CRITICAL SAFETY CONSIDERATIONS TO SUPPORT CTE

By Tyler S. Love & Kenneth Russell Roy

As this edition of *Techniques* focuses on infrastructure in the context of career and technical education (CTE), we examine why safety needs to be embedded at the core of CTE planning to foster long-term success. Within the context of this article, infrastructure refers to "structures and resources that are mobilized by school systems to enable teachers' efforts to provide, maintain and improve instruction" (Shirrell et al., 2019). While there are many important infrastructure components needed for high-quality CTE programs, safety is one that affects all students and instructors.

Safety practices that students learn in CTE programs often transfer to the workplace and postsecondary education settings.

(Love & Roy, 2022; Threeton & Evanoski, 2014)

Prioritize safety.

The health and safety of students and instructors has been a concern dating back to early vocational educational programs (Threeton & Evanoski, 2014). During the early 20th century, as a result of factory safety concerns and child labor laws, many adults stopped bringing their children to work to learn the trades. This led to a greater focus on career education programs in public schools, and safety was an immediate concern — as documented by Lewis A. Wilson in his 1916 book, titled *Safety First for Vocational Schools*. And while safety remains a foundational pillar of many CTE programs, continual advancement is needed. As instructional practices adapt to meet the needs of today's learners, and new technologies and processes emerge, safety concerns continue to be cited as a priority among CTE administrators and teachers (Lupton, 2021; Harvey et al., 2022; Jones et al., 2021; Threeton et al., 2021; Wells & Hainline, 2021). Moreover, studies examining safety issues related to hands-on instruction in science, technology, engineering and mathematics (STEM) have documented limited to no improvement in some key safety factors and practices over the past two decades despite calls to address these issues. For example, national studies have reported that the number of teachers who had appropriate eye protection available for every student in their class increased minimally from 81% in 2002 to 83% in 2022 (Love, Roy, Gill, & Harrell, 2022). Another national study we conducted (Love & Roy, 2022) provided similar insights about the status of safety in CTE and STEM courses.

Our study involved 718 teachers of CTE and STEM courses from 42 states. Many of the courses taught by participants fell under the oversight of their state department of education's CTE division (Love & Roy, 2022). Course topics taught by participants included:

- Technology and engineering design
- Pre-engineering
- Manufacturing technologies (woods and/or metals)
- Architectural design and construction
- Power/energy/transportation technologies
- Biotechnology and biosciences
- Electronics

(Love & Roy, 2022; Love, Roy, & Sirinides, in press)

A few of the key findings from this study were previously highlighted by ACTE's *CTE Policy Watch* blog (Hohman, 2022). And, in conjunction, this article highlights additional findings to help school systems, administrators, CTE educators, teacher educators, state education departments, and policymakers advocate for the resources needed to ensure safety.

Engage in instructor safety training.

An important element of CTE and STEM teacher preparation is classroom, laboratory and facilities management to establish and maintain safer learning environments. Because when students witness safer practices being modeled and enforced by their instructor(s), they will emulate what they have learned at home and in the workplace. But our study found there was a lack of safety training completed by participating teachers, despite the fact that OSHA legal safety standards require employers to train employees upon initial hiring, when there are changes in work assignments, and when there are changes in safety plans and workplace safety hazards/risks (Love & Roy, 2022).

Teachers reported receiving safety training from the following sources:

- Undergraduate coursework (67%)
- Graduate coursework (36%)
- District onboarding requirements (32%)
- District safety updates/retrainings within the past five years (56%)
- Source outside of the school system (e.g., professional association, OSHA, etc.) (18%)

Teachers who had comprehensive safety training were 49% less likely to have had an accident in their courses.

(Love, Roy, & Sirinides, in press)

Lower the occupancy load.

Overcrowding in instructional areas where CTE and STEM lab activities occur has been documented as a top concern for many years (Love & Roy, 2022; Threeton & Evanoski, 2014; West, 2016). And it's only getting worse as growing teacher shortages in CTE and STEM areas threaten to increase class sizes further. In our study, teachers reported that overcrowding was the second greatest cause of accidents, behind students failing to follow safety instructions. And 57% reported teaching classes with 25 students or more. These results are extremely concerning given that studies found accident rates to increase significantly (by nearly half) when occupancy exceeds 24 students per instructor (Love, Roy, & Sirinides, in press; West, 2016).

Other safety factors, such as course preps per semester, also have an impact on the frequency of accidents in CTE and STEM classrooms.

WHAT IS COMPREHENSIVE SAFETY TRAINING?

Comprehensive safety training involves the completion of a postsecondary education course that covered safety topics, safety training from one's school system upon initial hiring, and safety updates/retraining within the past five years. Additional details about the content and format of safety training, federal OSHA training requirements, and connections between OSHA training resources and safety training for CTE teachers and students are described in Love, Roy, Gill and Harrell (2022).

Safety practices and risk factors

Further research revealed what safety practices and factors correlate significantly with decreased accident occurrences and in what areas CTE educators should seek to improve (Love, Roy, & Sirinides, in press; Love, Sirinides, & Roy, 2022).

Safety practices associated with fewer accidents

- Safety zones taped or painted on the floor near potentially hazardous equipment and work areas
- Non-skid strips and/or rubber matting placed near potentially hazardous equipment
- Storage cabinets shut and locked
- Fire extinguisher located within 25 feet of lab activity areas
- Dust collection system connected directly to equipment
- Appropriate personal protective equipment worn by everyone in the room

Areas for improvement in safety practice

- 43% reported that their school system conducts annual safety audits
- 49% had a copy of their safety data sheets (SDS) readily accessible
- 69% required students to sign a safety acknowledgment form
- 27% had non-skid strips and/or rubber matting near potentially hazardous equipment
- 61% had a fully stocked first aid kit in their classroom/lab
- 51% worked in a school system that had a PPE policy

Safety is critical for the success of high-quality CTE.

While certain results presented in this study may not be applicable to all CTE programs of study, there are valuable takeaways that can enhance CTE instruction. The highlighted safety concerns should serve as topics for reflection and discussion among school systems, administrators, educators, families, teacher preparation programs, state education departments, and others involved in high-quality CTE.

Safety is a shared responsibility among education stakeholders.

The information presented in this article and the referenced resources, along with the resources from *ACTE's Quality CTE Program of Study Framework*: Facilities, Equipment, Technology, and Materials element, can help educators advocate for the support needed to keep students and instructors safer. ■

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RESOURCES

Full results from the authors' study can be accessed in the publications by Love, Roy, and Sirinides (in press) and Love, Sirinides and Roy (2022). Further, detailed recommendations and resources to help address each of the aforementioned safety issues can be found in our free downloadable book, *Safer Engineering and CTE Instruction: A National STEM Education Imperative* (Love & Roy, 2022).

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DID YOU KNOW...?

The National Fire Protection Association (NFPA) 101 Life Safety Code specifies that laboratories and shops in school settings require 50 net square feet per occupant — compared to 20 net square feet per occupant in classrooms where laboratory activities are not facilitated (Love & Roy, 2022).

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