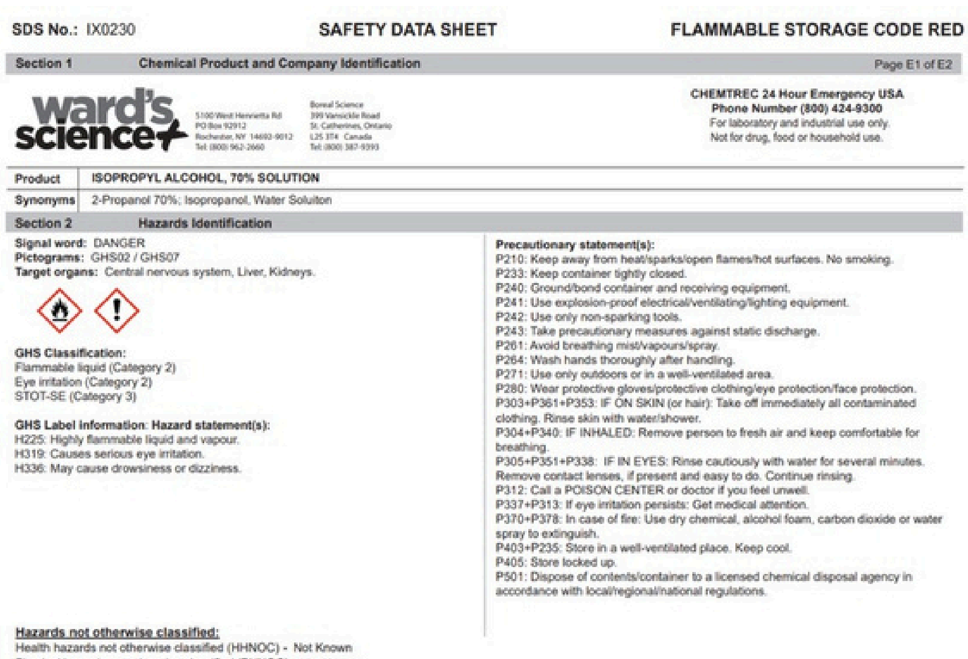
SDS provide information on:

- Hazard identification
- Composition and ingredients
- Handling and storage
- First aid and emergency measures
- Exposure controls and required personal protective equipment
- Physical, chemical, and toxicological properties

GHS classification elements appear prominently in Section 2 of every SDS and are reinforced throughout the document (UNECE).

Figure 8

This image demonstrates what a properly labeled container should include. It reinforces the importance of consistent labeling for communication and hazard awareness.



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Signal Words

Signal words provide a rapid indication of hazard severity. GHS uses two signal words:

- **Danger** for more severe potential safety hazards and resulting risks
- **Warning** for less severe hazards
  Only one signal word appears on a label, corresponding to the most severe applicable hazard. If no signal word applies, none is used (UNECE).

Hazard Statements

Hazard statements are standardized phrases assigned specific H-codes that describe the nature of a chemical hazard. These statements communicate the physical or health risks associated with a substance (UNECE).

Example:

- **H314** Causes severe skin burns and eye damage

Using hazard statements during instruction supports accurate interpretation of labels and SDS and reinforces professional laboratory practice (NSTA).

> **If students cannot interpret a label, they cannot make an informed decision. Hazard communication is literacy.**

Precautionary Statements

Precautionary statements describe measures required to minimize or prevent harm. They are organized into four categories:

- Prevention
- Response
- Storage
- Disposal

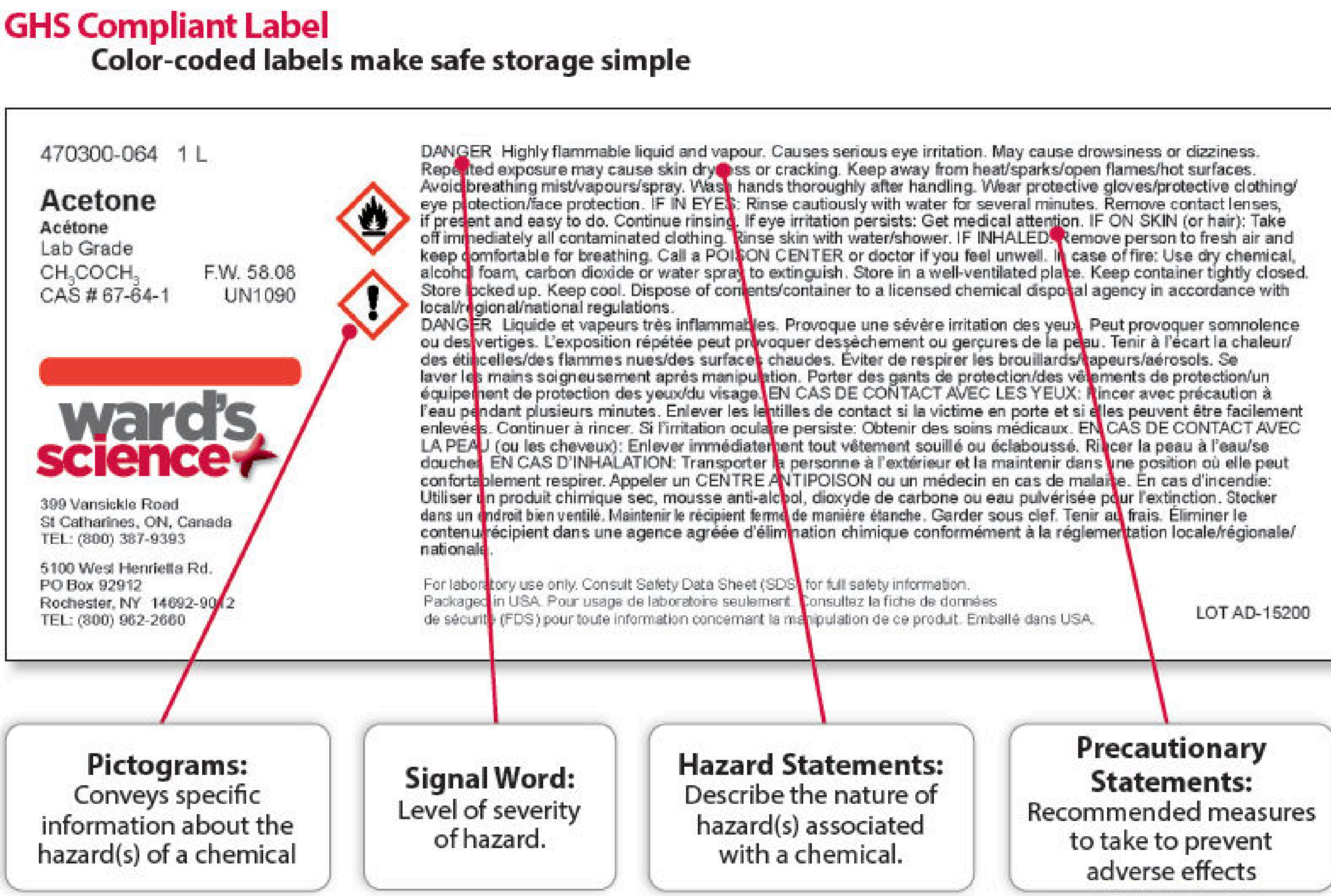
Example:

- **P280** Wear protective gloves, protective clothing, and eye protection

Precautionary statements translate hazard recognition into specific protective action and should be reinforced verbally and in writing during instruction (OSHA).

Figure 9

This image demonstrates what a properly labeled container should include. It reinforces the importance of consistent labeling for communication and hazard awareness.



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Duty and standard of care in middle school STEM is not theoretical. It is practical and observable. When potential safety hazards and resulting risks are foreseeable and controls are absent, responsibility does not rest with the student. It rests with the adult who planned the activity. Standards such as OSHA and NFPA function much like architectural blueprints: they quietly define what reasonable protection looks like long before an incident tests the system.

Figure 10

Standards such as OSHA and NFPA function much like architectural blueprints

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Closing Note from the Safety Desk

Middle school STEM educators operate within a framework designed to protect learners who are still developing judgment and self-control. When legal duty, professional standards, and local policy are aligned, instruction becomes more predictable, consistent, and measurably safer.

III LEARNING SPACE SAFETY

You cannot teach safer behavior in a space that encourages unsafe movement.
— James Palcik, CHO, Safer STEM

Learning instructional spaces shape behavior. In middle school STEM, the design, layout, and use of space directly influence student movement, supervision, and risk.

Safer STEM instruction requires learning instructional spaces that support the activities taking place and reflect the developmental needs of early adolescents (NSTA).

3.1 STEM Classroom and Laboratory Instructional Spaces Distinctions

Not all STEM learning instructional spaces are laboratory instructional spaces. Activities must be selected based on the design, infrastructure, and safety features of the room or instructional space, not on curriculum goals alone (NSTA; NFPA).

Authentic STEM experiences can occur in formal science laboratories or classroom instructional spaces, field settings, or dedicated makerspaces. However, hazards must align with what the space can safely support.

Implications for Middle School STEM

A STEM instructional space typically:

- Lacks fixed laboratory benches and built-in emergency equipment
- Is appropriate for design, modeling, coding, data analysis, and low-risk investigations

A laboratory instructional space includes:

- Fixed work surfaces designed for wet or tool-based activities
- Access to eyewash stations, ventilation, and emergency controls
- Utility shutoffs and safety equipment

If the room cannot support the hazard, the activity must be redesigned or relocated.

Discipline-Specific Context

- **Integrated Science:** Wet labs belong only in equipped laboratory spaces
- **Engineering:** Material testing must match room capabilities
- **Robotics:** Electrical work may be appropriate in classrooms with defined controls
- **Makerspaces:** Tool use must align with room design and supervision capacity

Laboratory-level potential safety hazards must not be introduced into spaces that are not designed to support them. Activity selection, material choices, and hazard analysis must align with available risk controls (NFPA).

Figure 11

This figure contrasts different instructional spaces and their safety considerations. It helps teachers recognize how environment influences supervision and risk.

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3.2 Makerspaces and Flexible Learning Environments

Makerspaces and flexible learning environments increase creativity but also increase potential risks if boundaries are unclear. Open layouts require explicit rules, defined zones, and continuous adult supervision (NSTA).

Implications for Middle School STEM

Safer makerspace practices include:

- Clearly defined zones for tools, materials, and movement
- Limits on the number of students per zone
- Gradual introduction of tools based on demonstrated readiness
- Established routines for setup, use, storage, and cleanup

Flexibility in furniture or layout does not mean flexibility in expectations or safety rules.

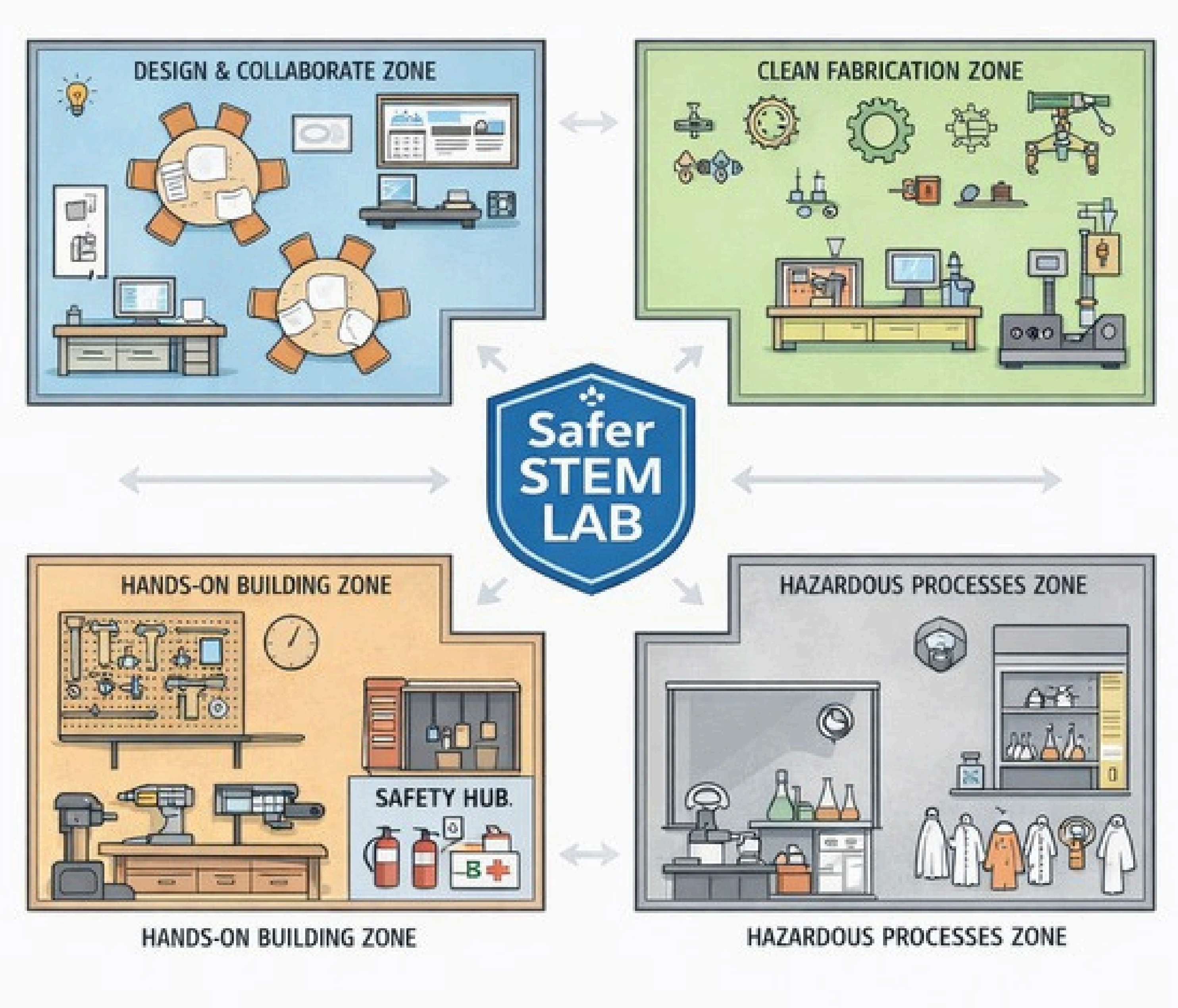
> **Flexible spaces demand firmer supervision, not less.**

Discipline-Specific Context

- **Engineering:** Prototyping materials must be age-appropriate and controlled
- **Robotics:** Electrical components require structured access and procedures
- **Makerspaces:** Cutting, heating, or mechanical tools require zoning and close supervision
- **Integrated Science:** Investigation stations must be clearly separated

Figure 12

This diagram shows how dividing a space into zones supports safer movement and tool use. It emphasizes the role of intentional design in managing activity and reducing risk.



