Master of Public Health

Integrative Learning Experience Report

Advancing Safety through Collaboration: Developing Public Health Education in Research and Laboratory Safety for Campus, Government, and Industry

by

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submitted in partial fulfillment of the requirements for the degree

MASTER OF PUBLIC HEALTH

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KANSAS STATE UNIVERSITY
Manhattan, Kansas

2025

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Summary/Abstract

Research and laboratory program outcomes reflect institutional safety initiatives and safety culture. The Applied Practice Experience, “Advancing Safety through Collaboration: Developing Public Health Education in Research and Laboratory Safety for Campus, Government, and Industry,” identified safety outcomes by analyzing reported incidents in research and laboratory environments, designing and implementing data-informed biannual collaborative education and training events, and proposing long-term, sustainable, tiered curriculum in research and laboratory safety for the campus community, government, and industry professionals. Through interdisciplinary and multisectoral collaboration, Kansas State University has integrated safety principles into institutional frameworks, mitigating risks, fostering professional development, and strengthening research integrity. The findings and methodologies outlined in this report may serve as a model for academic institutions to enhance their safety training programs and promote improved risk reduction through proactive institutional safety culture.

Subject Keywords: safety, education, laboratory safety, research safety, compliance, risk mitigation, safety training, professional development

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Chapter 1 - Literature Review

Academic laboratories are essential for scientific training and scientific discovery; however, academic laboratories also present significant safety risks to faculty, staff, and students due to hazardous materials, specialized equipment, and human behavior. Despite regulatory requirements and institutional policies, laboratory incidents continue to occur at high rates across institutions. Main contributors to incidents in academic laboratories are inadequate, non-specific safety training and lack of a strong, proactive safety culture.

Universities across the world have implemented safety training programs to mitigate inherent risks associated with laboratory operations and research, but efforts across these programs remain inconsistent, compliance-driven, or insufficiently integrated into academic curriculum. Safety training programs remain a checkbox for compliance versus attaining their full potential to support students throughout their academic career and professionals throughout their career by providing applied learning and resources that empower individuals to apply concepts and control strategies in real world scenarios.

Traditionally, safety training programs face challenges including limited faculty engagement and oversight in the laboratory, lack of standardized safety training across disciplines and academic units within each institution, and gaps in applied, hands-on learning experiences. These challenges result in students and researchers that are underprepared for real-world safety scenarios and application of knowledge in research and laboratory settings. However, recognizing these challenges and the outcomes of continuing to provide safety training as a compliance requirement present opportunities to enhance safety education and training programs by developing structured, data-driven programs that incorporate principles of public health, engage learners in active learning methodologies, and integrate industry-guided standards to establish robust, consistent, engaging, and interdisciplinary opportunities for global audiences of learners. Establishing comprehensive, interdisciplinary safety education programs in academia supports desired safety training program learning objectives including increased hazard recognition, informed risk reduction, emergency response

preparedness, proactive institutional safety culture, incident reduction, and workforce readiness. Students obtain education at academic institutions to prepare for impactful careers. It is critical that in this career preparedness, students are also given the tools to work safely, ethically, and sustainably.

This literature review will explore incident trends across academic institutions, current safety education program characteristics and challenges in academia, and opportunities and best practices for establishing effective and relevant safety programs at academic institutions. Academic institutions are uniquely positioned to be the catalyst for change in safety training and education across industries and can fill learner demands for different types and levels of education that benefit students, researchers, and industry professionals. By offering academic credit for students, professional degrees in safety for industry, and opportunities for upskilling—such as microcredentials and continuing education—institutions can address workforce demands and professional credential maintenance requirements. These tiered academic programs have the potential for far-reaching, long-term, and sustainable impacts.

Evaluation of Incident Types, Frequencies, and Trends in Academic Institutions

Incident types, frequencies, and trends reveal systemic safety gaps and inform targeted public health interventions for institution-wide risk reduction. Reported incidents across academic institutions represent a large range of root causes, including chemical exposures, chemical burns, laboratory fires, equipment accidents, chemical explosions, needlesticks, animal-related incidents, and exposures to biological substances. These incidents are often attributed to a combination of inadequate training, unsafe behavior, and/or failure to use established control methods, including engineering controls, work practice controls, and personal protective equipment (PPE).

Incident reporting in academia is often inconsistent, with underreporting of incidents and near-misses. Overall, our understanding of incident types, frequencies, and trends across academic institutions represents an underestimation of risks. When risks are underestimated or underreported, gaps exist in targeted risk management approaches. Critically analyzing institutional incident and near miss data on a regular basis reveals critical risk information including recurring hazards, locations and tasks

associated with higher risks, roles or job titles associated with higher risks, effectiveness of safety initiatives and intervention programs, and opportunities for targeted risk reduction. Systematically evaluating incident trends allows universities to develop data-driven strategies to enhance safety, reinforce compliance, and establish a safety-first culture.

Perspectives Across Institutions

Laboratory incident frequencies in academia are difficult to determine. Incident data is reliant on accurate, consistent reporting at each institution by all faculty, staff, and students, and researchers. Often, data indicates that incidents are greatly underreported at academic institutions. Many surveys have been conducted at academic institutions regarding laboratory safety education, training and practices. The results from these surveys tell an alarming story about the overall state of safety at academic institutions. Some notable findings include:

- 25-38% of laboratory personnel have experienced an accident or injury in the laboratory that was not reported,
- 30% of laboratory personnel have witnessed a colleague injury in the laboratory that warranted medical attention,
- 27% of researchers indicated they have never conducted a risk assessment prior to initiating work and 25% of researchers reported they did not receive hazard-specific training,
- Only 40% of researchers self-reported that they consistently wear personal protective equipment (PPE) and academic researchers are less likely to wear PPE than industry or government researchers,
- 81% of laboratory-related incidents at an academic institution occurred within teaching laboratories, 13% in research laboratories, and 2% in fabrication laboratories,
- 61% of teaching laboratories had frequent safety discussions, but only 16% of research laboratories had safety discussions,
- 20% of first year doctoral students experienced laboratory injuries with near misses occurring more frequently,

- Some faculty members have indicated that laboratory accidents are inevitable and that safety precautions are bureaucratic rather than important, and
- There are 2.5 laboratory incidents per week in academic settings (Feng et. al, 2023; Menard & Trant, 2020; Prpich & Unnerstall, 2022; Zhao et. al, 2024)

Additionally, multiple academic institutions publish incidents and lessons learned online for information and training. These publications provide insights to the types of incidents experienced at these academic institutions, although these are not complete accounts of all incident types and frequencies. University of California, Los Angeles (UCLA) publishes extensive lessons learned databases across categories for reference. UCLA lessons learned databases reference chemical incidents, including ignition, inhalation, unexpected reactions, incompatible personal protective equipment (PPE) use, chemical explosions, and chemical splashes into eyes (UC Center for Laboratory Safety, 2025). Additional lessons learned categories include biohazard exposures, such as needlesticks, splashes, sharps, and animal-related exposures; cryogen burns; glass lacerations; slips, trips, and falls; and dermal exposure to radioactive sources (UC Center for Laboratory Safety, 2025). Princeton University has a similar lessons learned webpage that cites a few unique incidents including shelving collapses, fume hood fires, incompatible waste mixing and electrical shock (Princeton University Office of Environmental Health and Safety, 2025). Texas Tech University's lessons learned webpage shares additional incidents resulting from outdated procedures, autoclaving, and powered vehicle rollover (Texas Tech University Environmental Health and Safety, 2025). Lastly, University of California, Berkeley notes unique lessons learned for laser eye exposure, equipment use, and powered vehicle rollover (UC Berkeley Office of Environment, Health and Safety, 2025). All universities noted similar chemical exposures, fires, and explosions as causes of laboratory incidents at the institution.

Laboratory-related deaths over the past 20 years share similarities with common causes of laboratory-related incidents in academia. The literature describes causes of academic laboratory incidents that resulted in death at academic institutions in the United States from 2008 to 2018. The most common causes of these incidents include

chemical burns, bacterium exposure, chemical inhalation, lathe machinery, and explosion (Menard & Trant, 2020).

To bridge gaps in the literature and provide a comprehensive 20-year perspective, an additional review of the Laboratory Safety Institute Memorial Wall, which honors individuals lost in laboratory accidents from 2005 to 2018 and 2018 to 2025, identified recurring previously discussed causes of laboratory incidents including explosions, chemical laboratory fires, contraction of monkey B virus, contraction of Mad Cow disease, electrocution, radioactive isotope exposure, chemical inhalation, exposure to bacteria, smoke inhalation, animal attack, and diving activities (Lab Safety Institute, n.d.). About 25-30% of all deaths on the Laboratory Safety Institute Memorial Wall occurred in academic laboratory institutions for the 20-year timeframe from 2005 through 2025, while approximately 70% occurred in government or private industry facilities.