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3.3 Occupancy, Layout, and Supervision

Occupancy load limits and layout determine how effectively teachers can supervise students. Overcrowding and poor sightlines undermine all other safety controls (NFPA; NSTA).

Implications for Middle School STEM

Safer learning spaces require:

- Adherence to posted occupancy load limits
- Layouts that allow continuous visual supervision of all students
- Clear aisles and defined work areas
- Group sizes appropriate to student maturity and activity risk

NFPA 101 establishes net square footage requirements for occupancy determination. NSTA guidance further recommends limiting enrollment to support effective supervision and hazard control (NFPA; NSTA).

> **If you cannot see every student, supervision is not adequate.**

Discipline-Specific Context

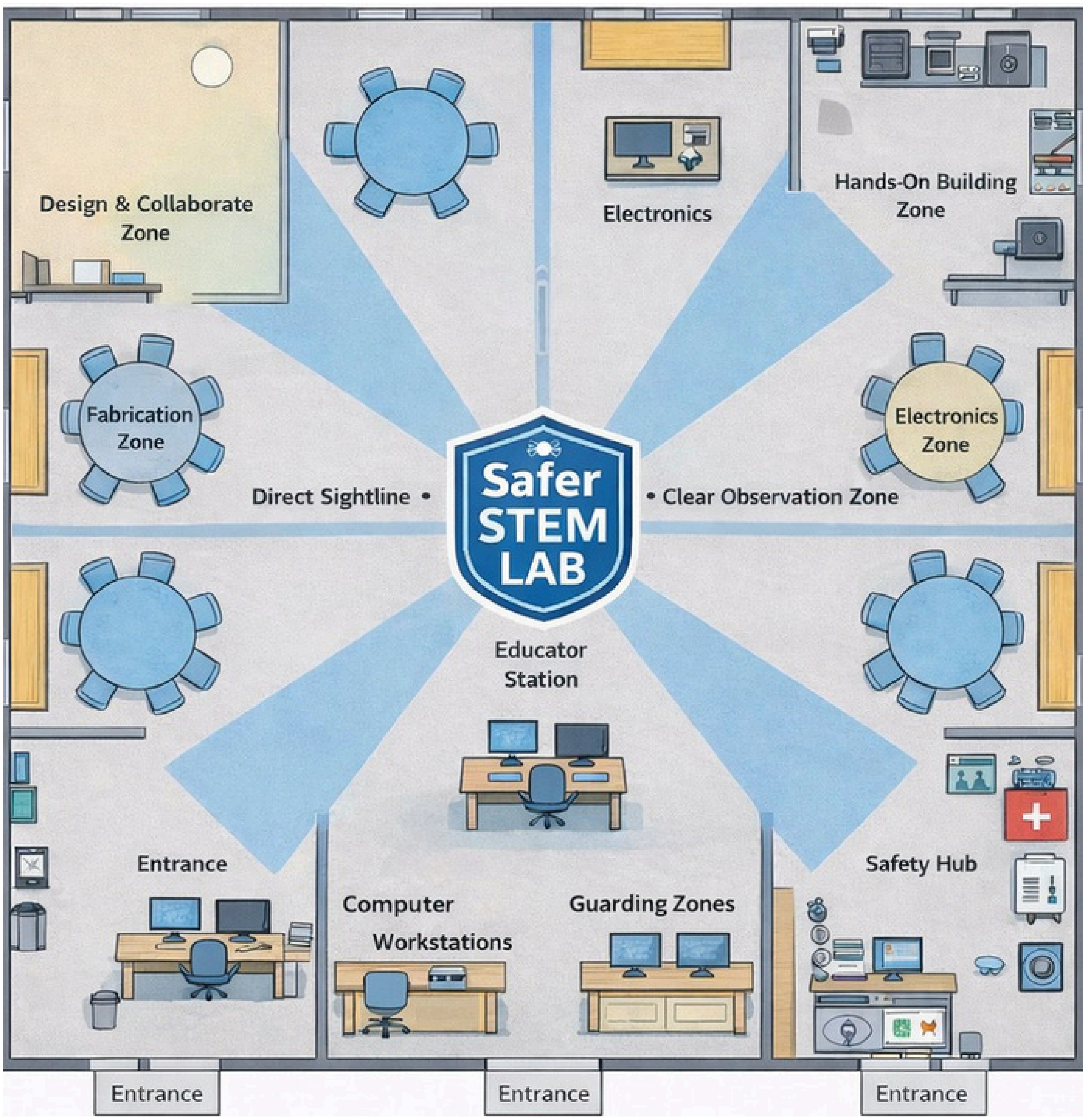
- **Integrated Science:** Hands-on stations require sufficient spacing
- **Engineering:** Construction activities need clear movement paths
- **Robotics:** Equipment storage must not block sightlines
- **Makerspaces:** Multiple simultaneous activities increase supervision demands

Students with additional needs may require some accommodations or modifications to their STEM program. Accommodations change how a student learns, while modifications change what a student is expected to learn.

Common accommodations in middle school STEM instructional spaces include step-by-step visual instructions, extended time, peer or adult support, strategic seating near safety equipment, and assistive tools. These supports must always be paired with a corresponding hazard analysis and risk assessment prior to the activity. Adjustments made for access must not introduce new or uncontrolled hazards and risks.

Figure 13

This visual demonstrates how room layout impacts a teacher's ability to monitor all students. It reinforces that clear visibility is essential for proactive safety.



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3.4 Ventilation and Electrical Safety

Ventilation and electrical systems are engineering controls. Middle school students must never compensate for inadequate infrastructure through behavior or caution alone (OSHA; NFPA).

Implications for Middle School STEM

Safer practices include:

- Ensuring general room ventilation is functional and unobstructed
- Restricting activities that generate fumes, vapors, or particulates
- Inspecting electrical cords, outlets, chargers, and power strips
- Preventing circuit overloading and improper extension cord use

Improvised electrical setups increase the likelihood of injury.

> **If the system cannot support the activity safely, the activity must change.**

Discipline-Specific Context

- **Integrated Science:** Heating and chemical use require adequate ventilation. The NFPA 45 standard mandates continuous flow ventilation in laboratory and classroom instructional spaces where hazardous chemicals are present.
- **Engineering:** Power tools and chargers require inspection before use
- **Robotics:** Batteries and power supplies must be monitored and stored safely
- **Makerspaces:** Multiple devices increase electrical load and risk

The NFPA 45 standard mandates continuous flow ventilation in laboratory and classroom instructional spaces where hazardous chemicals are present. This requirement is crucial for preventing the accumulation of hazardous vapors and ensuring safe dilution and removal of flammable, toxic, or reactive substances. The standard outlines specific airflow requirements to maintain consistent airflow across the laboratory and associated areas, with special attention to high-risk chemical zones. Continuous ventilation is essential for the effective operation of chemical fume hoods, which must capture and contain vapors with appropriate face velocities and containment capabilities. Additionally, exhaust air must be discharged safely to prevent re-entrainment into the building or exposure to outdoor areas.

The NFPA 45 standard mandates continuous flow ventilation in laboratory and classroom instructional spaces where hazardous chemicals are present.

Annex A provides a structured checklist for evaluating electrical safer practice in middle school STEM rooms, addressing room readiness, equipment condition, cord management, PPE, supervision, emergency preparedness, and shutdown procedures to reduce foreseeable electrical hazards during instruction.

3.5 Field Trip Safety

Field studies introduce a potential safety hazard that is less predictable and less controllable than those found in school-based STEM spaces. In middle school, field trip safety depends on advance planning, documented risk analysis, and continuous adult supervision.

Teachers must complete a potential hazard analysis before any off-campus learning experience. This analysis must consider terrain, weather, traffic, water exposure, wildlife, tools or equipment, student behavior, and individual medical or accessibility needs. Identified risks must be matched with appropriate supervision ratios, student preparation, personal protective equipment when required, and clearly defined emergency procedures.

Students must receive explicit safety instruction before leaving campus. Expectations must include appropriate clothing and footwear, required PPE, staying within established boundaries, and following adult directions at all times. Middle school students are not expected to independently assess or manage field-based risk. Responsibility remains with the adults planning and supervising the activity.

Schools must ensure required permissions and documentation are in place prior to departure. This includes parent or guardian consent, student safety acknowledgments, medical information, first-aid supplies, reliable communication methods, and clear emergency response procedures. Plans must address injuries, severe weather, and student separation.

When field work is intentionally planned, actively supervised, and properly documented, it extends STEM learning while meeting the school’s duty and standard of care. Field studies support meaningful connections to the natural and built world when safety is treated as a foundational condition of instruction.

> **Field trips do not reduce responsibility. They increase the need for planning, supervision, and documentation.**

Annex B outlines a standards-aligned checklist for planning and supervising K–12 field trips, emphasizing hazard identification, supervision, PPE, documentation, and emergency preparedness to support safer off-campus learning experiences consistent with NSTA core safety principles.

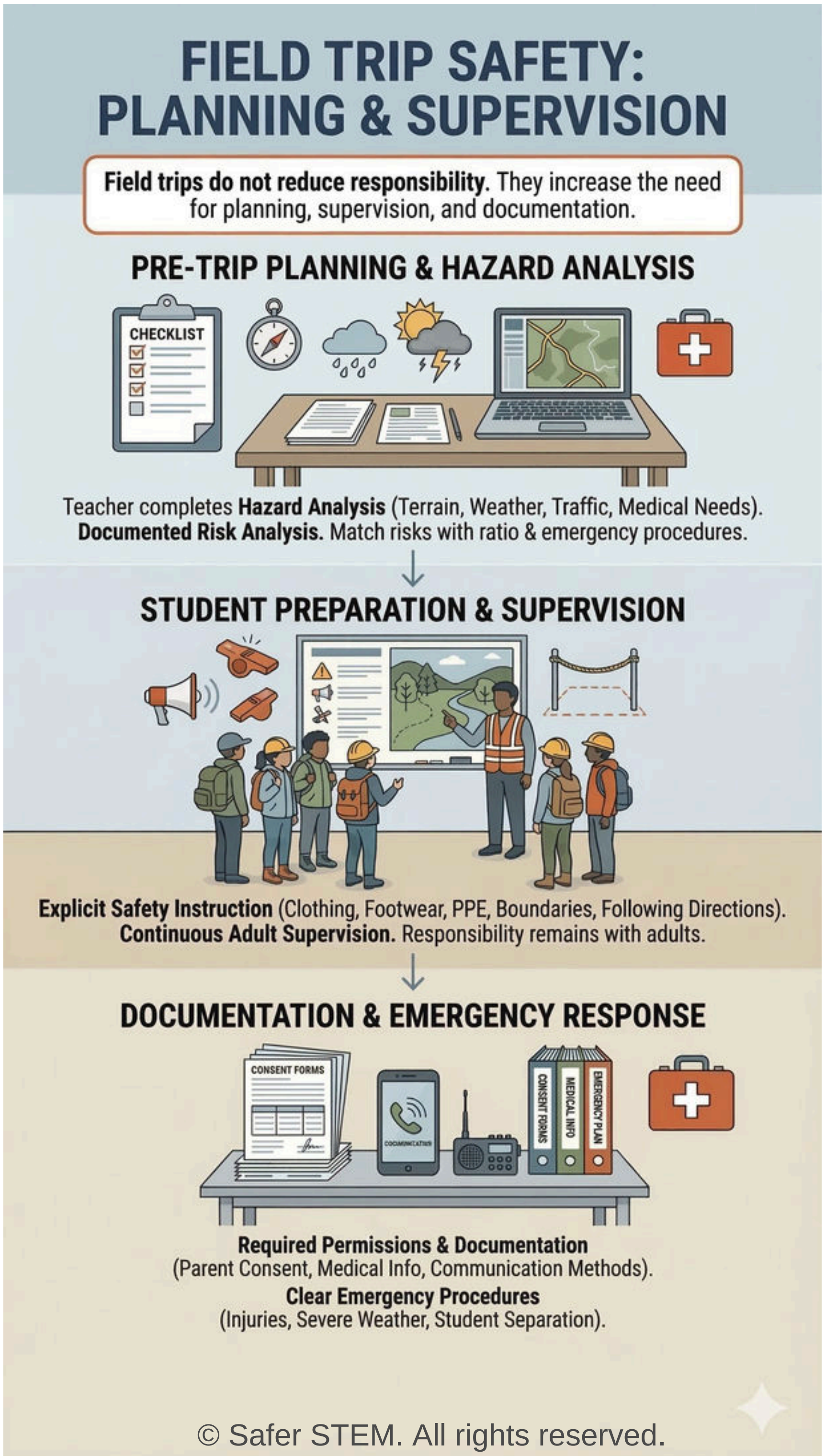
Learning instructional spaces influence behavior long before instruction begins. A room with clear sightlines, defined zones, and appropriate occupancy limits reduces risk before a single material is distributed. Expecting safer behavior in a space that encourages congestion or blind spots is like asking a coach to manage a game without seeing the field. Design and supervision must work together.

Closing Note from the Safety Desk

Learning instructional spaces (labs, classrooms or field study) either support safer STEM instruction or undermine it. When rooms are designed, organized, and used intentionally, they improve supervision, reduce preventable behavior issues, and make hands-on learning more predictable and effective (NSTA; NFPA).

Figure 14

This figure outlines key considerations for planning and supervising off-campus learning. It helps teachers think ahead about hazards, supervision, and student needs.



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IV MATERIALS AND CHEMICAL SAFETY

At the middle school level, the safest material is the one that matches both the lesson and the learner.
— James Palcik, CHO, Safer STEM

In middle school STEM, materials selection matters as much as instructional design. Many incidents occur not because students misuse materials, but because the materials themselves were inappropriate for the age, environment, or level of supervision.

Safer STEM instruction depends on disciplined decisions about what materials belong in the instructional space and which do not (NSTA; EPA).

4.1 Permitted and Prohibited Materials

Only materials that are instructionally necessary, age-appropriate, and manageable under direct supervision may be used in middle school STEM environments.

Materials that present disproportionate risk must be prohibited or removed (NSTA; ACS).

Implications for Middle School STEM

Safer material selection includes:

- Use of approved or permitted material lists aligned with curriculum goals
- Removal of legacy materials with no current instructional purpose
- Prohibition of materials with high toxicity, reactivity, explosivity, or long-term health risks
- Substitution of lower-hazard alternatives whenever possible

If a material requires advanced judgment to use safely, it does not belong in middle school STEM instruction.

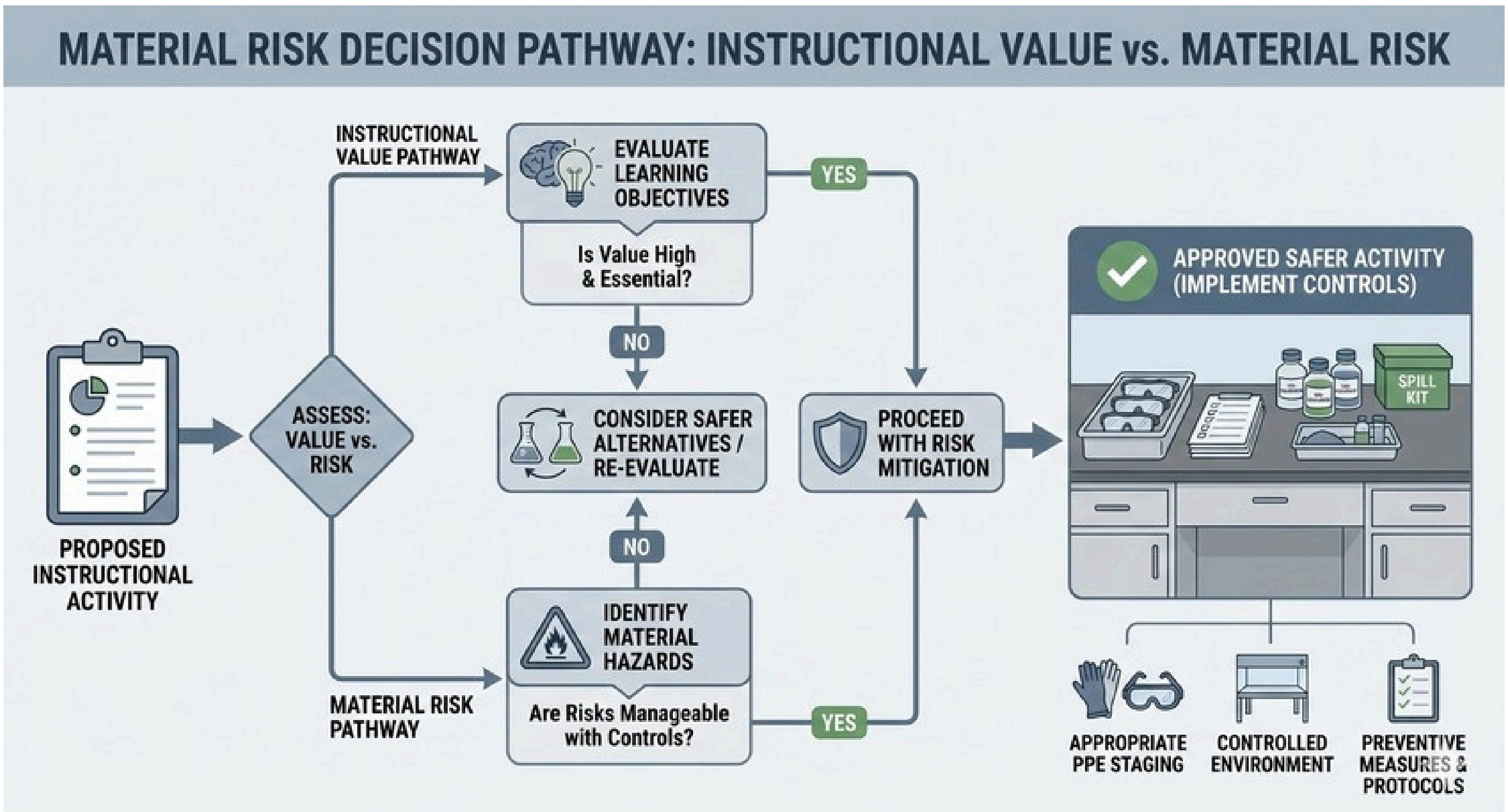
Discipline-Specific Context

- **Integrated Science:** Simple reagents and non-hazardous materials are preferred
- **Engineering:** Building materials should be lightweight and low risk
- **Robotics:** Electrical components must be low-voltage and enclosed
- **Makerspaces:** Cutting, heating, or chemical materials require strict limits

Middle school STEM laboratory instructional spaces are not scaled-down high school laboratory instructional spaces. Materials must reflect student developmental readiness and supervision capacity.

Figure 15

This flowchart supports teachers in evaluating whether an activity is appropriate for students. It emphasizes balancing learning goals with safety considerations.



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4.2 Household Chemicals in STEM Activities

Household chemicals are often incorrectly assumed to be low risk. Many present potential safety hazards when concentrated, mixed, heated, stored incorrectly, or misused. Household products require the same level of planning and oversight as laboratory chemicals (NSTA; CDC).

> **If a product carries a warning label at home, it carries a potential hazard at school.**

Implications for Middle School STEM

Safer use of household chemicals includes:

- Limiting quantities to the minimum required and using only approved materials
- Never mixing products without a documented potential safety hazard analysis
- Avoiding heating, aerosolizing, or concentrating household products
- Treating all household chemicals as potentially hazardous

Availability does not determine appropriateness.

Program-Specific Context

- **Integrated Science:** Vinegar, baking soda, and salt still require supervision
- **Engineering:** Adhesives and coatings may release vapors
- **Robotics:** Cleaning agents must be approved and controlled
- **Makerspaces:** Paints, solvents, and resins require strict controls

Figure 16

This figure highlights that everyday materials can still present real risks. It helps teachers avoid assumptions that “common” means safer.

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4.3 Storage, Labeling, and SDS Access

All materials and chemicals must be stored, labeled with a GHS label, and documented to support potential safety hazard recognition and emergency response. Unlabeled or poorly stored materials represent unmanaged risk (OSHA).

Implications for Middle School STEM

Safer material management includes:

- Clearly labeled chemical containers with original or appropriate secondary labels
- Storage by compatibility and hazard class, not convenience
- Ready access to Safety Data Sheets (SDS), digitally or in print
- No use of any material without an accessible SDS and understanding of compatibility

Materials that cannot be identified must not be used.

If the label is missing, the material is unusable.

Discipline-Specific Context

- **Integrated Science:** Classroom kits must retain original labels
- **Engineering:** Adhesives and coatings require SDS access
- **Robotics:** Battery chemicals must be labeled and documented
- **Makerspaces:** Shared materials demand consistent labeling

Figure 17

This image models how safety information should be organized and accessible. It reinforces that preparation and visibility support safer student behavior.

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4.4 Waste Minimization and Disposal

Waste generated during STEM activities must be minimized, identified, and disposed of properly. Improper disposal creates risks for facilities, staff, and the environment (EPA).

Implications for Middle School STEM

Safer waste practices include:

- Designing activities to minimize waste generation
- Never disposing of chemicals or residues down sinks or in regular trash unless explicitly permitted
- Following district-approved waste disposal procedures
- Teaching students that cleanup is part of responsible STEM practice

The sink is not a disposal method. Ever.

Discipline-Specific Context

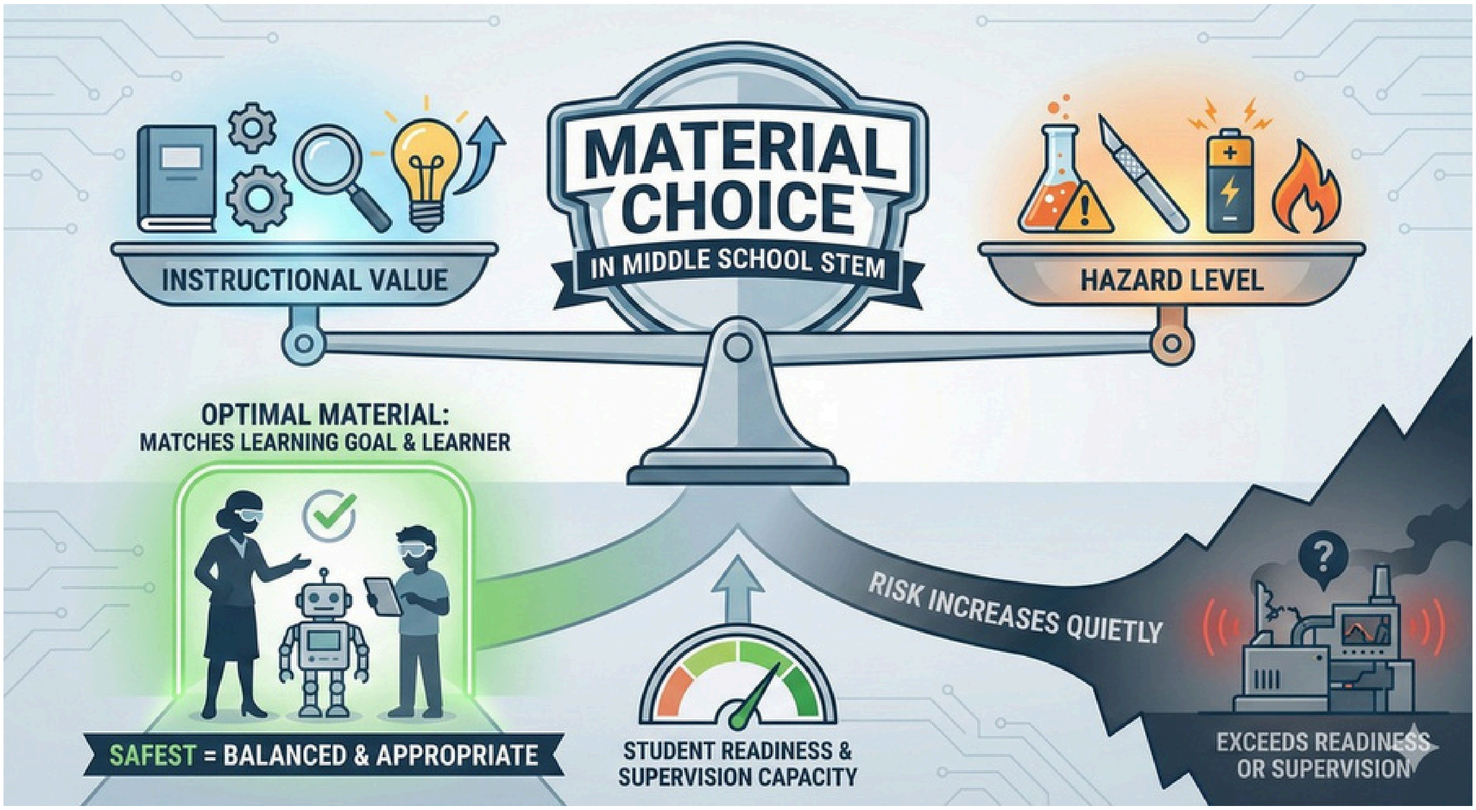
- **Integrated Science:** Small quantities still require proper disposal
- **Engineering:** Adhesives and coatings may need special handling
- **Robotics:** Batteries must follow district disposal guidelines
- **Makerspaces:** Mixed-material waste must be segregated

Waste decisions must be made during planning, not after instruction.

In middle school STEM, material choice is one of the most controllable safety decisions educators make. When materials exceed student readiness or supervision capacity, risk increases quietly. The safest material is not the most advanced one; it is the one that matches both the learning goal and the learner. Instructional value and potential safety hazard/risk level must be weighed together, not separately.

Figure 18

This diagram shows how different materials must be handled and disposed of appropriately. It helps teachers guide students in responsible and safer cleanup practices.



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Closing Note from the Safety Desk

Material selection and management are among the most controllable aspects of middle school STEM safety. When educators choose materials intentionally, manage them carefully, and dispose of them responsibly, they reduce risk while preserving rich, hands-on learning (NSTA; EPA).

V TOOLS, EQUIPMENT, AND TECHNOLOGY

At the middle school level, tools must match both the task and the student.
— James Palcik, CHO, Safer STEM

Tools and technology expand what students can build and test. They also increase the consequences when supervision weakens. In middle school STEM environments, injuries most often occur when tools exceed student readiness, supervision is diluted, or equipment is treated as routine rather than potentially hazardous.

Safer STEM instruction requires intentional tool selection, controlled access, and continuous adult supervision (NSTA).

5.1 Hand Tools and Basic Power Tools

Only age-appropriate hand tools and limited, well-controlled power tools may be used in middle school STEM environments. Tool access must be structured, supervised, and purposeful at all times (NSTA; CPSC).

When a tool requires judgment to avoid injury, the teacher must provide that judgment.