From 2001 to 2018, the Chemical Safety Board, an intendent federal agency in the United States responsible for reviewing chemical accidents, investigated 120 academic research lab accidents ranging from laboratory evacuations to serious injuries (Prpich & Unnerstall, 2022). This number supports that chemical laboratory accidents are rare or underreported (Prpich & Unnerstall, 2022). Overall, incidents in academic laboratories that are publicized are those that involve work with highly hazardous materials and equipment, whereas more common causes of laboratory incidents are often not publicized (Shroder et. al, 2015).

Academic laboratories play a critical role in scientific education and discovery; however, frequent safety incidents from common causes remain a persistent challenge across institutions. Our information about laboratory-related incidents in academia is hindered by underreporting and inconsistent reporting. The data presented, including survey results from primary literature, university lessons learned insights, laboratory memorial wall documentation, and Chemical Safety Board investigations highlights alarming trends, including frequent incidents observed in academic laboratories, absence of formal risk assessments, inconsistent and inadequate safety education and training, reactive safety cultures, and likely large numbers of unreported incidents. Additionally, university lessons learned databases provide valuable insights into

common and recurring laboratory hazards, yet they only reveal a fraction of incidents occurring in academia, publishing only selected incidents for wide, public dissemination. The prevalence of severe accidents, including documented global fatalities, necessitates public health interventions targeting improved safety education and training, and proactive risk mitigation strategies focused on the known, most common causes of laboratory incidents.

Overview of Laboratory Safety Education and Training in Academia

The academic laboratory environment supports the primary functions of teaching, learning, research, development, and diagnostic and clinical operations. Laboratory safety education and training in academia is important for providing a baseline level of knowledge that promotes faculty, staff, student, and visitor health and well-being in laboratory and research environments. Individuals who complete safety education and training programs are equipped to recognize and mitigate risks, preventing accidents, injuries, and exposures to hazardous materials and infectious substances.

Laboratory safety education and training in academia focuses on fundamental core concepts, providing general knowledge and introductory training in areas including:

- Chemical safety
- Biological safety
- Radiological safety
- Hierarchy of controls
- Risk assessment
- Hazardous materials management
- Emergency response
- Fire safety
- Equipment safety
- Electrical safety
- Ergonomics
- Laboratory design/ workflows
- Incident and near-miss reporting
- Regulatory compliance

- Ethics
- Occupational health
- Research security
- Cybersecurity/ information security

Many academic institutions deliver general safety education and training in a combination of formats, including online training, in person training, and hybrid training. Varying modalities and training durations are appropriate for different topics. Most importantly, training must be accessible to learners in a timely manner in a modality that supports knowledge transfer, retention, and application.

General, foundational laboratory safety education and training may not be sufficient for the hazards, operations, and work environments experienced by all learners. Academic courses and research across an institutional enterprise is diverse and rapidly evolving, necessitating safety education and training programs that are adaptable, comprehensive, learner-focused, and specific. Laboratory-specific, course-specific, and task-specific safety training supplement general university safety education and training programs, providing specialized, application-focused knowledge and resources for faculty, staff, students, and visiting scholars.

Establishment of robust safety education and training programs in academia is especially important, as academic environments are foundational spaces for innovation, discovery, and learning. Students and early career professionals often receive their first and foundational safety education and training in academic environments that translates into skills, behaviors, knowledge and norms that are carried throughout their careers and professional endeavors. Ethical and responsible conduct in professional endeavors begins with the knowledge and ability to protect oneself, others, animals, and the environment without compromising efficiency, innovation, and discovery.

Gaps and Challenges in Research and Laboratory Safety Training

Gaps and challenges in delivering effective, engaging, and specific research and laboratory safety training persist for academic institutions. Many academic safety training programs are administered to achieve regulatory compliance and provide only foundational knowledge or compliance notes, resulting in faculty, staff, students, and

researchers feeling unprepared to assess and mitigate risks in real-world scenarios. Learners require successful knowledge transfer, retention, and application to take safety education and training to the next level and feel confident implementing what they have learned.

Knowledge Transfer, Retention, and Application

The objectives of safety training and education programs must include the successful transfer of knowledge—did participants learn the outlined content?—the successful retention of knowledge—did participants build a foundation that was reinforced throughout the course?—and the successful application of knowledge—can participants apply what they have learned in real-world scenarios after completing the course? Effective safety training and education programs must achieve more than information delivery; they must ensure that learners internalize and can apply critical safety concepts prior to program completion.

A significant challenge in research and laboratory safety training is the transfer of knowledge from instructor or educational program to the learner in a meaningful, digestible format. Instructing content so that it is directly applicable to the learner at a level and language that promotes understanding is of paramount importance for knowledge transfer. Safety education and training programs should be built for the learner to obtain knowledge that they can apply. The use of applied learning methods, hands-on experiences, and designing curriculum so that learners must engage with the content represent best practices in knowledge transfer and retention.

Knowledge retention describes the long-term attainment of knowledge from an education or training program. Knowledge retention is important for knowledge application. Once a learner has gained knowledge, they must retain the knowledge to apply it. Repeated training provides opportunities for learners to retain and build up prior knowledge (Bond, Gammie, & Lorsch, 2020). Safety training should not occur once; it should be a repetitive and reinforced process through classroom study and institutional culture. Repetitive and reinforced training may look like advancing through progressively challenging coursework, formal and informal mentorship, completion of culminating projects, real-world drills and simulations, and having ownership in safety program outcomes. Student-led safety initiatives are an effective way to promote

Knowledge application refers to a learner's ability to apply knowledge post-training. Literature emphasizes learners that complete safety education and training programs may encounter challenges when applying knowledge in real-world settings. Townsend and Goffe note that students may not see the relevance of online safety training, especially if they are not physically in the laboratory (Townsend & Goffe, 2022). Safety training cannot be a fully online, compliance-based activity. To promote knowledge application, students must have opportunities to apply knowledge within the scope of their educational and training experiences. Providing hands-on opportunities to apply knowledge in safe, informed environments prepares learners to apply knowledge in a variety of environments with varied risks throughout their educational and professional careers.

Compliance-based vs. Behavior-based Safety

Many safety education and training programs focus on teaching learners' compliance, including regulations and requirements, but often place less emphasis on education and training that address human behavior and its impact on individual and institutional safety outcomes. Human behavior, also referred to as “human error,” is a leading cause of laboratory accidents in academia (Feng et al., 2023). However, human behavior is not entirely individual—it is influenced by beliefs, perceptions, values, and institutional safety culture.

Institutions may shape individuals to have certain beliefs, perceptions, and values surrounding individual safety. Shifting from compliance-based training to behavior-based training improves safety culture and reduces incidents. Research indicates that fostering proactive safety behaviors—such as peer accountability, hazard recognition, and risk assessment—leads to lasting improvements across the institution (Simmons, Matos, & Simpson, 2017). To create meaningful change, safety education and training programs must prioritize behavior change, instill safe research habits, and be reinforced by institutional commitment. The most effective academic safety training integrates behavior-based methods to address the role of behavior in safety (Kaufman & Berkelman, 2007). Behavior-based safety is a collective effort that starts with education and training and is reinforced by the institution.

Safety Culture

Safety culture is a collection of values, behaviors, perceptions, competencies and actions that reflect individual, group, and organizational commitment to and pursuit of safety (NIOSH, 2023). Safety climate represents a narrower concept on current perceptions of organizational support, monitoring, and management of safety practices (NIOSH, 2023). Institutional safety culture directly impacts support, resources, and learner outcomes of safety education and training initiatives.

In academic laboratory environments, a prudent safety culture nurtures attitudes and habits of responsible behavior and communicates that safety is inseparable from laboratory activities (National Research Council, 2011). A proactive, positive academic safety culture reflects values, attitudes, and behaviors at an individual level, indicating integration into education and training at each stage of one's academic training and career (National Research Council, 2011). An optimal safety culture reflects safety consciousness, deep concern for individual and community well-being, habitual risk assessment, accountability, dedicated safety education and training, and leadership commitment (National Research Council 2011).

Primary challenges for safety culture in academia include:

1. Lack of knowledge and hands-on training (Brewster et. al, 2023; Love et. al, 2022; Ogundipe et. al, 2018).
2. Work pressures, including pressures of productivity and efficiency (Brewster et. al, 2018; Ogundipe et. al, 2018).
3. Belief systems and varying perceptions on the importance of safe practices (Brewster et al, 2018, Menard & Trant, 2020; Ogundipe et. al, 2018).
4. Discrepancies between attitudes toward safety and safety behaviors/ safe practices (Menard & Trant, 2020; Ogundipe et. al, 2018; Wu, Yang & Xu, 2023), and
5. Lack of positive (promotions, tenure, positive performance reviews, funding, leadership support, supervision) reinforcement and negative reinforcement (mandating safety policies and practices, consequences for unsafe practices) at the institutional level (Brewster et. al, 2023; Martin et. al, 2022; Menard & Trant, 2020; Schroder et. al, 2016).