Implications for Middle School STEM

Safer tool practices include:

- Using hand tools and power tools designed specifically for student use
- Inspecting tools before and after each use for damage, wear, or defects. Labeling and removing tools from the instructional site if found to be damaged upon inspection.
- Introducing one new tool at a time with explicit instruction and demonstration
- Establishing clear rules for carrying, using, and returning tools
- Prohibiting tool use during transitions or unsupervised moments

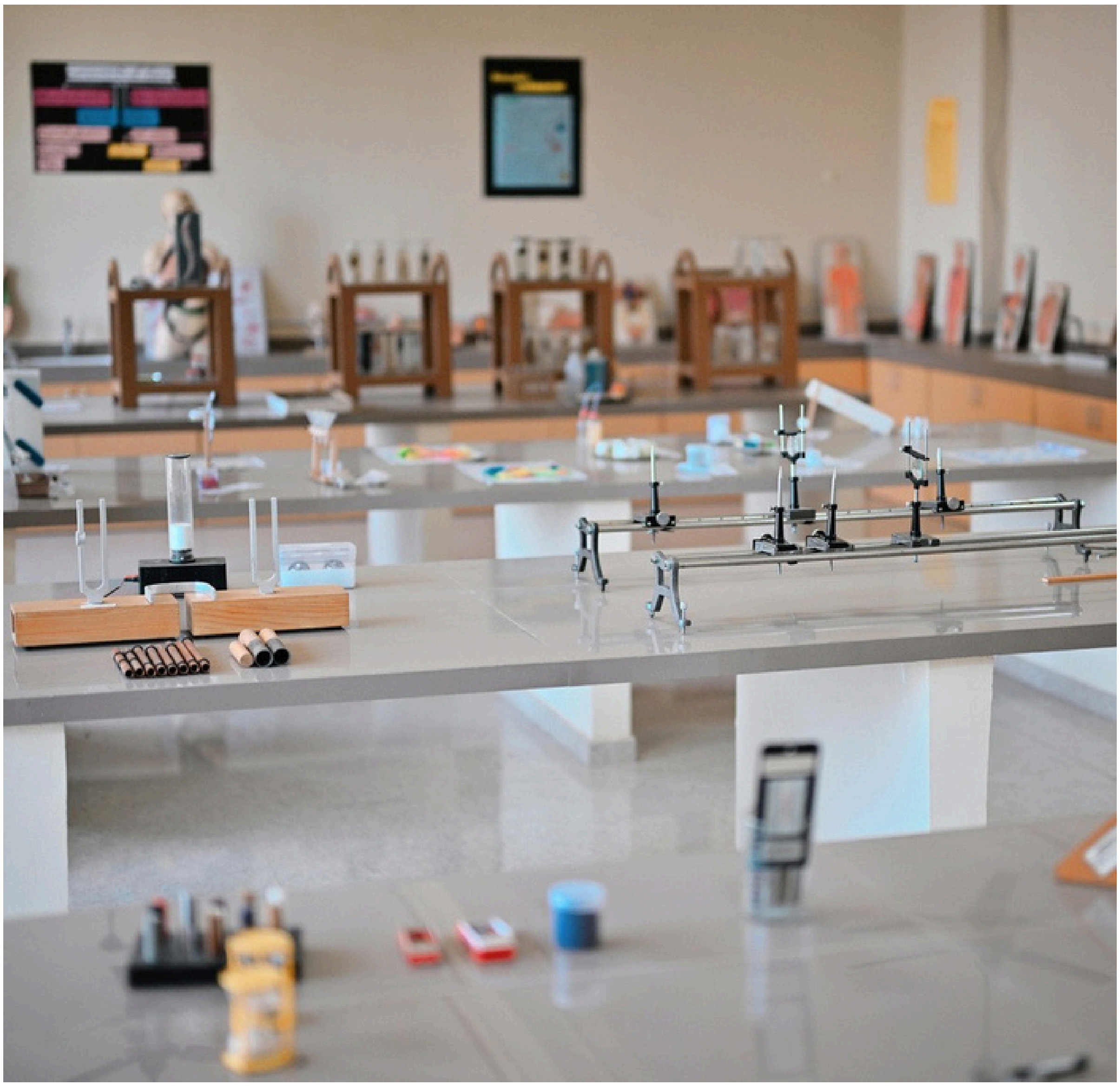
Discipline-Specific Context

- **Integrated Science:** Simple cutting and measuring tools require direct instruction
- **Engineering:** Prototyping tools must be lightweight, guarded, and controlled
- **Robotics:** Mechanical tools must be low-torque and supervised
- **Makerspaces:** Shared tools require check-in and check-out routines

Basic power tools, where permitted by district policy, must include required guards, emergency shutoffs, and direct adult supervision. Many tools appropriate for high school instruction are not appropriate for middle school use.

Figure 19

This figure provides another example of a robotics learning environment with structured organization. It highlights how equipment setup and supervision reduce risk during hands-on work.



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5.2 Robotics, Electronics, and Battery Safety

Robotics and electronics introduce electrical, thermal, and chemical hazards. Components must be low-voltage, enclosed when possible, and matched to student developmental readiness. Robotics instruction must not be offered without appropriate safety qualification and professional development (OSHA; NFPA).

Implications for Middle School STEM

Safer electronics practices include:

- Using low-voltage power supplies and batteries only
- Prohibiting student modification of batteries or power sources
- Preventing short circuits, overheating, and exposed wiring
- Monitoring charging stations continuously
- Removing damaged components from service immediately

Lithium-based batteries require heightened controls due to fire and thermal runaway risk and must be handled, stored, and disposed of according to district Chemical Hygiene Plans (NFPA).

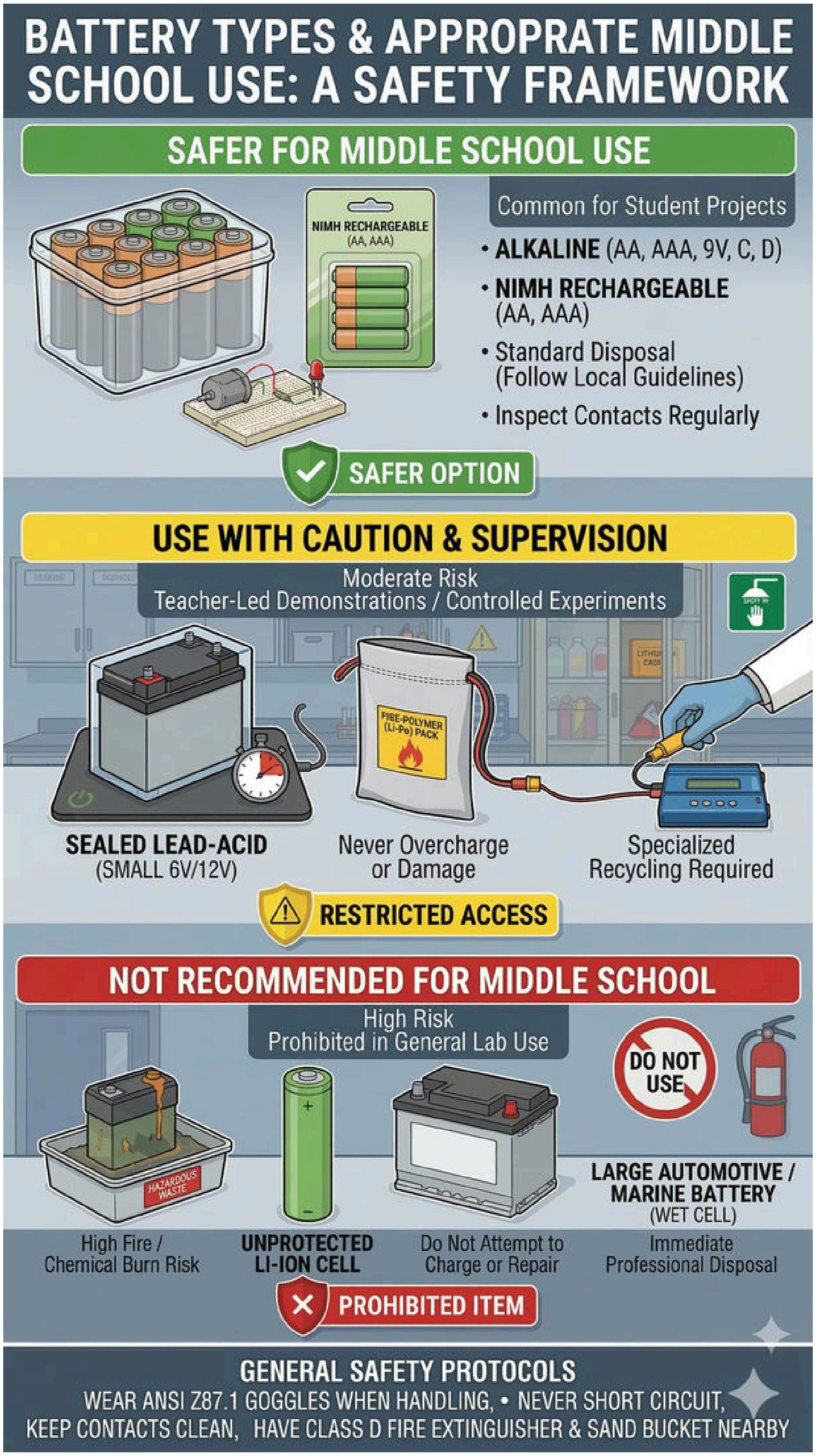
> **Stored energy is stored risk. Control both.**

Discipline-Specific Context

- **Robotics:** Motors and controllers must be rated for student use
- **Engineering:** Circuits should be teacher-approved initially
- **Integrated Science:** Electrical demonstrations must limit exposure
- **Makerspaces:** Charging areas must be designated and supervised

Figure 20

This chart identifies which batteries are appropriate for student use and why. It helps teachers make safer decisions when planning electrical activities.



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5.3 3D Printers, Laser Cutters, and Heat Tools

Advanced fabrication tools generate heat, fumes, and mechanical hazards. In middle school settings, these tools must be restricted, enclosed, and operated primarily by adults or under one-to-one supervision only (NIOSH; NSTA).

Implications for Middle School STEM

Safer fabrication practices include:

- Limiting student interaction to observation or controlled, teacher-directed steps
- Ensuring proper ventilation and air filtration for 3D printers and cutters
- Never bypassing guards, enclosures, or interlocks
- Treating heat tools as burn hazards at all times

Laser cutters and similar equipment are typically demonstration-only unless district policy explicitly permits supervised student operation.

> **If a tool can burn, cut, or emit fumes, access must be limited.**

Discipline-Specific Context

- **Engineering:** Prototyping may involve teacher-operated fabrication
- **Robotics:** Printed parts must cool fully before handling
- **Makerspaces:** Heat tools require zoning and cooldown protocols
- **Integrated Science:** Fabrication supports design but does not justify added risk

Figure 21

This figure shows tools that require limited or supervised access. It reinforces that not all equipment is developmentally appropriate for independent student use.

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5.4 Projectiles, Forces, and Motion Hazards

Activities involving motion, stored energy, or projectiles require strict safety controls. Even low mass objects can cause injury when velocity or force increases (NSTA; CPSC).

Implications for Middle School STEM

Safer practices include:

- Prohibiting projectiles aimed toward people
- Using barriers or clearly defined target zones. Trajectory path must be clear of fragile items, etc.
- Limiting launch energy, distance, and repetition
- Requiring eye protection when impact risk exists
- Conducting trials only under teacher direction

Uncontrolled motion experiments are not developmentally appropriate.

> **If it moves with force, it must be controlled.**

Discipline-Specific Context

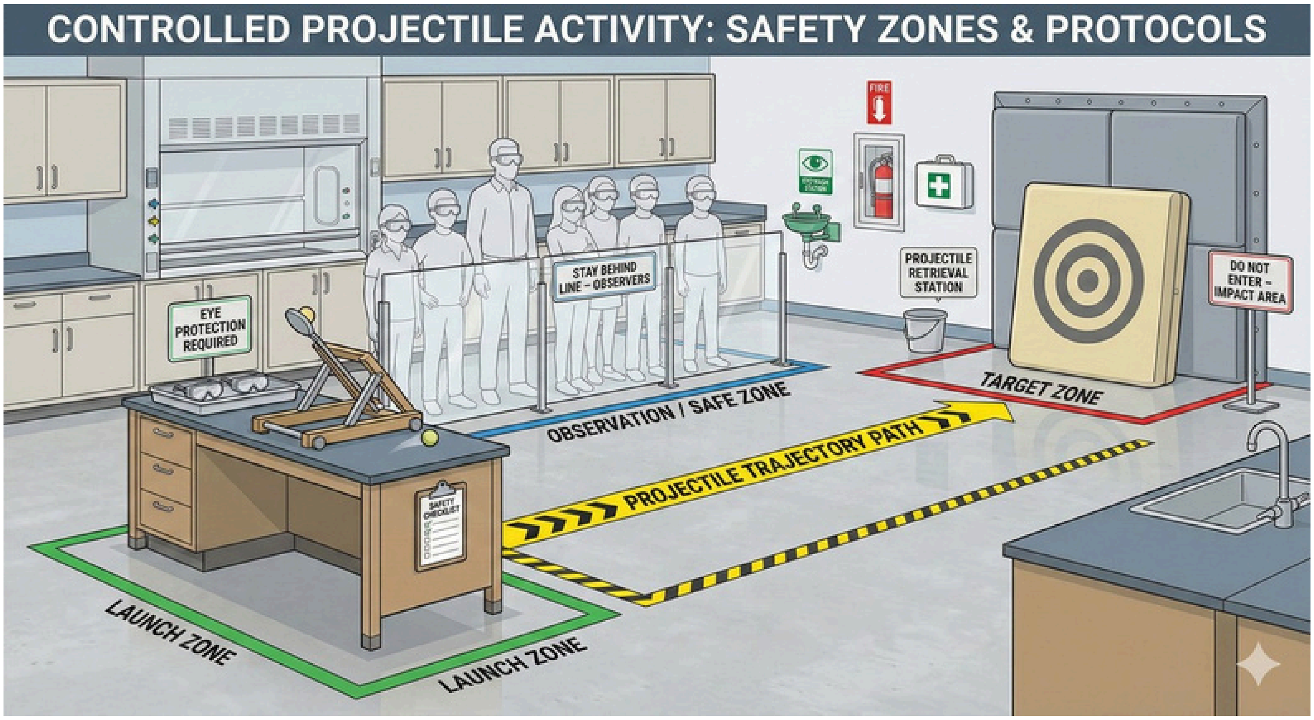
- **Integrated Science:** Force demonstrations require clear safety zones
- **Engineering:** Catapults and launchers must be low-energy
- **Physics Foundations:** Motion studies must control trajectory
- **Makerspaces:** Elastic and spring-loaded systems require oversight

---

Tools amplify both learning and risk. Middle school students should not be expected to supply judgment that their developmental stage does not yet support. Structured access, gradual introduction, and continuous supervision function like guardrails on a bridge. They do not limit movement; they prevent falls.

Figure 22

This diagram illustrates how to safely manage activities involving motion or force. It emphasizes clear boundaries, direction, and teacher control.



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Closing Note from the Safety Desk

Tools and technology should expand learning, not expand injury risk. When access is controlled, expectations are explicit, and supervision is continuous, middle school students can engage meaningfully with STEM tools in ways that are challenging, engaging, and measurably safer (NSTA).

VI PERSONAL PROTECTIVE EQUIPMENT (PPE)

If PPE is optional, injuries are predictable.
— James Palcik, CHO, Safer STEM

Personal protective equipment (PPE) is the last line of defense in middle school STEM environments following engineering control use and specific relevant safety protocols. Because early adolescents are still developing judgment and impulse control, PPE expectations must be simple, consistent, and enforced without exception when hazards are present.

Safer STEM instruction requires adults to determine when PPE is required and to enforce its use every time (NSTA).

6.1 Eye Protection Requirements

Eye protection must be worn whenever there is a reasonable risk of impact, splash, heat, or airborne material, resulting from potential biological, chemical, and/or physical hazards. The decision to require eye protection is not left to students. It is a professional judgment made by the teacher (NSTA).

Implications for Middle School STEM

Safer eye protection practices include:

- Requiring ANSI/ISEA Z87.1 D3–compliant indirectly vented chemical splash goggles whenever liquids, chemicals, biological materials, heat, or splash hazards are present (ANSI/ISEA)
- Limiting ANSI/ISEA Z87.1 safety glasses with side shield protection to dry activities with no splash, vapor, particulate, or heat risk (OSHA)
- Requiring eye protection for all occupants during demonstrations, investigations, setup, and cleanup
- Keeping eye protection in place until all hazards are removed and all groups have completed work
- Maintaining a sanitation plan for shared eye protection

Goggles worn on the forehead or removed between steps are not acceptable. Teachers need to enforce this behavior.

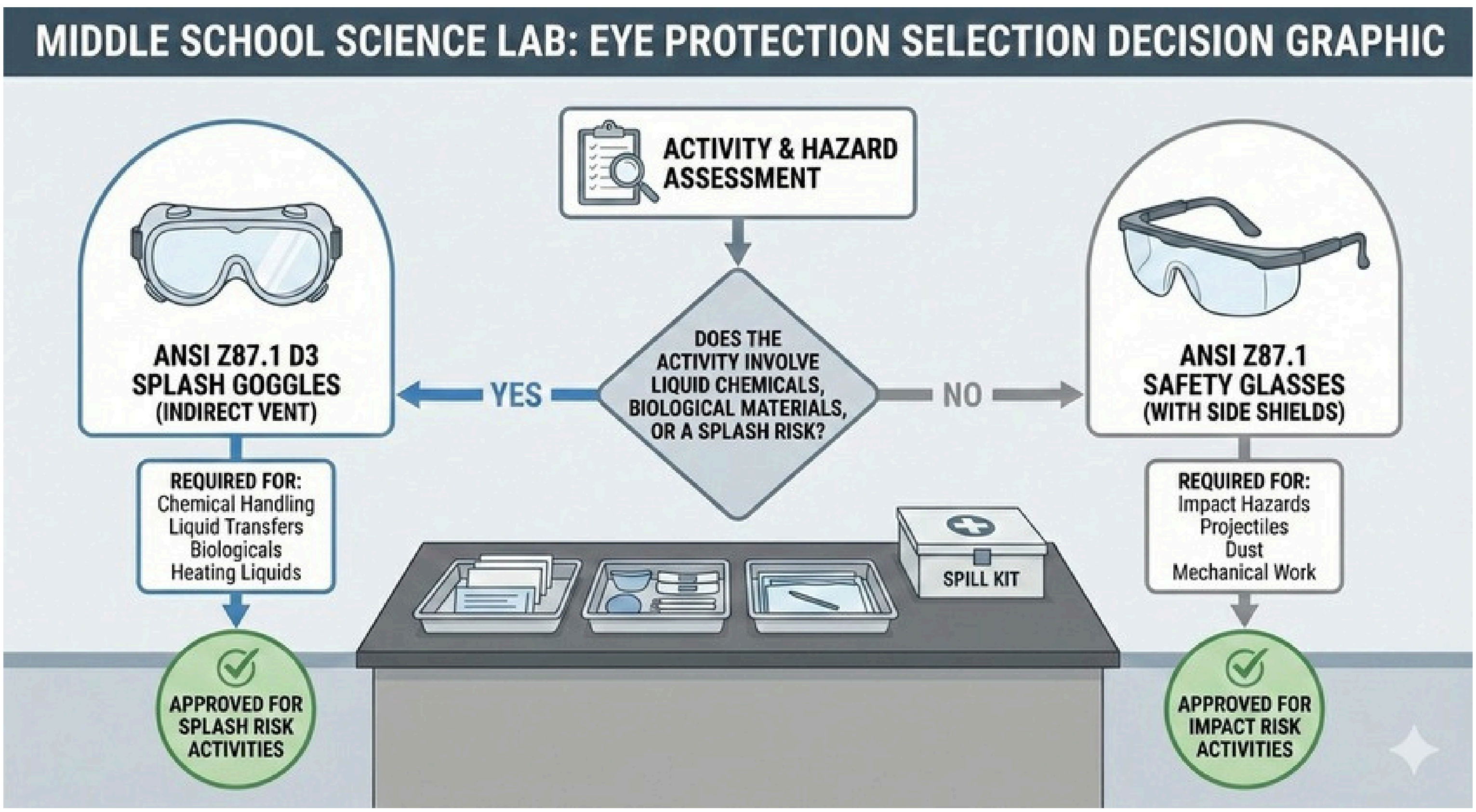
> **If it can splash, fly, snap, or heat, eye protection stays on.**

Discipline-Specific Context

- **Integrated Science:** Liquids, reactions, and motion require eye protection
- **Engineering:** Cutting, drilling, and snapping materials require eye protection
- **Robotics:** Mechanical motion and projectiles require eye protection
- **Makerspaces:** Tools and fabrication activities require eye protection

Figure 23

This figure helps teachers choose the correct type of eye protection based on the hazard. It reinforces that PPE decisions must be specific to the activity.



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6.2 Hand, Hair, and Clothing Controls

Hands, hair, and clothing must be controlled to prevent contact with potential hazards, moving parts, heat, or chemicals. PPE selection is hazard-based, not comfort-based (NIOSH).

Implications for Middle School STEM

Safer body protection practices include:

- Using nitrile or other non-latex gloves when handling chemicals or biological materials
- Using insulated gloves only for handling hot or cold objects
- Removing gloves immediately after the task to prevent contamination
- Securing hair on the back of the head/neck and controlling loose clothing
- Prohibiting dangling jewelry and open-toed footwear
- Wearing long sleeves under aprons when working with chemicals

Gloves are task-specific. They do not stay on beyond the hazard.

Discipline-Specific Context

- **Integrated Science:** Gloves required for chemical or biological contact
- **Engineering:** Clothing and hair control near moving parts is essential
- **Robotics:** Pinch points require hand and clothing awareness
- **Makerspaces:** Heat tools require full-body control

Once the task is complete, gloves come off immediately, before contact with faces, phones, or shared surfaces. Teachers need to have students removed from the instructional site if non-compliant with safety compliance expectations.

Figure 24

This image contrasts appropriate and unsafe clothing for STEM activities. It helps teachers clearly communicate expectations to students.

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6.3 Mandatory versus Recommended PPE

Mandatory PPE requirements must be clearly defined and consistently enforced. Ambiguity undermines compliance and increases risk (NSTA).

Implications for Middle School STEM

- PPE is mandatory whenever biological, chemical, or physical hazards are present, and participation depends on compliance
- Recommended PPE may reinforce professional practice, but never replaces required controls
- No activity proceeds when required PPE is not worn correctly
- PPE use is not negotiable

PPE is not optional, and its use is not negotiable.

No PPE means no participation.

Program-Specific Context

- **Integrated Science:** Liquids and reactions trigger mandatory PPE
- **Engineering:** Tool use often requires mandatory eye protection
- **Robotics:** Motion hazards may require mandatory eye protection
- **Makerspaces:** Fabrication and heat tools require mandatory PPE

Closing Note from the Safety Desk

PPE only works when it is consistent and hazard-based. When eye protection or gloves become negotiable, the message shifts from safety as an expectation to safety as a suggestion. Early adolescents are highly attuned to adult consistency. If protection is enforced every time, it becomes routine. If it is optional once, it becomes optional always.

Figure 25

This chart guides teachers in determining when PPE is required. It reinforces that required protection is not optional for participation.

Activity or Hazard	**Mandatory PPE**	**Engineering / Administrative Controls**
Hand tools (cutting, drilling, sawing)	Safety glasses with side shields (ANSI/ISEA Z87.1)	Secured materials; tool inspection; active supervision
Biological specimens (nonpathogenic)	Nitrile gloves; safety glasses with side shields if splash risk	Proper disposal; required handwashing
3D printing (enclosed unit)	Safety glasses during part removal	Manufacturer instructions followed; ventilation functioning
Chemical handling (noncorrosive, middle school approved)	Indirectly vented chemical splash goggles (ANSI/ISEA Z87.1 D3); nitrile gloves	SDS review; minimum quantities; eyewash access consistent with ANSI/ISEA Z358.1 intent
Electrical low-voltage kits	Safety glasses with side shields (ANSI/ISEA Z87.1)	GFCI outlets where required; no energized modifications; instructor supervision
Heat tools (low temp glue guns, soldering ≤ 40W instructor directed)	Safety glasses with side shields (ANSI/ISEA Z87.1)	Fire-resistant surface; extinguisher accessible; no methanol permitted
Sanding / Light fabrication	Safety glasses with side shields (ANSI/ISEA Z87.1)	Dust collection where available; cleanup protocol
Painting / solvent use (approved materials only)	Indirectly vented chemical splash goggles (ANSI/ISEA Z87.1 D3); nitrile gloves	Ventilated area; methanol prohibited; ethanol substitution only with approval

VII INSTRUCTIONAL HAZARD & RISK CONTROL

Good instruction anticipates risk before students encounter it.
— James Palcik, CHO, Safer STEM

Instructional hazards and resulting risks in middle school STEM are not accidental; they are predictable. Most injuries occur during transitions, shared equipment use, open-ended design challenges, or when student abilities exceed instructional controls.

Safer STEM instruction requires intentional risk control embedded in lesson design, not added after problems arise. Understanding inherent hazards before beginning a planned activity is the foundation of risk management in science programs (NSTA).

7.1 Risk Assessment for Design Challenges

Every design challenge must be preceded by a teacher-led risk assessment that identifies potential safety hazards and resulting health and safety risks introduced by materials, chemicals, biologicals, tools, motion, energy, and student behavior. Middle school students are not developmentally prepared to independently assess or manage risk.

Every laboratory/classroom instructional space activity, demonstration, and field investigation must be preceded by a documented potential safety hazard analysis and resulting health and safety risk assessment (NSTA).

Hazards that are not identified cannot be controlled.

Implications for Middle School STEM

Safer design planning includes:

- Identifying potential safety hazards and resulting health and safety risks before materials or tools are distributed
- Limiting the number of simultaneous safety hazards within a single activity
- Selecting materials that tolerate misuse without causing injury
- Modifying or eliminating challenges when potential risks cannot be adequately controlled

Risk assessment is an instructional design responsibility, not a student task.

> **If potential safety hazards resulting health and safety risks are not identified in advance, they cannot be controlled during instruction.**

Program-Specific Context

- **Integrated Science:** Reactions and motion require pre-identified controls
- **Engineering:** Prototypes must limit force, speed, and heat
- **Robotics:** Energy storage and movement must be constrained
- **Makerspaces:** Open-ended builds require defined boundaries

Annex C contains a student and parent acknowledgment form that documents understanding of middle school STEM safety expectations, including behavior, PPE use, electrical safer practice, and emergency response, reinforcing shared responsibility and professional duty of care.

7.2 Group Work and Shared Equipment

Group work increases exposure risk when roles are unclear and equipment is shared without structure. Safer STEM instruction requires defined roles, controlled access, and active supervision (NSTA).

Implications for Middle School STEM

Safer group practices include:

- Assigning clear roles before equipment is issued
- Limiting the number of students handling tools or materials at one time
- Have well-defined work zones when using tools
- Establishing explicit procedures for passing, using, and returning equipment
- Stopping work immediately when group behavior degrades

Shared equipment multiplies risk unless movement and access are intentionally managed.

As group size increases, structure and supervision must increase with it.

Program-Specific Context

- **Integrated Science:** Stations must limit crowding
- **Engineering:** Only one student manipulates tools at a time within a work zone
- **Robotics:** Power-up sequences require teacher permission
- **Makerspaces:** Tool checkout systems reduce confusion

A general hazard analysis is not sufficient when students with additional needs are present. Educators must conduct a student-specific risk assessment that includes reviewing IEP or 504 documentation, identifying hazards and risks unique to the learner, adjusting procedures or materials, and documenting safety decisions.

For example:

- Smaller-scale activities may reduce exposure, but may require adaptation for student accessibility
- Alternative tools may be needed for safer material handling
- Pre-lab walkthroughs may reduce anxiety-related risks

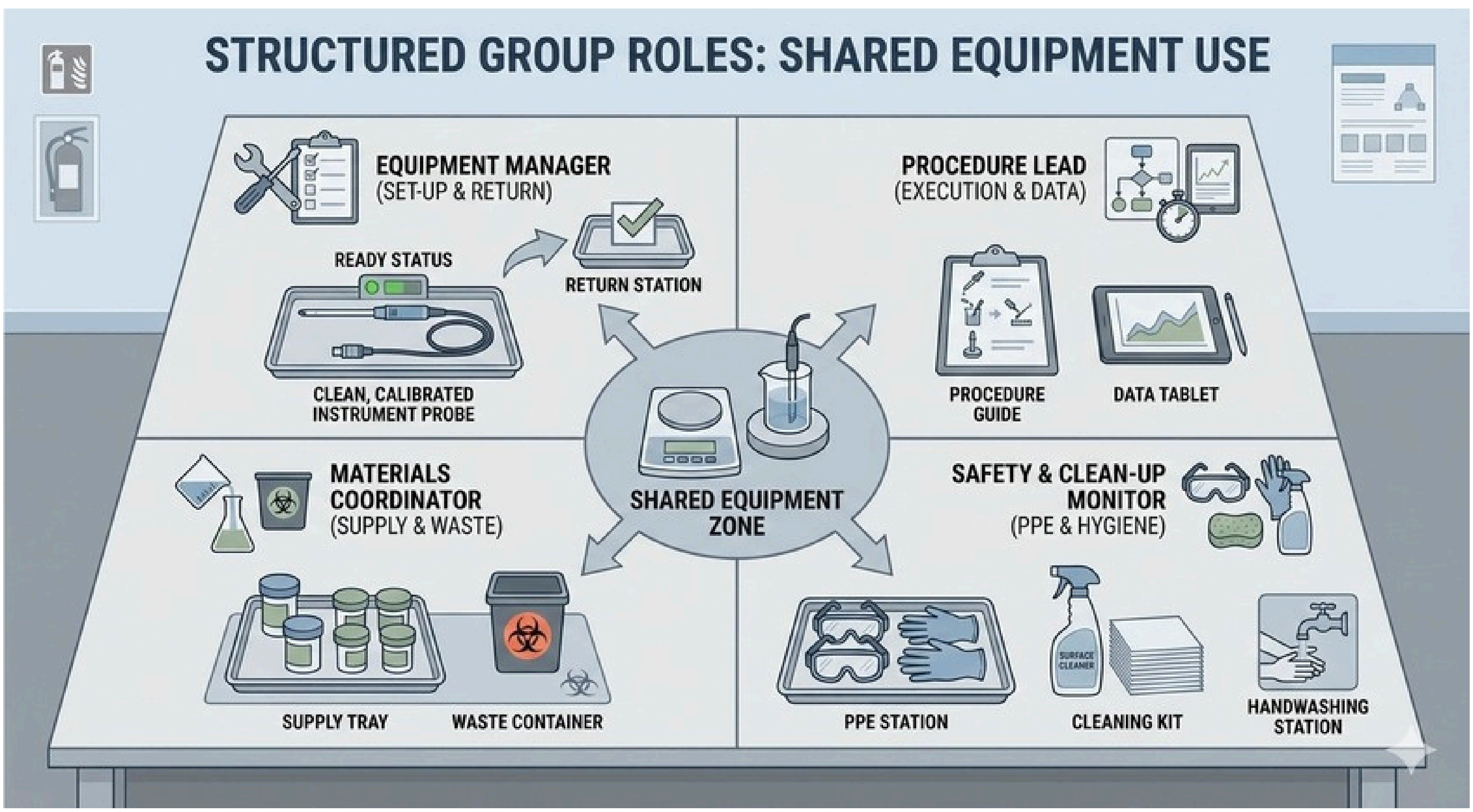
Program-Specific Context

Practical Safety Strategies for Students with Additional Needs

- Visual needs: high-contrast labels, verbal descriptions, magnification tools
- Hearing needs: written procedures, visual alerts, clear sightlines
- Mobility needs: unobstructed aisles, accessible safety equipment
- Learning/attention needs: chunked procedures, modeling, structured routines
- Health needs: safer material substitutions, avoidance of triggers

Figure 26

This figure shows how assigning roles improves safety and accountability. It helps teachers manage group work more effectively.