Safety education and training programs in academic institutions should consider how current institutional safety culture will impact knowledge transfer, retention, and application within institutional laboratory environments. Leadership support is critically important for safety culture establishment and enhancement.

In conclusion, academic research and laboratory safety education must go beyond achieving compliance requirements to fostering a lasting understanding of safety principles, encouraging long-term knowledge retention, and promoting real-world application. Learners must have opportunities to apply knowledge in safe, informed environments with real-time feedback and support.

Academic institutions face persistent challenges in developing and delivering engaging and impactful safety training. Addressing known gaps is essential to improving safety outcomes. By prioritizing behavior-based training, integrating hands-on learning experiences, and reinforcing institutional safety culture, academic safety education programs promote proactive and resilient safety mindsets for learners and institutions. A strong safety culture, built on continuous education, accountability, and reinforcement, ensures that learners not only acquire safety knowledge but also retain and apply it throughout their academic and professional careers.

Opportunities for Establishing Safety Education and Training Programs in Academia

Academic institutions have unique opportunities to establish safety education and training programs that meet the needs of current and future learners, while also improving institutional safety culture and safety outcomes. These institutions have missions centered around providing excellence in education and training to prepare students for in-demand careers toward lifelong success. Additionally, academic institutions have valuable assets including educators, educational facilities, diverse hazards, industry and government partnerships, and interactive technologies providing optimal resources for providing consistent, structured, engaging, and hands-on learning in research and laboratory safety topics.

Established safety education programs in the United States primarily exist at colleges and universities or are offered through professional safety organizations. There

are three major types of established safety education programs: credit-bearing programs, which provide undergraduate or graduate credit toward a degree or formal qualification; credential-bearing programs, which provide recognized credentials such as certificates, diplomas, professional certifications, or microcredentials; and non-credit-bearing programs, such as webinars, seminars, workshops, conferences, symposiums, and training programs, which do not provide academic credit or formal qualifications. Each program type fulfills a critical need in safety education and training for specific learner demographics, including traditional credit seeking learners who would like to earn a formal degree to initiate a career in safety, safety professionals who require continuing education and upskilling for credential maintenance and career progression, and academic, government, and industry professionals who utilize safety knowledge in their careers across a wide range of disciplines. The most comprehensive and complete safety education and training programs are built to address these learner populations simultaneously.

Integrating Safety into Curriculum

Students pursuing education and careers in science, technology, engineering, and mathematics (STEM) fields often complete a curriculum with extensive coursework with laboratory or applied STEM requirements. Research has highlighted the benefits for knowledge transfer, knowledge retention, and knowledge application when safety education and training is integrated into established academic programs across disciplines. Additionally, incorporating safety education into preexisting curriculum reflects an institutional stance on the importance of safety and outwardly shows dedication of resources toward ensuring human, animal, environmental, and community health and well-being. When safety is integrated into curriculum, faculty, staff, and students engage in routine, regular, and consistent discussion and application of safety best practices within a chosen field or discipline.

Best practices for integrating safety into curriculum include dedicated courses for safety, early structured training, practical hands-on experiences, and interdisciplinary approaches. Dedicated safety courses in the curriculum emphasize the importance of safety in chosen fields and ensure in-depth training (Ogundipe et. al, 2018). Subject-specific courses allow instructors and students to explore specific topics and regulations

within the context of other coursework. While all academic disciplines may be subject to core safety regulations, standards, and best practices, some topics are unique to specific majors and workforce preparedness programs. Safety training should be integrated into curriculum and instruction as inseparable from didactic and mentorship activities (Bond, Gammie, & Lorsch, 2020). It is important that students are introduced to safety early in their academic career, from their first university laboratory-based courses. Robust, repeated training throughout the academic career and long-term oversight increase effectiveness of safety training at academic institutions (Bond, Gammie, & Lorsch, 2020). To increase effectiveness of safety education and training programs and to reinforce robust, proactive institutional safety culture, integrating safety education and training programs into preexisting curricula is recommended.

Academia, Government, and Industry Collaborations

Collaboration with government and private industry in safety education and training enhances student preparedness for competitive workforce entry, aligning skills and knowledge with professional demands and expectations, while reinforcing a high standard of safety performance.

When compared to industry and government, academic laboratories:

1. Perform fewer risk assessments (18%) versus industry (43%) and government (51%) and have less structured risk assessment programs (Meyer, 2012; Shroder et. al, 2016).
2. Have lower compliance with consistent PPE use (51%) compared to industry (87%) (Shroder et. al, 2016), and
3. May have fewer resources, less funding, and dedicated support for safety education and training initiatives.

These findings suggest that academic institutions may have unique challenges in implementing an effective safety culture when compared to government and industry organizations as a whole. Implementation of industry models for safety, exploration of government funding opportunities, and adherence to regulatory frameworks provide foundational components for academia to improve institutional safety culture.

Incorporation of Technology

Incorporation of technology into safety education and training initiatives provides a modern, engaging approach to prepare learners for hazard recognition and risk mitigation in safe, immersive environments. Advancements in technology, including artificial intelligence (AI) and virtual reality (VR) are leading technology choices for safety training, offering interactive, self-paced, data-driven learning experiences. Both technologies have the ability to personalize training through providing real-time feedback in realistic environments and safety challenges. The use of technologies in safety training promotes enhanced knowledge retention and helps organizations to play an active role in prediction and prevention of risks.

Artificial intelligence has the opportunity to revolutionize how we work, learn, and operate. Artificial intelligence has been employed in safety programs to enhance risk assessments and improve monitoring of safety outcomes (Shroder & Merlic, 2024). One of the greatest benefits of integrating artificial intelligence technologies into safety training is real-time feedback. This allows safety training experiences to be fully immersive and personalized to provide the greatest benefit to each learner on a personal level. This level of personalization also allows for training programs to address learners with varied knowledge and experience levels. Studies warn that overreliance on artificial intelligence for safety programs may lead to individual complacency and may result in ethical dilemmas (Shroder & Merlic, 2024). However, when implemented responsibly alongside other training methods and modalities, artificial intelligence has the ability to personalize training experiences and provide real-time feedback to support learner knowledge transfer, knowledge retention, and knowledge application in a safe, modern learning environment.

Virtual reality is an increasingly popular and engaging tool used to experience environments and scenarios as if one were fully integrated into the virtual environment. Virtual reality is a favorable technology for use in safety education and training with multiple benefits. First, learners have the opportunity to experience simulations and scenarios without the presence of hazardous materials or physical safety risks (Townsend & Goffe, 2022). This provides a safer, more accessible training for local and global learners. Second, the use of virtual reality promotes increased learner

engagement and improved understanding (Townsend & Goffe, 2022). The use of virtual reality allows learners to be immersed in unlimited virtual environments and scenarios for specific, targeted training opportunities (Kong et. al, 2022). In virtual reality, the learner directly engages with the environment, increasing training effectiveness (Kong et. al, 2022). Lastly, virtual reality safety training can be designed to be self-based and student-led, resulting in a customizable, learner-focused training modality at the individual learner level (Kong et. al, 2022). Education and training programs should consider the integration of virtual reality technology for increased curriculum adaptability, increased learner engagement, and increased training outcomes for knowledge transfer, retention, and application.

Upskilling

Upskilling refers to learning new skills and enhancing current skillsets in alignment with specific roles or tasks. Safety education and training programs have an opportunity to develop a curriculum with a focus on learning outcomes that promote upskilling of learners to close gaps between applicant profiles and workforce demands. Some of the greatest gaps between applicant profiles and unique job postings for environmental health and safety positions include communication, operations, investigation, writing, planning, problem solving, coordination, oral presentation, interpersonal communications, verbal communication skills, influencing skills, organization, report writing, computer literacy, self-motivation, decision making, and record keeping (Salas, 2024). Addressing these skill gaps for learners is an opportunity to upskill program learners to meet workforce demands (Salas, 2024). Skills where applicant profiles exceed job posting demands include research, customer service, and time management, reflecting skills that safety education and training may choose to prioritize less as learners enroll in programs with prior knowledge and experience (Salas, 2024).