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7.3 Safer Prototyping and Iteration

Iteration must not increase risk. As designs evolve, new potential safety hazards must be reassessed and controlled before testing continues (NSTA; ACS).

Implications for Middle School STEM

Safer prototyping practices include:

- Requiring teacher approval before design changes are implemented
- Testing prototypes incrementally rather than at full scale
- Preventing escalation of force, speed, heat, or stored energy
- Using barriers, distance, or remote testing when appropriate

Iteration is structured and supervised, not open-ended experimentation.

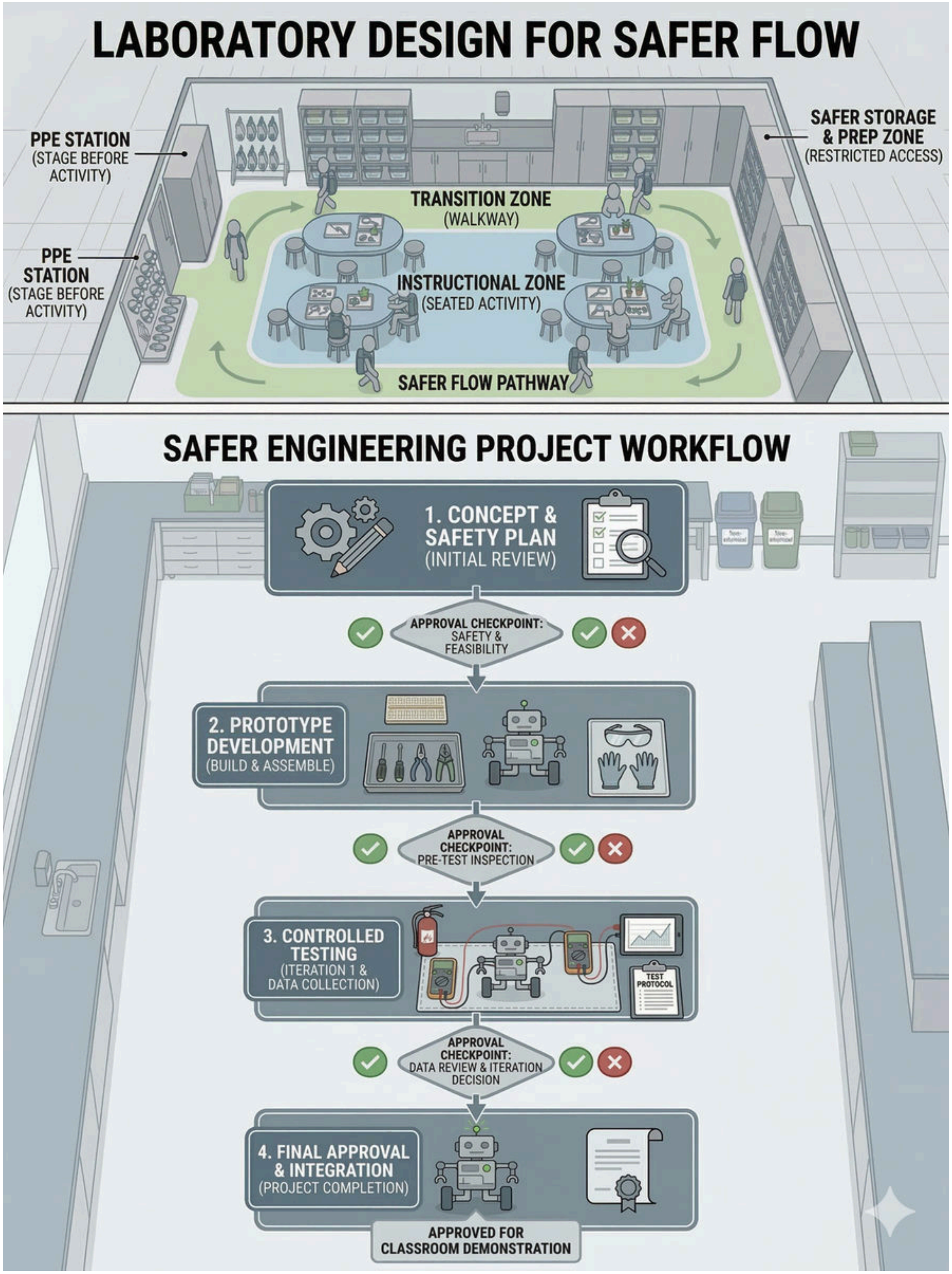
> **Iteration without limits leads to predictable injuries.**

Discipline-Specific Context

- **Integrated Science:** Experimental variables must remain constrained
- **Engineering:** Launchers and structures must remain low-energy
- **Robotics:** Software changes affecting motion require review
- **Makerspaces:** Material substitutions require approval

Figure 27

This diagram outlines a step-by-step process for safe design and testing. It supports teachers in pacing student work to reduce risk.



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7.4 Accessibility and Inclusion Considerations

Accessibility and inclusion are risk control strategies, not exceptions. Instruction must be designed so that all students can participate without increased potential safety hazards (NSTA).

Implications for Middle School STEM

Safer, inclusive practices include:

- Modifying tasks rather than lowering expectations
- Assigning roles that reduce exposure to potential safety hazards
- Adjusting tools, materials, or room layout
- Providing additional supervision or using demonstrations when needed

Equitable participation requires intentional design, not reactive accommodation.

Equal access does not mean equal risk.

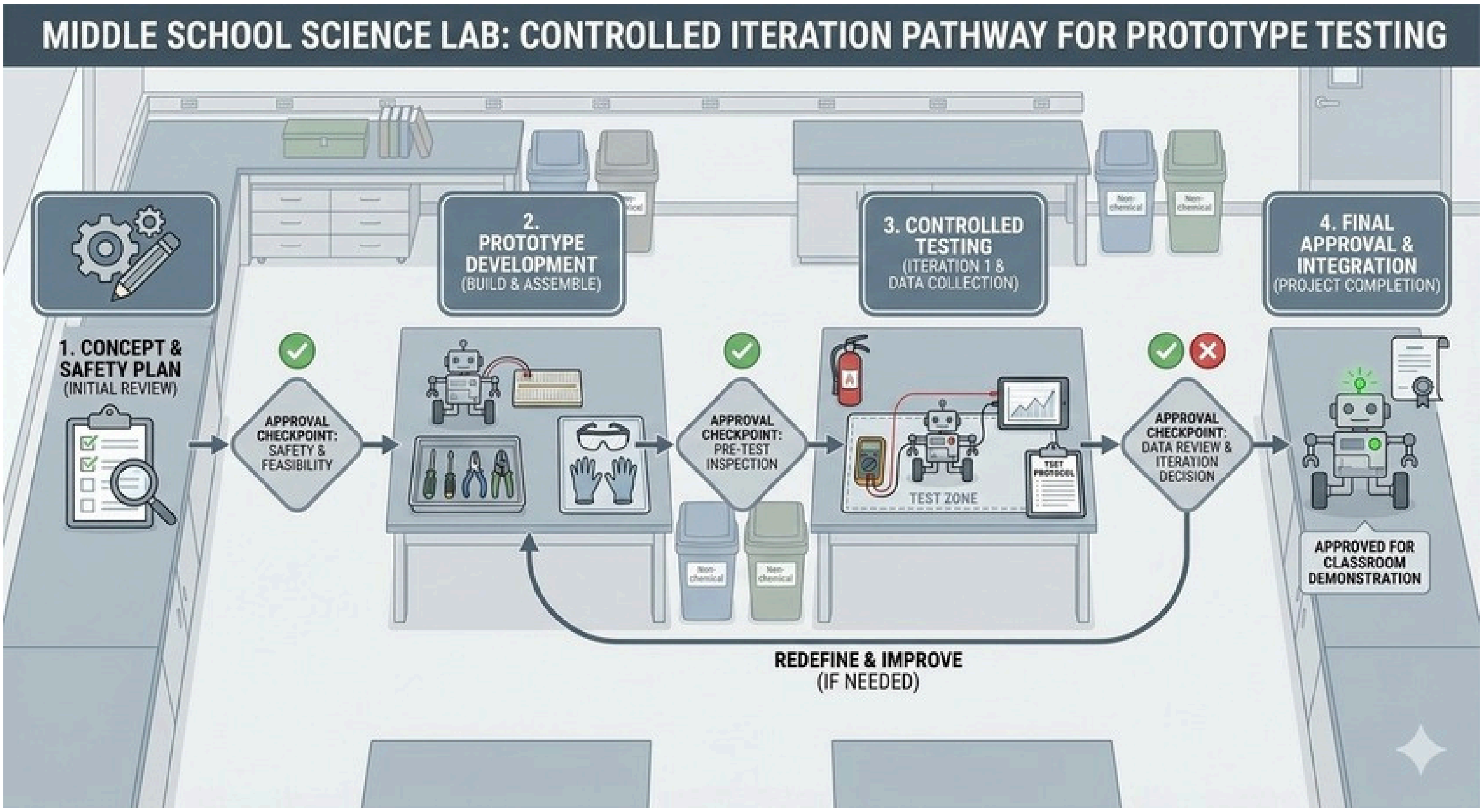
Discipline-Specific Context

- **Integrated Science:** Fine motor demands may require adjustment
- **Engineering:** Tool use may be teacher- handled
- **Robotics:** Visual, auditory, or motor supports may be required
- **Makerspaces:** Layout must support mobility and supervision

Risk assessment is not an add-on to lesson planning. It is lesson planning. Open- ended design without structured limits can escalate force, speed, or heat beyond what middle school environments can safely support. Iteration is powerful, but without boundaries, it resembles acceleration without brakes. Good instruction channels experimentation within safer parameters.

Figure 28

This figure highlights how roles can be adapted to support all learners. It reinforces that inclusion and safety go hand in hand.



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Closing Note from the Safety Desk

Instructional risk control does not limit creativity. It directs creativity within boundaries that protect learners. When teachers anticipate risk, structure collaboration, and design for inclusion, middle school STEM becomes more engaging, equitable, and measurably safer (NSTA; NIOSH).

VIII EMERGENCY RESPONSE

Adequate preparation determines whether an incident becomes an injury.
— James Palcik, CHO, Safer STEM

Emergencies in middle school STEM environments are rarely sudden surprises. They are most often the result of predictable safety hazards combined with delayed, uncertain, or inconsistent responses.

Safer STEM instruction requires that educators be prepared to act decisively and that students know how to respond when directed. Most accidents and injuries in school STEM spaces are preventable (NSTA).

8.1 Minor Injuries and First Aid

Minor injuries must be addressed immediately, calmly, and within the scope of training and district policy. Even small injuries require attention, documentation, and reflection (NSTA).

Middle school students must never self-administer first aid beyond basic teacher direction.

Implications for Middle School STEM

Safer response practices include:

- Stopping the activity immediately
- Providing first aid consistent with training and district procedures
- Referring the student to the school nurse or medical professionals when needed
- Monitoring the student following treatment
- Documenting the incident according to district requirements, including sharing accident information with the chief building administrator, supervisor, safety compliance officer, chemical hygiene officer, school nurse, and parents/guardians.

Ignoring or minimizing minor injuries increases the likelihood of more serious incidents.

> **If an injury causes pain, bleeding, or concern, instruction stops until the situation is addressed.**

Program-Specific Context

- **Integrated Science:** Cuts, splashes, and minor burns
- **Engineering:** Tool-related abrasions
- **Robotics:** Pinch-point injuries
- **Makerspaces:** Heat-related contact injuries

Emergency Planning Strategy for Students with Additional Needs

Emergency procedures must account for all learners. Educators should determine whether students can independently access safety equipment, follow evacuation routes, and respond under emergency conditions. Best practices include practicing procedures, assigning trained assistance when needed, and maintaining unobstructed access to all safety equipment and exits. Time is critical in emergencies, and response times vary by student.

Figure 29

This flowchart helps teachers respond quickly and appropriately to minor incidents. It emphasizes clarity and consistency in first aid decisions.

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8.2 Fire, Electrical, and Thermal Incidents

Fire, electrical, and thermal incidents require immediate adult control. Students are not responders; they are evacuees or observers under direct instruction (NFPA; OSHA).

Fire extinguishers are emergency tools for trained adults only.

Implications for Middle School STEM

Safer emergency response includes:

- Shutting down equipment when it can be done safely
- Directing students away from the potential hazard immediately
- Evacuating when the incident cannot be controlled at once
- Determining if Board of Education policy authorize employee use of fire extinguishers
- Using fire extinguishers only when trained, escape routes are clear, and the fire is small
- Activating school emergency procedures without delay
- Have annual fire extinguisher training

Delay compounds risk. If uncertainty exists, evacuation protects people first (NFPA).

When in doubt, evacuate. Property can be replaced; people cannot.

Discipline-Specific Context

- **Integrated Science:** Open flames and heating equipment
- **Engineering:** Electrical overloads or short circuits
- **Robotics:** Battery overheating or failure
- **Makerspaces:** Heat tools and fabrication equipment

Figure 30

Fire response decision tree for middle school STEM spaces

Stage	Decision Node	The "Stop" Condition (Evacuate/Alert)
Verification	Is the fire confirmed?	If smoke/burning is present but no flame, isolate and investigate.
Life Safety	Is anyone injured or on fire?	Immediate Emergency Response. Prioritize medical aid and 911.
Assessment	Is the fire small and contained?	If spreading or uncontained, Evacuate immediately.
Capability	Are you trained and authorized?	If no formal district training, Evacuate.
Equipment	Is the correct extinguisher ready?	If blocked, missing, or path is obstructed, Evacuate.
Action	Can you douse it in <10 seconds?	If suppression fails or smoke builds, Abandon and Evacuate.

8.3 Chemical and Material Spills

Chemical and material spills must be addressed based on the potential safety hazard level, quantity, and exposure risk. Teachers must not improvise spill response beyond their training or available equipment (OSHA; EPA).

Middle school students must never clean spills involving hazardous materials.

Implications for Middle School STEM

Safer spill response includes:

- Isolating the affected area immediately
- Directing students away from the spill
- Using spill kits only for small, manageable spills
- Distinguishing minor spills from major spills using written procedures
- Using eyewash stations or safety showers immediately when exposure occurs
- Contacting administration and emergency services when escalation is required

Improvised responses increase harm.

These recognized middle school STEM program hazards may present elevated risks for middle school learners with additional needs and must be addressed through careful planning, supervision, and appropriate instructional adjustments based on a hazard analysis and risk assessment. (ADA; IDEA)

If the correct response is unclear, stop and escalate.

Discipline-Specific Context

- **Integrated Science:** Household chemicals still require response protocols
- **Engineering:** Adhesives and coatings may emit vapors
- **Robotics:** Battery leaks require isolation
- **Makerspaces:** Mixed-material spills require escalation

Figure 31

This diagram shows how to respond to spills safely and systematically. It reinforces that students should not handle hazardous cleanup.

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8.4 Reporting and Documentation

All incidents, near-misses, and injuries must be documented accurately and promptly. Documentation supports prevention, accountability, and program improvement (OSHA).

Implications for Middle School STEM

Safer documentation practices include:

- Completing incident reports according to district policy
- Notifying supervisors and administrators as required
- Reviewing incidents to identify root causes
- Adjusting instruction, materials, or controls to prevent recurrence

A near-miss is not good luck. It is early warning data.

> **If an incident is not documented, the system cannot learn from it.**

Program-Specific Context

- **All STEM areas:** Patterns often cross disciplines
- **Engineering and Makerspaces:** Repeated tool issues signal training gaps
- **Robotics:** Battery incidents require immediate review

Emergencies in middle school STEM are rarely unpredictable. They are most often predictable hazards combined with delayed response. Preparation reduces hesitation. Clear protocols transform uncertainty into action. Fire, electrical, and chemical spill procedures are not dramatic interventions. They are rehearsed decisions that protect students when seconds matter.

Figure 32

This figure illustrates how incidents are documented and used for improvement. It emphasizes that learning from events strengthens safety systems.

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Closing Note from the Safety Desk

Emergency response in middle school STEM is not about heroics. It is about preparation, clarity, and calm action. When procedures are known, practiced, and enforced, response becomes faster, injuries are reduced, and learning continues safely (NSTA; OSHA).

IX TRAINING & PROGRAM OVERSIGHT

Safety systems fail when training and oversight are assumed instead of verified.
— James Palcik, CHO, Safer STEM

Safer middle school STEM programs are sustained through intentional training, consistent oversight, and systematic review.

Facilities and equipment alone do not create safer learning environments. Adults do. When training is inconsistent or documentation is incomplete, risk increases even in well-designed spaces (OSHA).

9.1 Educator Safety Training

All educators responsible for middle school STEM instruction must receive regular, documented safety training aligned to the potential safety hazards and resulting health and safety risks present in their instructional spaces. Training is a professional and institutional responsibility, not a one-time event (OSHA; NSTA).

Professional development must mirror what actually occurs in classrooms. If students are building, cutting, heating, wiring, or testing, training must address those hazards directly.

Implications for Middle School STEM

Effective training systems include:

- Safety orientation for new teachers, substitutes, and support staff
- Annual refresher training focused on middle school–specific hazards
- Targeted training before introducing new tools, materials, or instructional formats
- Documentation of training dates, topics, and participants
- Verification that training addresses supervision, emergency response, and student behavior management

Training that is not documented is assumed not to have occurred.

- OSHA Laboratory Standard Retraining Requirements. Employees must be retrained when:
    - New chemical hazards are introduced
    - If a new chemical or process with different hazards is added to the laboratory
    - New equipment or procedures are introduced
    - When new laboratory equipment, experiments, or procedures present hazards that the employee has not previously been trained on.
    - There is evidence that employees do not understand or follow safety procedures (e.g., improper chemical handling, PPE misuse, unsafe laboratory practices
    - The Chemical Hygiene Plan (CHP) changes in a way that affects safety
    - If policies, procedures, or protective measures are updated.
    - An incident or near-miss indicates a training gap
    - Spills, exposures, fires, or accidents may trigger retraining.

Figure 33

This visual outlines ongoing training expectations for educators. It reinforces that safety is maintained through continuous learning.

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9.2 Student Safety Instruction and Acknowledgment

Students must receive explicit safety instruction and acknowledge expectations before participating in STEM activities involving potential safety hazards and resulting health and safety risks. Safety instruction supports consistency but does not replace supervision or enforcement (NSTA).

Implications for Middle School STEM

Safer student preparation includes:

- Age-appropriate safety instruction at the start of each course
- Reinforcement before higher-risk activities or transitions
- Clear explanation of behavioral expectations and consequences
- Student safety acknowledgment forms reviewed and signed according to district policy

Middle school students require repetition and reinforcement. Safety instruction must be ongoing.

Annex D presents an age-appropriate laboratory safety assessment designed to evaluate student understanding of core safer laboratory and classroom instructional space practices, including PPE use, behavior expectations, emergency response, and equipment handling prior to participation in hands-on science activities.

> **A signed form supports instruction; it does not control behavior.**

Program-Specific Context

- **Integrated Science:** Classroom routines and investigation rules
- **Engineering:** Tool handling and design constraints
- **Robotics:** Electrical and motion safety
- **Makerspaces:** Shared space expectations

Annex E includes the laboratory safety test with an accompanying answer key and scoring guidance, enabling educators to verify student readiness, document safety instruction, and identify when additional safety review is required before science laboratory or classroom instructional space participation.

9.3 Inspections, Audits, and Corrective Action

Middle school STEM spaces must be inspected regularly to identify potential safety hazards, verify controls, and correct deficiencies. Inspections are preventive, not punitive (NSTA; NFPA).

Implications for Middle School STEM

Effective inspection systems include:

- Scheduled inspections using standardized checklists
- Verification of emergency equipment, PPE availability, and tool condition
- Review of appropriate storage, labeling, and waste disposal practices
- Documentation of findings and corrective actions
- Timely follow-up to ensure issues are resolved

When core safety systems fail, instruction pauses. Learning resumes only after correction.

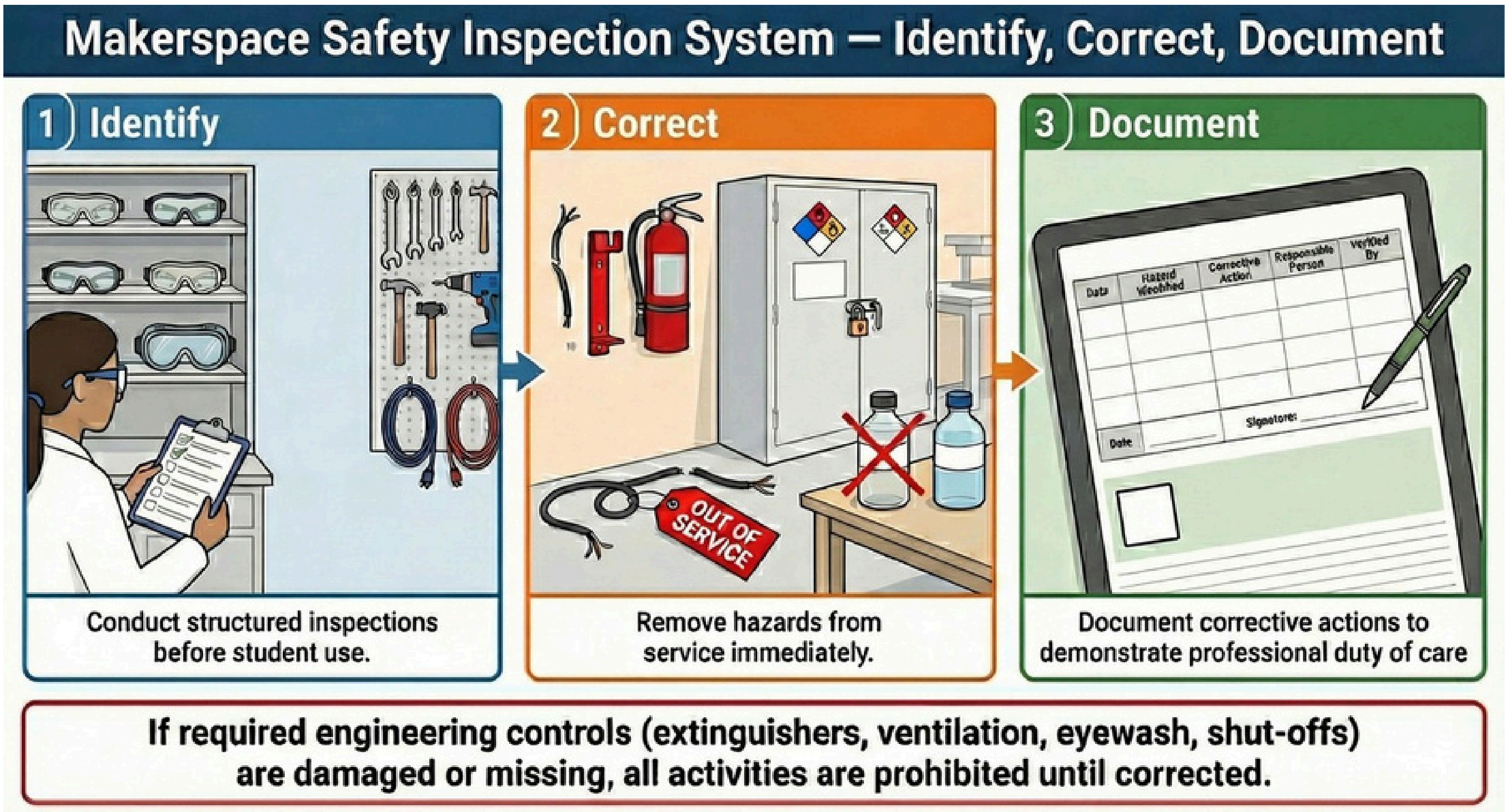
> **Uncorrected potential safety hazards become predictable incidents.**

Program-Specific Context

- **Integrated Science:** Classroom and lab readiness
- **Engineering:** Tool storage and guarding
- **Robotics:** Battery charging and electrical condition
- **Makerspaces:** Shared responsibility for space safety

Figure 34

This figure shows how regular inspections support safer environments. It helps teachers understand the role of routine checks.



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9.4 Incident Review and Continuous Improvement

Incidents, injuries, and near-misses must be reviewed to prevent recurrence. Continuous improvement depends on learning from what has already occurred (OSHA).

Implications for Middle School STEM

Safer improvement practices include:

- Reviewing incident reports for trends and root causes
- Updating training, procedures, or materials as needed
- Communicating lessons learned to all STEM staff
- Tracking corrective actions to completion

Near-miss events, situations in which potential hazards were present, but injury did not occur, should also be documented and reviewed. Near-miss reporting helps identify emerging safety risks before incidents occur.

Safety Enables Equitable Access

Inclusive middle school STEM education is not about lowering expectations; it is about strengthening supports and designing safer instructional spaces where all students can succeed. When safety is approached proactively and equitably, all students can participate, learn, and thrive.

> **Each incident generates information. The question is whether the system learns from it.**

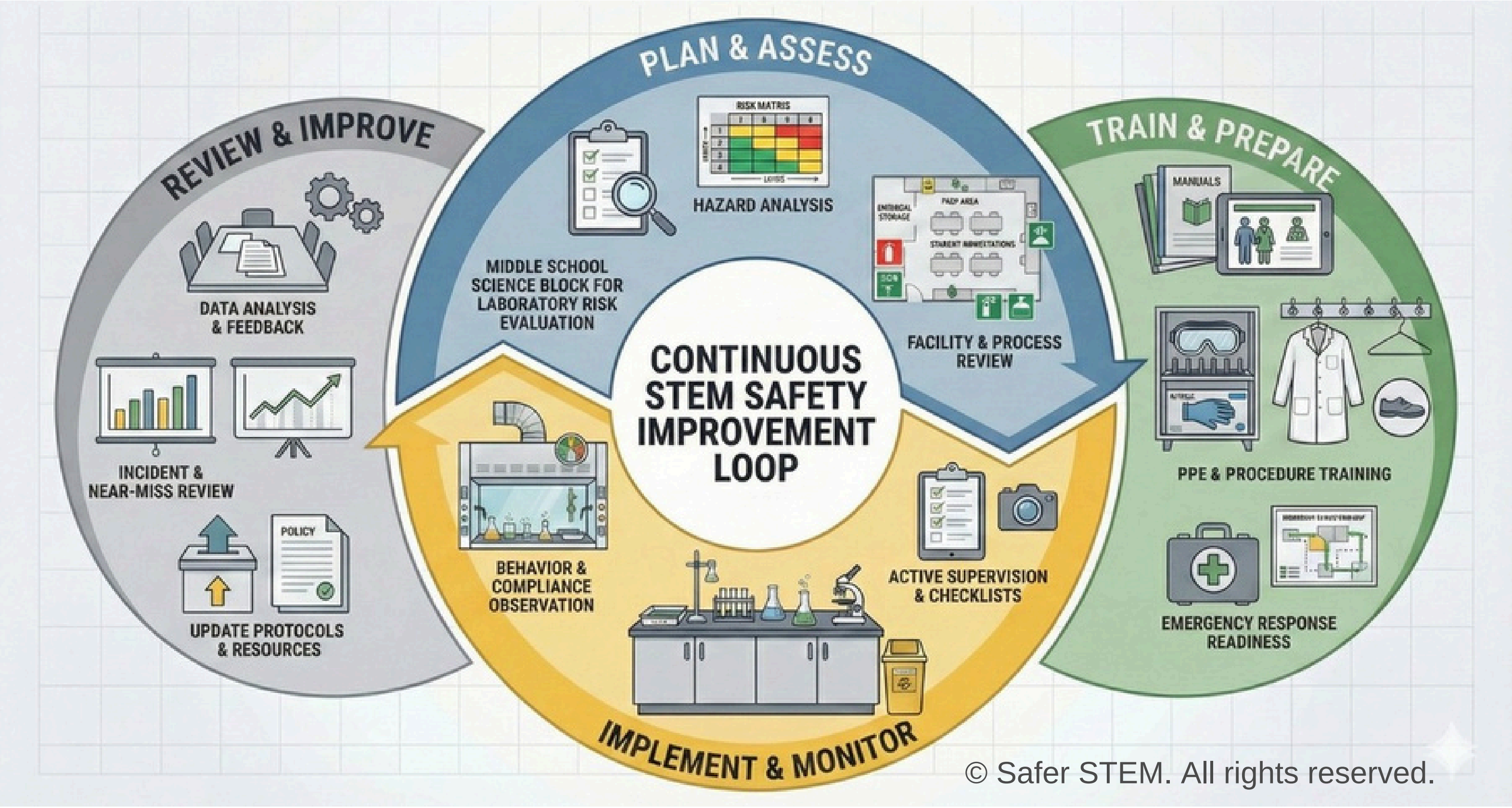
Discipline-Specific Context

- **All STEM areas:** Patterns often extend across programs
- **Engineering and Makerspaces:** Tool incidents may signal supervision gaps
- **Robotics:** Battery or electrical incidents require immediate review

Safer middle school STEM programs do not rely on good intentions. They rely on systems and controls. Training, documentation, inspection, and incident review function much like a feedback loop in engineering. Without feedback, systems drift. With feedback, they improve. Oversight is not about fault- finding. It is about strengthening the structure that protects students.