The top thirty specialized skills for health and safety workforce demands revealed thirteen rapidly growing skills and fifteen growing skills in job postings. Skills that are rapidly increasing in safety and health job postings (rapidly growing skills), including data collection, environmental engineering, process improvement, risk management, storm water management, data analysis, biology, continuous improvement process, root

cause analysis, auditing, emergency response, project management, and environmental science represent key focus areas for safety education and training programs to proactively prepare learners for future workforce demands (Salas, 2024). Skills including regulatory compliance, risk analysis, chemistry, environmental compliance, key performance indicators, safety culture, occupational hygiene, environmental health and safety, occupational safety and health, waste management, regulatory requirements, Occupational Safety and Health Administration (OSHA) knowledge, safety training, and construction represent growing skills in job postings (Salas, 2024). These specialized skills are projected to grow by 10.5% to 29.9% across all job postings in health and safety over the next two years, compared to communication, the most common skill listed on all job postings, projected to grow by 4% over the next two years (Salas, 2024). This indicates the great demand for these specialized skills and significant opportunity to build safety training and education programs to meet these projections.

Implementing modern, engaging, and effective safety education and training programs at academic institutions requires consideration of best practices. Integrating safety education and training into curriculum, fostering collaborations with government and industry, and leveraging cutting edge technologies including artificial intelligence and virtual reality all represent opportunities that create comprehensive training and education programs that enhance knowledge transfer, retention, and application for learners. Additionally, safety education programs should emphasize upskilling initiatives tailored to workforce trends to bridge skill gaps and better equip learners for evolving job markets upon completion of academic programs. As safety training and education continue to evolve, academic institutions must remain proactive in adopting innovative approaches and expanding access to high-quality training for all demographics of learners. A commitment to structured, engaging, multisectoral, and interdisciplinary safety education reflects the institution's efforts toward proactive safety culture and enterprise-wide risk reduction.

Public Health Agency Overview

The Applied Practice Experience (APE) was conducted with the Department of Environmental Health and Safety (EHS) at Kansas State University (KSU). EHS Executive Director, Dr. Joseph Whitlock, served as the site preceptor.

Kansas State University has a large academic research enterprise facilitating valuable experience in examining safety culture and public health interventions across disciplines, locations, and educational programs. The campus location in Manhattan Kansas nearby state and federal government research facilities and within the animal health corridor, a hub of animal health research and development companies, is an ideal location for exploring industry, government, and academic partnerships. Lastly, absence of a formal, established academic program focusing on safety education and workforce preparedness provides the opportunity to explore the interdisciplinary attributes of safety education and possibilities for integration into preexisting curriculum.

Kansas State University

Kansas State University is a public, land-grant institution founded in 1863 in Manhattan, Kansas (Kansas State University, 2024a). The university has three physical campuses located in Manhattan, Salina, and Olathe, Kansas and extension centers located throughout the state of Kansas (Kansas State University, 2024a).

Kansas State University is designated as a Research 1 institution by the Carnegie Classification of Institutions of Higher Education (Carnegie Classification of Institutions of Higher Education, 2025). Research 1 (R1) institutions have very high research spending and doctorate production. In 2025, R1 status is reserved for institutions with $50 million or greater in annual research expenditures that award 70 or greater doctoral degrees annually (Nietzel, 2025). In 2025, a total of 187 institutions hold this designation (Nietzel, 2025).

Laboratory and research environments at the university support learning, teaching, research, development, and diagnostic applications. Kansas State University offers over 250 undergraduate majors and programs and over 165 graduate certificates and programs supported by over 1,200 full-time faculty (Kansas State University, 2025). Dedicated research opportunities for both undergraduate and graduate students support

early career engagement and success in research and support for lifelong research careers. More than 90 research centers provide specialized research focus and access across the state of Kansas to solve global challenges (Kansas State University, 2024e). Over 375 patents have been granted for Kansas State University research, emphasizing the innovation and success of the world-renowned research faculty and programs (Kansas State University, 2025).

Department of Environmental Health and Safety

The Department of Environmental Health and Safety at Kansas State University provides programs, resources, and services to ensure safety and compliance across the university enterprise (Kansas State University, 2024f). The department is organized into seven units specializing in compliance and service areas including radiation and laser safety, occupational health and safety, research and laboratory safety, training, fire and life safety, environmental protection, and agriculture safety (Kansas State University, 2024f). These units are illustrated in Figure 1.1, “Environmental Health and Safety Organization Chart”.

As the Research and Laboratory Safety Program Manager at Kansas State University, I lead the research and laboratory safety unit while collaborating with all other units collectively to provide resources and services to research and laboratory environments. My Applied Practice Experience was conducted to enrich education and training opportunities at the university within the discipline of research and laboratory safety.

Executive Director, Dr. Joseph Whitlock, served as the site preceptor for the Applied Practice Experience. Dr. Joseph Whitlock has extensive public health experience developing, advising, and executing safety programs and assessments for over 30 years globally. Dr. Whitlock’s experience spans private industry, government, and academia. Dr. Whitlock holds a PhD in Safety Sciences, a Master of Business Administration, a Chemical, Biological, Radiological, Nuclear (CBRN) Defense Graduate Certificate, and a Bachelor of Science in Public Affairs, Geography, and Environmental Science, Dr. Whitlock is a Certified Industrial Hygienist, Certified Safety Professional, Certified Hazardous Materials Manager, and Certified in Risk Management Assurance.

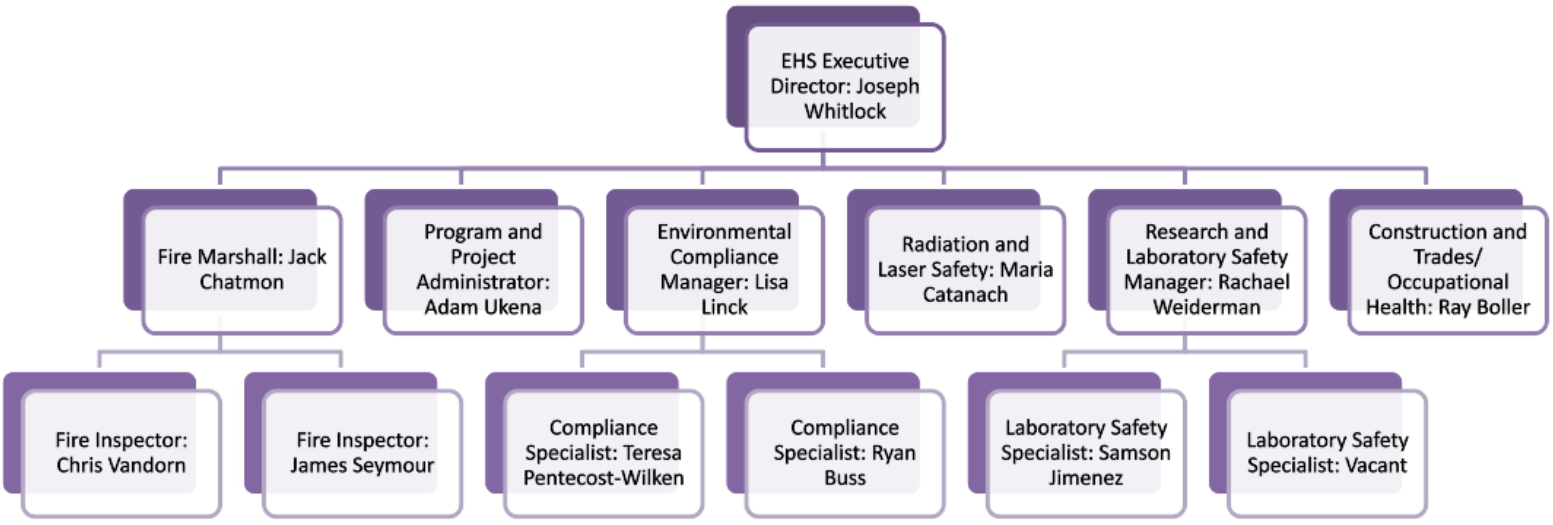

Figure 1.1 Environmental Health and Safety Organization Chart

In summary, the Department of Environmental Health and Safety at Kansas State University provides services, resources, and support to the campus community, playing a vital role in fostering a safe and compliant academic environment through specialized units and collaborative efforts. The Applied Practice Experience provided an opportunity to enhance research and laboratory safety education and training opportunities offered by the Department of Environmental Health and Safety to support enterprise hazard recognition, risk mitigation, and the promotion of safe and healthful working environments across campus. Under the guidance of Dr. Joseph Whitlock, this experience contributed to the development of multisectoral, interdisciplinary safety initiatives that align with industry standards and institutional needs. Beyond this project, continued investment in safety education, cross-disciplinary collaboration, and innovative training methods will be essential in strengthening the university's safety culture and preparing students and researchers for future challenges in laboratory and research environments.