Figure 35

This diagram highlights how feedback, training, and review strengthen safety over time. It reinforces that safer STEM programs rely on systems, not chance.



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Closing Note from the Safety Desk

Training, documentation, and oversight transform safety from a set of rules into a sustainable system. When adults commit to ongoing learning and consistent review, middle school STEM programs become safer, stronger, and more resilient over time (NSTA; OSHA).

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ANNEX A

ELECTRICAL SAFER PRACTICE CHECKLIST

Middle School STEM Rooms

A. Room and Infrastructure Readiness

- ☐ All electrical outlets are intact, labeled, and free from cracks, scorch marks, or exposed wiring
- ☐ Ground-fault circuit interrupter (GFCI) outlets are installed where required and tested regularly
- ☐ Power strips are surge-protected and mounted or placed off floors to prevent tripping hazards
- ☐ Extension cords are not used as permanent wiring and are removed when not required. Are also disconnected at the end of each workday
- ☐ Electrical panels and emergency shutoff switches are clearly labeled and unobstructed

B. Equipment Condition and Placement

- ☐ All electrical equipment is inspected before use for damaged cords, loose plugs, or exposed conductors
- ☐ Devices are placed on stable, dry, non-conductive surfaces
- ☐ Liquids are stored and used away from electrical equipment and outlets
- ☐ Equipment ventilation openings are unobstructed
- ☐ Manufacturer instructions and voltage ratings are followed

C. Cord and Cable Management

- ☐ Cords are routed to avoid walkways, pinch points, and sharp edges
- ☐ Cables are not wrapped tightly, knotted, or stretched
- ☐ Only approved connectors and adapters are used
- ☐ Unused cords are unplugged and stored properly

D. Personal Protective Equipment and Controls

- ☐ Appropriate electrical PPE is available and staged before instruction when required
- ☐ Insulated tools are used for electrical activities
- ☐ Emergency equipment (fire extinguisher rated for electrical fires) is accessible
- ☐ First aid supplies are visible and reachable

E. Instructional Controls and Supervision

- [ ] Electrical activities are age-appropriate and aligned with middle school instructional limits
- [ ] Energized systems are not modified during student activity
- [ ] Power is disconnected before adjustments or troubleshooting
- [ ] Clear start and stop procedures are established
- [ ] Active supervision is maintained whenever electrical equipment is energized

G. End-of-Activity Shutdown

- [ ] All equipment is powered down before storage
- [ ] Devices are unplugged properly by the plug, not the cord
- [ ] Cords are coiled loosely and stored to prevent damage
- [ ] Work surfaces are cleared and dry

ANNEX B:

FIELD TRIP SAFETY

Below is a K–12 Field Trip Summary Checklist grounded in NSTA core safety principles, written to be age-neutral, defensible, and usable across elementaray, middle, and high school programs.

K–12 FIELD TRIP SUMMARY CHECKLIST

Aligned to NSTA Core Safety Principles

Purpose

This checklist supports safer, standards-aligned planning and supervision of K–12 field trips and off-campus learning experiences. It reflects NSTA guidance that safety is a professional responsibility requiring advance planning, hazard analysis and risk assessment, supervision, and documentation.

A. Pre-Trip Planning and Approval

- ☐ Instructional purpose is clearly defined and aligned to curriculum goals
- ☐ Teacher visit trip site prior to bringing students in order to assess potential safety hazards and resulting health and safety risks.
- ☐ Field trip location and activities are age-appropriate for students
- ☐ Administrative approval obtained per district policy
- ☐ Transportation method approved and scheduled
- ☐ Destination safety policies and emergency procedures reviewed

B. Hazard Identification and Risk Assessment

- ☐ Site-specific hazards identified (terrain, traffic, water, wildlife, equipment)
- ☐ Weather conditions reviewed and contingency plans established
- ☐ Activity-specific hazards reviewed (tools, materials, demonstrations, movement)
- ☐ Student medical, accessibility, and supervision needs considered
- ☐ Risks matched with controls (supervision, PPE, activity modification). Potential hazards and resulting risks that are foreseeable must be controlled before departure.

C. Supervision and Student Management

- [ ] Supervision ratios meet or exceed district and developmental expectations
- [ ] Roles of teachers, chaperones, and volunteers clearly defined
- [ ] Chaperones briefed on expectations, boundaries, and emergency response
- [ ] Student groupings established and headcount procedures planned
- [ ] Clear physical boundaries and behavior expectations established

D. Student Safety Instruction

- [ ] Safety expectations reviewed with students before departure
- [ ] Site-specific rules and hazards explained in age-appropriate language
- [ ] Behavioral expectations reinforced (stay with group, follow directions)
- [ ] Procedures for injuries, separation, or emergencies reviewed
- [ ] Consequences for unsafe behavior communicated. Students do not assess risk independently. Adults retain responsibility.

E. Personal Protective Equipment (When Applicable)

- [ ] PPE requirements determined by hazard analysis
- [ ] Required PPE available, properly sized, and in good condition
- [ ] Students instructed on correct PPE use
- [ ] PPE worn consistently during exposure to hazards

F. Documentation and Permissions

- [ ] Parent/guardian permission forms completed and on file
- [ ] Student safety acknowledgments completed (when required)
- [ ] Emergency contact and medical information accessible
- [ ] Accommodation plans documented for students with specific needs

G. Emergency Preparedness and Communication

- [ ] First-aid supplies available and accessible
- [ ] Reliable communication method confirmed (cell phone, radio)
- [ ] Emergency procedures reviewed with staff and chaperones
- [ ] Plan in place for injuries, severe weather, or student separation
- [ ] Meeting location and reunification plan identified

H. During the Field Trip

- [ ] Headcounts conducted regularly and at transitions
- [ ] Supervision maintained at all times
- [ ] Activities modified or stopped if conditions change
- [ ] Unsafe behavior addressed immediately
- [ ] PPE use monitored and enforced

I. Post-Trip Review

- [ ] Incidents or near-misses documented per district policy
- [ ] Safety concerns communicated to administration
- [ ] Lessons learned incorporated into future planning

ANNEX C:

MIDDLE SCHOOL STEM STUDENT SAFETY ACKNOWLEDGMENT FORM

Student Name: ____

Student ID (if applicable): ______________________________________

Teacher: ____

Date: ____

Course / Subject: ____

Room Number: ____

PURPOSE

Middle School STEM courses include hands-on learning activities that may involve tools, materials, electrical devices, or laboratory equipment. These activities are designed to support learning while maintaining safer instructional conditions.

Because students are minors and are still developing judgment and motor skills, all STEM activities require active adult supervision and adherence to established safety expectations. Students are expected to follow instructions, use materials only as directed, and immediately report unsafe conditions or damaged equipment.

Failure to follow safety expectations may result in removal from an activity or from the instructional space.

GENERAL SAFETY EXPECTATIONS

Students are expected to:

- Follow all verbal and written safety instructions provided by the teacher
- Enter STEM rooms only when a teacher or authorized adult is present
- Behave responsibly at all times; horseplay and unsafe behavior are not permitted
- Use tools, materials, and equipment only for their intended instructional purpose
- Ask for clarification before using any tool or material they do not understand
- Immediately report damaged equipment, spills, or unsafe conditions to the teacher
- Remain within assigned work areas unless directed otherwise
- Maintain appropriate housekeeping safety protocols to keep workspaces neat, organized, and free of unnecessary materials
- Focus on assigned tasks and avoid distracting others

PERSONAL PROTECTIVE EQUIPMENT (PPE)

When required for an activity, students must:

- Wear appropriate eye protection as directed
- Use gloves or other protective equipment when instructed
- Wear closed-toe shoes when in the STEM instructional space at all times.
- Tie back long hair and secure loose clothing
- Remove or secure jewelry when instructed

ELECTRICAL AND EQUIPMENT SAFER PRACTICE

Students will:

- Use electrical devices only when directed and supervised
- Never plug in, unplug, or adjust equipment without teacher approval
- Keep liquids away from electrical equipment
- Never attempt to repair, modify, or troubleshoot equipment
- Power down equipment when instructed

EMERGENCY EXPECTATIONS

- Report all injuries, no matter how minor, immediately
- Follow teacher instructions during drills or emergencies
- Do not touch emergency equipment unless directed by an adult

STUDENT ACKNOWLEDGMENT

I have read and discussed these Middle School STEM safety expectations with my teacher. I understand that these rules are in place to protect me and others. I agree to follow all safety instructions and to ask questions if I am unsure about what to do.

Student Signature: ____

Date: ____

PARENT / GUARDIAN ACKNOWLEDGMENT

Dear Parent or Guardian,

Your child will participate in hands-on STEM learning activities appropriate for middle school students. These activities are supervised by trained educators and follow recognized safer instructional practices.

Students may not participate in hands-on STEM activities until this form is signed and returned.

I have reviewed the Middle School STEM safety expectations with my child and agree to support these requirements. I understand that participation requires following safety rules and teacher instructions at all times.

Parent/Guardian Name (Printed): ____

Parent/Guardian Signature: ____

Date: ____

Phone or Email: ____

ANNEX D:

MIDDLE SCHOOL SCIENCE LABORATORY SAFETY TEST

Student Name: ____

Class: ____

Date: ____

Part A: True / False

Circle T for True or F for False.

01. T / F – Sanitized and indirectly vented chemical splash goggles should be worn when working with chemical or biological safety hazards.

02. T / F – It is okay to touch chemicals if they look safe.

03. T / F – Students must listen to the teacher's safety instructions before starting a lab.

04. T / F – Spills or accidents should be reported to the teacher right away.

05. T / F – Running and playing in the lab or classroom instructional space is safer if no equipment is nearby.

06. T / F – Long hair should be tied back during lab activities.

Part B: Fill in the Blank

Write the correct word or phrase in each blank. Use these words to complete: lab procedure; science; students; eye wash; not;

07. Before starting a lab, students should read the _____________ carefully.

08. Food and drinks are _____________ allowed in the lab or classroom instructional space.

09. If a chemical splashes into your eyes, go to the _____________ station and tell the teacher immediately.

10. Safety rules are used to help keep _____________safer in the laboratory or classroom instructional space.

11. At the end of a lab, students must clean their work area and _____________ equipment as instructed.

PART C: MULTIPLE CHOICE

Circle the best answer.

12. What should you do before using any lab equipment?

A. Start using it right away

B. Ask a friend how to use it

C. Wait for the teacher's instructions

D. Try it once to see what happens

13. Which item should always be worn during most lab activities?

A. Sandals

B. Indirectly vented chemical splash goggles

C. Jewelry

D. Hoodies

14. If you break a piece of glassware, you should:

A. Pick it up with your hands

B. Sweep it into the sink

C. Leave it on the table

D. Tell the teacher and follow specific directions

15. Which behavior shows good lab safety practice?

A. Talking loudly during instructions

B. Keeping materials at your station

C. Running to get supplies

D. Playing with lab tools

16. If you are unsure about what to do during a lab, you should:

A. Guess and keep going

B. Copy another student

C. Stop and ask the teacher

D. Skip the lab

MIDDLE SCHOOL SCIENCE LABORATORY SAFETY TEST – ANSWER KEY

Part A: True / False

01. Sanitized and indirectly vented chemical splash goggles should be worn when working with chemical or biological safety hazards.
Correct Answer: T

02. It is okay to touch chemicals if they look safe. **Correct Answer: F**

03. Students must listen to the teacher's safety instructions before starting a lab. **Correct Answer: T**

04. Spills or accidents should be reported to the teacher right away. **Correct Answer: T**

05. Running and playing in the lab is safer if no equipment is nearby. **Correct Answer: F**

06. Long hair should be tied back behind the head and neck during lab activities.
Correct Answer: T

Part B: Fill in the Blank

Word Bank: lab procedure; science; students; eye wash; not

01. Before starting a lab, students should read the lab procedure carefully.

02. Food and drinks are not allowed in the laboratory or classroom instructional spaces.

03. If a chemical splashes into your eyes, go to the eye wash station and tell the teacher immediately.

04. Safety rules are used to help keep students safer in the lab.

05. At the end of a lab, students must clean their work area and science equipment as instructed.

Part C: Multiple Choice

01. What should you do before using any lab equipment?
Correct Answer: C. Wait for the teacher's instructions

02. Which item should always be worn during most lab activities?
Correct Answer: B. Certified safety goggles

03. If you break a piece of glassware, you should:
Correct Answer: D. Tell the teacher and follow specific directions

04. Which behavior shows good lab safety practice?
Correct Answer: B. Keeping materials at your station

05. If you are unsure about what to do during a lab, you should:
Correct Answer: C. Stop and ask the teacher

Scoring Guide (For Teacher Reference)

- **14–16 correct:** Excellent understanding of laboratory safety
- **11–13 correct:** Good understanding; review recommended
- **Below 11 correct:** Safety review required before lab participation

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