Chapter 2 - Learning Objectives and Project Description

Project Description

The Applied Practice Experience, titled "Developing Public Health Education in Research and Laboratory Safety for Campus, Government, and Industry," focused on designing and implementing key safety initiatives at Kansas State University to enhance the research and laboratory safety culture. From concept to execution, biannual structured training events were developed and assessed to improve access to safety education, support regulatory compliance, foster cross-disciplinary collaboration, and celebrate science and research. Key accomplishments included the design and execution of safety training events, program evaluation, development of educational materials, establishment of cross-disciplinary partnerships, advancement of institutional safety efforts, and the proposal of frameworks for sustainable, credit-bearing safety programs.

Learning Objectives

The learning objectives established for the Applied Practice Experience emphasize desired skills and knowledge to be developed throughout activities, projects, and deliverables. These learning objectives included:

1. Analyzing the progression and goals of institutional safety culture through structured educational initiatives
2. Identifying best practices for integrating safety principles into academic and research environments
3. Exploring strategies for fostering collaboration between faculty, staff, students, and industry professionals to enhance organizational safety culture
4. Developing hybrid learning models to expand access to safety training and professional development
5. Developing approaches for sustaining and evolving institutional safety programs based on emerging risks and technological advancements, and
6. Strengthening personal and institutional accountability in research safety through certification and continuing education opportunities.

Responsibilities

To obtain the outlined learning objectives, the following activities, projects, and deliverables were completed as part of the Applied Practice Experience. These are discussed in more depth throughout Chapter 2 of this report.

1. Compile and interpret data on incidents, injuries, illnesses, and near misses occurring in laboratory and research environment. Identify trends and patterns including personnel type/role, incident type, incident location, and work practices associated with incidents.
2. Prepare a comprehensive report of laboratory-related incidents, illnesses, exposures, and injuries at K-State. Identify priority focus areas for safety training and education for the campus community.
3. Design and plan biannual conference-style safety training and education events for K-State University, including setting event objectives, developing event timelines, selecting presentation subjects and subject-matter experts, and creating a structured agenda.
4. Implement biannual conference-style safety training and education events, including coordination of logistics, event marketing and promoting, and facilitating discussions and activities.
5. Design safety education and training programs for a global and hybrid local audience. Offer live-streamed and recorded sessions of major safety events for remote participants. Develop formal Canvas Course assessments to reinforce key safety concepts and track participant progress.
6. Design and implement a continuous improvement model where stakeholder feedback drives safety program updates. Create and administer post-event surveys to guide refinement and reinforcement for future safety education and training.
7. Explore Strategies for Fostering Collaboration between Faculty, Students, and Industry Professionals. Host dedicated networking events and provide opportunities for long-term participant connection and collaboration. Provide opportunities to showcase research and emerging technologies utilized at K-State to a global audience.

8. Propose a long-term, tiered educational program with advanced safety training for researchers at different levels, including microcredentials, master badges, continuing education, and credit-bearing courses.
9. Complete a funding proposal for #8.
10. Present research, program accomplishments, lessons learned, and future directions to key stakeholders.

Analysis of Laboratory-Related Incidents, Illnesses, Injuries, and Exposures

Purpose

Reported incidents, illnesses, injuries, and exposures are lagging indicators of safety program effectiveness (OSHA, 2019). The purpose of conducting an analysis of reported laboratory-related incidents is to systematically document, analyze, and communicate key information to provide accurate information, identify issues and trends, support decision-making, ensure accountability and compliance, enhance information sharing among stakeholders, and evaluate performance and outcomes of targeted interventions. This report compiled incident-related information from pre-established channels and presented the information in a new, objective way for analysis, identifying patterns and trends that have relevance to risk reduction for the institution.

Objectives

1. **Identify common causes** of campus laboratory-related incidents and near misses to determine contributing factors, frequency of occurrence, and opportunities for enterprise-wide risk reduction, including targeted training initiatives integrated into the Applied Practice Experience.
2. **Determine temporal trends** of reported incidents and near misses to identify risks associated with time of day and time of year to identify opportunities for risk reduction.
3. **Assess training effectiveness and establish baseline** for future metrics. Evaluate gaps in current university training as contributing factors to laboratory-related incidents.

4. **Develop data-driven recommendations** for targeted interventions and training to enhance research and laboratory safety at the university based on incident type, frequency, cause, and temporal patterns. Some data-driven recommendations may include:
    a. Training topics
    b. Targeted audiences
    c. Training frequencies and time frames of offered trainings (time of day, month, time of year, offerings per year)
    d. Training modalities (in person, online, hybrid)
    e. Applied training technologies (simulations, hands-on training, case studies)
    f. Long-term, tiered curricular design for continuing education, microcredentials, and undergraduate/graduate certificates
    g. Alignment with Next-Gen K-State priorities and initiatives for university sustainability, innovation, and growth

The incident analysis was included as part of the Applied Practice Experience to connect training interventions and proposed long-term, sustainable safety education credentials curriculum with community needs for a learner-centered approach.

Methodology

Methodology describes the data collection methods, data analysis techniques, ethical considerations, and limitations for the laboratory-related incident analysis. Data was collected from established campus incident and near miss reporting forms for 2023 and 2024. Comprehensive data was filtered to incident reports that indicated the incident occurred in a campus laboratory. Data was analyzed using charts, graphs, and tables in spreadsheet software programs for patterns and trends, including individual position title/role, cause of incident, body part affected, PPE use, temporal data (time of day, month of year) and research and animal association. Additional data analyzed, including frequency of incidents in specific university colleges/departments and locations was omitted from this published report due to the sensitivity and of the information. Key findings from this analysis and implications for university safety training

and education are discussed in Chapter 3 and Chapter 4 of this report. The full incident analysis report can be found in Appendix 3.

A limitation of this report is the two-year scope of analyzed incident data. While electronic incident reporting began in July 2018, a transition to a new reporting system occurred in June 2022. Prior to that, a different system was in use from July 2018 through June 2022, with only limited ability to filter incidents by lab-specific designations. Lab-specific incident reporting fields were introduced for beta testing in June 2022 and fully implemented in January 2023, making 2023 the first complete year of structured, lab-specific incident data collection. Incident reporting prior to 2018 was managed exclusively through paper forms, further limiting the consistency and availability of older data for longitudinal analysis.

Biannual Safety Education and Training Events

Purpose

Biannual safety Education and Training events were developed to enhance safety education for the university and a global community of learners to address. Development of the first event began in December 2023, and the first event was held in February 2024. Since then, two additional biannual events were held in October 2024 and February 2025. The evolution of the biannual events is illustrated in Figure 2.2, “Evolution of Biannual Safety Education and Training Events”. Biannual safety education and training events created a foundation for research and laboratory safety education to provide professional development opportunities for learners in academia, industry, and government.

Objectives

Biannual research and laboratory safety educational programs address gaps in current safety training and education opportunities for faculty, staff, and students at Kansas State University and other academic institutions, government organizations, and private employers.

These events enhance learning opportunities by:

- Engaging the University community in teaching research and safety topics aligned with subject-matter expertise
- Inviting subject-matter experts across organizations and specialties to present knowledge at Kansas State University
- Including hands-on experiences and applications of topics presented
- Connecting researchers and laboratorians with vendors who provide laboratory and safety solutions and equipment
- Providing opportunities for discussions, discourse, and idea generation across attendee populations
- Encouraging interdisciplinary collaboration and partnerships

Learning objectives for biannual education and training events include:

- Learners will be able to recognize potentially hazardous conditions and emerging risks in laboratory and research environments, while utilizing tools and reporting systems to mitigate these risks.

- Learners will have expanded knowledge of comprehensive research and laboratory safety, including chemicals, biological materials, equipment, facilities, animals, physical hazards, psychological safety, and regulatory requirements.

- Learners will cultivate a safety-conscious culture and a sense of responsibility; they will be empowered to prioritize and advocate for safe practices across all facilities and levels.

- Events will promote continuous professional growth by offering updated resources, certifications, and opportunities to stay ahead of emerging technologies and challenges.

Methods

Kansas State University safety education and training events (Lab Safety Awareness Week, Biosafety and Biosecurity Summit, and Research Safety Bootcamp) are collaborative hybrid events designed to provide training and resources on physical

(chemical, biological, equipment, PPE) and psychological safety, information security, and updates on regulations and emerging research technologies. Held twice annually on the K-State campus, these hybrid events feature presentations from government and state regulatory agencies, private industry experts, K-State collaborators, partner organizations, and campus faculty and staff. The events provide opportunities for networking, hands-on experiences, live presentations, poster presentations, tabletop exercises, and a scientific vendor fair. Most recently, the Research Safety Bootcamp in February 2025 offered 15 continuing education (CE) units, a university credit hour, an OSHA-10 certification course, and an official certificate of course completion from Kansas State University.

A simplified process for event planning, execution, and follow up is illustrated in Figure 2.1, “Simplified Process for Biannual Safety Education and Training Events Planning, Execution, and Follow-Up". A more detailed process is illustrated in Appendix 1, “Process Map for Biannual Safety Education and Training Events”. A full event timeline, including event metrics, event refinements, and elaboration on planning, execution, and follow-up phases is illustrated in Appendix 2, “Innovation (Change Management) History for Key Biannual Safety Training and Education Events”.

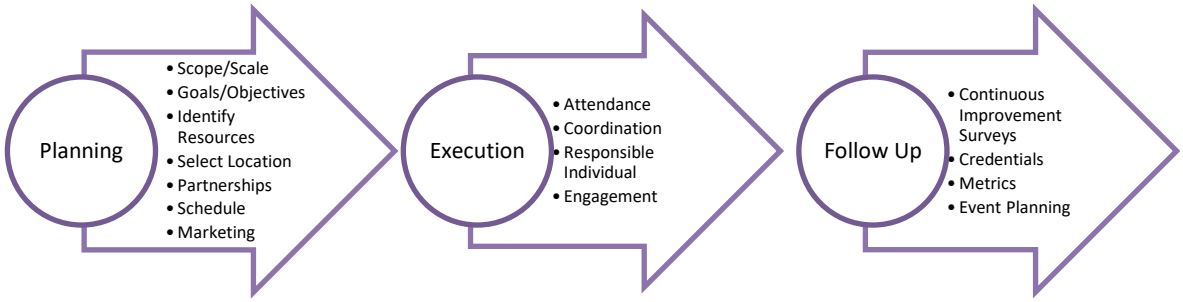

Figure 2.1 Simplified Process for Biannual Safety Education and Training Events Planning, Execution, and Follow-Up

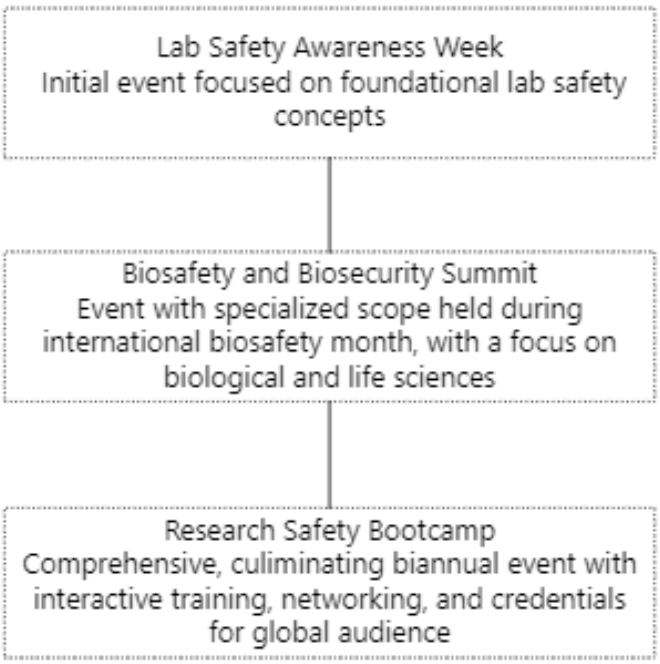

Figure 2.2 Evolution of Biannual Safety Education and Training Events

Develop Post-event Quantitative and Qualitative Surveys

Purpose

The purpose of developing mixed-methods post-event surveys was to gather comprehensive quantitative and qualitative feedback from attendees of biannual safety education and training events. These surveys were designed to support continuous improvement and inform future program development for safety education and training at the university, asking participants dedicated questions about event marketing, logistics, venue, presenters, presentations, and education credentials. The feedback collected provides a targeted approach to enhance future events and align them with the needs and interests of the learner population.

Objectives

The objectives of the post-event surveys include:

- **Gather measurable data**: The post-event surveys collect quantitative data through structured questions to assess attendee demographics, event perceptions, and interest in future safety education opportunities.
- **Assess participant satisfaction:** The post-event surveys collect qualitative insights through open-ended questions to evaluate the effectiveness of each event and alignment of the event with learner expectations.
- **Inform future program development and refinement**: Collectively, quantitative and qualitative data inform the continuous improvement of safety education programs to ensure future initiatives to meet learner needs.

Methodology

Post-event surveys were developed and administered via Microsoft Forms. All learners receive a link to the post-event survey promptly after the event is concluded. The survey link has also been incorporated into the Canvas course for the Research Safety Bootcamp, a newly incorporated learning platform.

Quantitative questions include numerical scales, multiple-choice options, and yes/no responses, focusing on topics such as attendee demographics, event organization, perceptions, marketing effectiveness, and interest in future credit-bearing programs (e.g., continuing education, microcredentials, undergraduate, and graduate courses). Qualitative questions provide opportunities for open-ended feedback, allowing participants to share opinions on specific presentations, presenters, and suggestions for future events. The combination of quantitative and qualitative data allows for statistical analysis to identify trends and in-depth insights into participant experiences. Appendix 5 includes a sample of both quantitative and qualitative questions from the survey.

Credit-bearing Program Development Proposal

Purpose

Traditional safety training at academic institutions is conducted to ensure compliance with a variety of federal, state, local, and institutional regulations and standards. However, compliance-based training represents a missed opportunity to deliver structured, credit-bearing, and adaptive safety education to a wide range of learners at academic institutions. The proposal for a tiered, interconnected credit-bearing curriculum providing safety education credentials stemmed from the idea that safety education and training can be so much more than a compliance checkmark, providing students and researchers with knowledge, skills, and experiences that empower them to work safely in laboratory and research environments throughout the duration of their academic and professional careers.

Objectives

The proposed tiered safety education credentials were designed to bridge gaps in existing safety education and training across institutions and industries by providing real world learning opportunities with a focus on targeted upskilling and acquisition of knowledge and skills toward proactive risk management.

The key objectives for the proposed curriculum include:

1. **Design of a comprehensive, structured, and adaptive curriculum that meets the needs of current and future learners across institutions and industries.** To be comprehensive, the curriculum must include foundational topics such as risk management, hazard assessment, hazardous materials management, chemical safety, biological safety, laboratory design, and laboratory equipment safety. To be truly adaptive and flexible, the program has built in engaged learning opportunities, projects, research of emerging technologies, and electives from existing academic programs.
2. **Design of a tiered program for accessibility across learner communities.** The curricular design features continuing education (CE), microcredentials, and undergraduate and graduate courses and certificates. Offering multiple levels of education promotes accessibility for students, professionals, and lifelong learners across organizations and industries.
3. **Increase university learner enrollment toward K-State Next Gen goals for alternative credit seeking learners and degree seeking learners**. The curriculum design has multiple entry points for degree seeking learners and alternative credit seeking learners to obtain safety education credentials at Kansas State University. The proposed curriculum expands learning opportunities where microcredentials result in optional CEs and elective credit hours, and CE offerings result in optional elective credit hours toward the undergraduate and graduate certificate programs. Providing multiple pathways into the curriculum and dual credit for microcredential and CE completions supports accessibility for all learner backgrounds. We envision this program supporting learners in academia, government, industry, and regulatory backgrounds.
4. **Bridge existing gaps in safety education and training programs.** Offer real-world learning opportunities employing applied learning methods and curriculum designed through academia, government, and industry partnerships.

Methodology

The proposal of the credit-bearing safety education program is founded upon the belief that one curriculum can simultaneously address the needs of learners across organizations, sectors, and baseline knowledge levels, providing a flexible and adaptable option for obtaining safety education and professional development. The central ideas and program proposal components include:

1. **Curriculum Design:**

The program is designed as a tiered and interconnected curriculum with objectives, learning outcomes, and applied experiences at each level (CE, microcredentials, undergraduate, and graduate). The curriculum includes core courses that cover foundational safety topics as well as elective courses that focus on emerging topics, technologies, and specialized areas within laboratory and research safety.

The program will incorporate project-based learning, internships, and research opportunities to provide learners with applied learning experiences and a customizable curriculum aligned with career goals and expertise.

2. **Course Delivery:**

The program will employ hybrid learning models, combining in-person and online learning opportunities to ensure accessibility and flexibility for diverse learners. Engaged learning opportunities including live presentations, tabletop exercises, interactive workshops, case studies, and simulations will be embedded in the curriculum to improve knowledge transfer and retention and provide real-world application of safety concepts.

3. **Multiple Entry Points:**

The program allows for multiple entry points, enabling degree-seeking students, alternative credit-seeking learners, and professionals to enroll at different stages of their education or career. Providing multiple entry points allows for interaction between learners across career stages, sectors, and specialties in the same curricular space and encourages learners to customize the program to fit their needs and interests. The proposed curriculum is illustrated in Appendix 6.

4. **Integration and Collaboration with Existing Academic Programs:**

The program will be designed and reviewed with feedback from existing academic departments and government and industry partners to ensure that the curriculum is aligned to address modern safety challenges, communicate safety best practices, and meet workforce demands for safety professionals. It is of utmost importance that program learners are equipped with up-to-date resources, skills and knowledge and that program graduates find that the program prepared them for success.

5. **Assessment and Evaluation:**

Learners will have regular assessments and evaluation throughout courses and the program through quizzes, exams, projects, and practical assessments (hands-on, case studies), ensuring that learning objectives are met, and curriculum successfully delivers knowledge. Continuous feedback informs program improvements and revisions, ensuring that the curriculum remains relevant and timely.

Funding Application Submission

Purpose

As part of the Applied Practice Experience, a funding application was completed and submitted for the proposal to develop credit-bearing safety education programs at Kansas State University. The purpose of submitting the funding application was to secure financial support to develop the proposed credit-bearing safety education including continuing education (CE) courses, microcredentials, and undergraduate and graduate certificates in research and laboratory safety. This initiative aligns with Kansas State University's Next-Gen K-State priorities, focusing on academic innovation, workforce readiness, and increasing diverse learner populations.

Objectives

The funding proposal for establishing safety education credentials was developed to achieve key objectives, including:

1. **Expanding access to high-quality, learner-centered safety education and training** for the university community, government organizations, and

industry professionals is a top priority of the future safety education and training at Kansas State University. The funding would establish this adaptable curriculum for diverse learners at the university and ensure safety credentials meet learner needs and workforce demands.

2. **Enhancing safety culture** through safety education and training programs that focus on equipping learners with knowledge, skills, and confidence to identify and mitigate risks using established control mechanisms and safety best practices.
3. **Aligning critical competencies in safety with Next-Gen K-State** imperatives and priorities, aiming to increase enrollment of degree seeking learners and alternative credit seeking learners through innovative program offerings.
4. **Establishing Kansas State University as a choice provider for safety education and training** for academia, industry and government. Continually increasing relevant and timely credential offerings and designing an adaptable curriculum will ensure that education and training remains among the best available.
5. **Secure foundational funding to establish the proposed curriculum** and achieve program objectives of proactive safety culture promotion, risk reduction, and enhanced safety knowledge across university colleges and departments. Achievement of these objectives at the university will be strengthened by partnerships with government and industry organizations and through engagement with a global audience of learners.

Methodology

The Academic Innovation Fund, launched in 2023, is a university commitment to investing up to $1 million dollars in new academic programs per annual funding cycle (Kansas State University, 2024b). Proposals range from credit to non-credit programs at all levels for existing and new audiences, with priority given to proposal that meet future learner and workplace needs, drive innovation, and support financial liability of Kansas State University (Kansas State University, 2024b). In October 2024, a preliminary

proposal was submitted to the Academic Innovation Fund for the safety education credentials. Based on the initial review by the funding review team, the proposal was selected to submit a full proposal in January 2025. As part of the full proposal, the following were described:

1. A three-year budget, including costs for course development, instructional resources, technologies, and marketing was projected to require an investment of $113,000.
2. A proposed, tiered curriculum structure that answers the needs of multiple learner populations by offering microcredentials, continuing education, and undergraduate and graduate course credit with multiple program entry points and dual credit offered for many courses. Hybrid offerings increase accessibility for a global audience.
3. Alignment with training and workforce gaps to improve knowledge retention and application while preparing learners for competitive employment.
4. Established and growing partnerships with government and industry partners to deliver high-quality offerings across sectors and disciplines that support alignment of academia with other sectors.

The Academic Innovation Fund initial and full proposals represent a commitment to fully investing in developing safety education and training programs at Kansas State University that address gaps and challenges in academic safety training and align with best practices for these programs. The funding proposals reflect desired investment beyond the Applied Practice Experience to move away from compliance-based training offerings that are fully online, lack real-world application scenarios, and are not credential-bearing to an applied learning curriculum designed to prepare learners for the workforce and support continuous professional development with multiple credential opportunities.

Chapter 3 - Results

Laboratory-Related Incidents Analysis: Findings and Insights

Reported incidents are critical lagging indicators of safety, revealing insights about institutional safety culture, effectiveness of safety training programs, and successfulness of institutional safety management systems. The laboratory-related incidents analysis in Appendix 3 provides graphs highlighting the incident trends for 2023 and 2024 briefly noted below. Ensuring all incidents are reported and evaluated is critical to identifying organizational risks and determining effective targeted interventions for risk reduction. Data-driven insights, including incident types, affected body parts, PPE compliance, daily temporal patterns, seasonal temporal patterns, high risk activities, high risk locations, and high-risk roles provide foundational knowledge that can be used to improve education, training, risk management, and risk reduction across the organization. These insights also allow safety professionals to predict high-risk operations and high-risk locations to engage in proactive risk management, preventing future incidents with similar characteristics.

Key findings from the analysis and report are summarized below to reveal the most common incident types and affected body parts, temporal patterns, high-risk locations, and high-risk roles. The full incident analysis report is available in Appendix 3.

Incident Types and Affected Body Parts

1. Cuts, punctures, scrapes, needlestick injuries and chemical burn incidents were top reported incidents in both 2023 and 2024.
2. Hand tools and utensils were a top cause of injury in 2023.
3. Chemical exposures increased from 2023 to 2024.
4. Fingers, hands, and eyes were the most frequently injured body parts across incident causes and years.
5. 90.9% of lab-related reported incidents in 2023 documented the use of PPE, while 61.5% of lab-related reported incidents in 2024 documented the use of PPE.
6. Gloves and lab coats were the most commonly used PPE, with gaps in eye protection.

Temporal Patterns

7. Most reported incidents occur during standard business hours (8 am – 5 pm) with peak occurrences between 10 am – 11 am and 1 pm – 4 pm. Few reported incidents occurred from midnight - 10 am and 4 pm – 7pm.
8. Seasonal peaks of incidents occurred in February, May, June, and August. These seasonal peaks may align with academic calendars.

High Risk Locations

9. Most incidents occurred on the Manhattan campus within STEM- (science, technology, engineering, and math) related laboratory and research activities and environments. **Departments have been omitted from this report due to sensitivity.**
10. Research-related incidents increased from 11 in 2023 to 15 in 2024. This may indicate an increase in incidents in research environments or during research related tasks or may represent an increase in reporting.

Individual Roles

11. Faculty and staff reported more incidents than students across both years, but student reports increased from 2023 to 2024.

Conducting a multi-year incident analysis provides visualization of critical safety information. Recurring safety concerns are illustrated in consistent or upward trends from year to year. These include hand and eye injuries, lack of consistent PPE use, and temporal patterns affecting time of day and time of year, aligning with the academic calendar. Data-driven actions suggested from recurring safety concerns include hazard-specific training, hierarchy of controls integration into risk assessment exercises, PPE reinforcement, and establishment of written procedures for high-risk activities. High-risk locations may benefit from targeted training initiatives and in-person offerings to address location and operation specific factors contributing to higher incident rates. Lastly, increased awareness for incident reporting and a focus on improving institutional safety culture support long-term risk mitigation and improved data collection. The

findings from the incident analysis establish a foundation for building a safety-informed campus community, dedicating safety resources to improved research and laboratory safety across the institution.

Biannual Training and Education Events: Summaries and Accomplishments

As part of the Applied Practice Experience, three biannual safety training and education events were planned, executed, evaluated, and refined. Establishment of the biannual events was a key objective of the Applied Practice Experience, contributing to safety culture enhancement at the university. These events, including Lab Safety Awareness Week in February 2024, the Biosafety and Biosecurity Summit in October 2024, and the culminating Research Safety Bootcamp in February 2025 provided safety presentations in targeted topics, applied experiences, interdisciplinary collaborations, dedicated professional networking, and multisectoral partnerships, providing a unique, high-quality learning experience for faculty, staff, students, government, and industry learners. These events align academic safety training with national safety awareness initiatives (Lab Safety Awareness Week in February spearheaded by the Campus Safety, Health, and Environmental Management Association (CSHEMA) and the Biosafety and Biosecurity Summit in October inspired by Biosafety and Biosecurity Month coined by the Association for Biosafety and Biosecurity (ABSA)), internationally recognized best practices, and industry standards providing a foundation for discussing regulatory requirements, emerging technologies and risks, and upskilling aligned with workforce demands.

Key metrics, event characteristics, and insights are provided below for each event. A full report detailing biannual event metrics is available in Appendix 4.

1. Lab Safety Awareness Week (February 2024)

Total Attendance: 165 learners

Number of Presentations: 10 sessions

Percentage of Presentations Archived: 70%

Total Training Contact Hours Provided: 2,475 hours

Quantitative Participant Feedback:

Net Promoter Score: 39

2. **Biosafety and Biosecurity Summit (October 2024)**

Total Attendance: 234 learners

Number of Presentations: 13 sessions

Percentage of Presentations Archived: 77%

Total Training Contact Hours Provided: 3,042 hours

Quantitative Participant Feedback:

Net Promoter Score: 78

3. **Research Safety Bootcamp (February 2025)**

Total Attendance: 1,517 learners

Number of Presentations: 13 sessions

Percentage of Presentations Archived: 92%

Total Training Contact Hours Provided: 18,737 hours

Quantitative Participant Feedback:

Net Promoter Score: 100

Biannual safety education and training events have achieved engaged learning, individual knowledge transfer, and institutional impact. Each consecutive event has increased total attendance, increased presentation offerings, increased presentation archiving for future training, increased total contact hours of training provided, and a higher net promoter score. These event metrics indicate strong participation, learner satisfaction, and increasing demand for safety education and training across a global community.

Funding Application Outcomes

An initial academic innovation fund proposal was prepared and submitted in October 2024 to propose the development of microcredentials, continuing education units, and undergraduate and graduate credit-bearing courses that culminate into certificates and a master badge in research and laboratory safety. The initial Academic Innovation Fund Proposal is available in Appendix 7. The proposed curriculum,

including tiered levels and dual credit courses described in the initial and full Academic Innovation Fund Proposal can be visualized in Appendix 6. Based on the initial proposal submission, the program was selected to complete a full proposal submitted in January 2025. The full Academic Innovation Fund Proposal is available in Appendix 8. Our funding application for safety education credentials was awarded $123,000.

Chapter 4 - Discussion

2023 and 2024 Campus Laboratory Incidents

Interpretations

Incidents are lagging indicators of safety culture (OSHA, 2019). Tracking and responding to reported laboratory incidents and near-misses provides a proactive, preventative response toward future related incidents of similar origin. Incident and near miss-reporting provide insights into institutional safety culture that inform of risks and necessitate personnel training and resources to promote safe working environments. The purpose of analyzing reported laboratory-related incidents at the university for 2023 and 2024 as part of the Applied Practice Experience was to identify focus areas for education and training and to establish a baseline for measuring progress in safety culture through incident and near miss reporting mechanisms. Interpretation of these findings provides insights for Kansas State University and other academic institutions for risk reduction and incident prevention.

1. Incident trends revealed a **decline in self-reported PPE usage** in laboratory-related incidents. A decline in self-reported PPE usage may have multiple root causes that necessitate further investigation. Decreased PPE utilization may be due to decreased availability of appropriate PPE, decreased training in PPE usage, or a decline in compliance due to safety culture.
2. **Increase in student incidents was revealed from 2023 to 2024.** This increase may be due to increased awareness and reporting (a false increase), change in hazards or procedures (true increase), lack of effective task specific training (true increase), and poor onboarding of new students (true increase).
3. **Increase in research-related incidents from 2023 to 2024.** Research is a broad category of tasks and operations across the university. Increased risk and hazard exposure or improved reporting of incidents are the most likely reasons for this increase.

Implications

In response to key findings, recommendations for safety training and education at Kansas State University include:

1. **Strengthen training programs/offerings and knowledge about personal protective equipment (PPE).** Consistent availability and use of PPE provides a layer of protection for individuals from injuries and exposures when more effective control methods fail (engineering controls, administrative/work practice controls). All faculty, staff, students, and visitors should have training detailing hazards, risk mitigation controls, processes and procedures, and PPE requirements and availability.
2. **Training should include targeted safety topics.** Campus safety education and training initiatives should target key trends and patterns in reported incidents, including hand and finger injuries, needlestick injuries, chemical burns, eye injuries, research-related injuries, animal-related injuries and inconsistent use of PPE. Temporal patterns indicate that training should occur at the beginning of each academic semester (fall, spring, summer) for faculty, staff, and students, and should include discussions detailing risks of laboratory and research work while fatigued, warning signs of burnout, and the importance and benefit of taking scheduled breaks.
3. **Targeted training.** Training should target all personnel roles at the university, including faculty, staff, and students. Targeted workshops or training in colleges and departments based on identified hazards, reported risks, and reported incidents and near-misses is recommended, proactive response to the report findings. Laboratory groups that conduct research, diagnostic facilities, and academic laboratory classes should conduct laboratory-specific training to address specific hazards in procedures, equipment, materials, and work environments. Role-specific training for faculty, staff, and students based on incident data may reduce role-specific risks. Additionally, training should be conducted early in each semester to reduce incident peaks observed in February, May, and June.

4. **Improve data reporting.** Training should provide education on the basics and reasoning for completing incident and near miss reports for every occurrence, including the critical role of incident and near miss reports in documentation, risk mitigation, and continuous improvement processes. Training must emphasize consistent and accurate incident and near-miss reporting for employee health and wellbeing and risk reduction across the enterprise. Workers and students should be encouraged to report all incidents and near misses without fear of penalty.

Recommendations for Safety Education Refinements

Critical evaluation and continuous improvement initiatives have identified opportunities for continuous improvement and program expansion for the biannual safety education and training events. Previous biannual events have provided a strong foundation for event refinement and success of future events with learner-focused approaches. Learners have expressed a strong desire for interactive, interdisciplinary learning opportunities during the events with hands-on training and technology integration. To enhance the impact of future biannual events, program refinements will focus on hands-on and applied learning, continued growth of partnerships, and development of flexible learning resources for application of knowledge post-event across organizations and sectors.

1. Refine biannual safety education and training events to increase hands-on applied learning aligned with recommendations for engaging safety training. These refinements may include implementing more tabletop exercises, instruction using case studies, and integration of virtual reality. The ability to apply knowledge with a diverse group of learners expands learning opportunities. Tabletop exercises engage learners at all levels toward a common goal. Case studies present real-world scenarios where knowledge application reflects what learners may encounter in real-world situations. Virtual reality allows learners to be immersed in a safe, risk-free environment to explore safety best practices and make decisions with real-time feedback mechanisms. Employing applied learning activities at biannual events

strengthens the learning opportunity for all participants and provides an engaging introduction to new information.

2. Increasing interdisciplinary and multisectoral partnerships in safety education and training has been a primary objective starting with the first biannual event and continuing through following events. Establishing university partnerships across colleges and departments engages the campus community in safety initiatives and provides ownership in safety outcomes. This establishes and reinforces an institutional safety culture of many voices and perspectives toward a shared goal. Increasing partnerships with government, industry, and regulatory agencies provides learners with diverse perspectives, increased opportunities to learn and apply knowledge, and unique networking opportunities. It is important to align programs across sectors to address a diverse population of current learners and prepare learners for responsibilities and experiences across global environments.

The goals of refining the biannual safety events are to increase participant engagement, and thereby, increase knowledge retention, strengthen cross-sector and cross-disciplinary collaborations in research safety education initiatives, and to ensure learners are exposed to curriculum that reinforces academia, government, and industry best practices and applications of safety knowledge. By incorporating applied training methods, cutting-edge technologies, and diverse expertise, we can create a more effective and inclusive safety culture at Kansas State University and beyond. Future developments will continue to align with best practices in safety and education, industry standards, and emerging safety challenges, ensuring events remain relevant, timely, impactful, sustainable, and responsive to evolving learner needs.

Proposal for Long-term, Sustainable Safety Education Credentials

Timely, comprehensive, and sustainable safety education is critical for establishing a program for future learners. Traditional safety training is motivated by a compliance-driven and reactive culture resulting in poor knowledge transfer, retention, and application in real-world scenarios. The proposed, tiered, structured approach to

research safety education, emphasizing microcredential pathways, curriculum integration, and national leadership in safety training provides a foundational path forward for Kansas State University to shift academic institutions away for compliance-driven training toward behavior-based training with applied learning, technology integration, and an emphasis on upskilling. The proposed curriculum is a scalable, adaptable, and future-focused framework for safety education that enhances institutional compliance, targets student workforce readiness, and emphasizes the importance of partnerships in developing a world-class program applicable to a diverse audience of learners. Key components of the proposal are summarized below:

1. Multiple entrance pathways into certification: The proposed tiered curriculum provides learners multiple pathways to achieve progressively advanced education in research and laboratory safety, awarding multiple credit types per course completion and integrating into many pre-existing academic programs. Learners may complete microcredentials and earn triple credit: a microcredential badge, a continuing education (CE) unit, and an elective credit hour toward an undergraduate or graduate certificate. Learners may start with any course and build upon prior learning to achieve the level of training and education desired.
2. Integration of safety education within degree programs: The proposed curriculum is designed to be very flexible and adaptable to meet individual learner needs. To this end, the core curriculum can be incorporated into many pre-existing academic programs and courses from pre-existing programs can be utilized as electives for the program certificates. This promotes integration of safety into a variety of majors and programs and ensures dedicated courses for safety education are available in the academic catalog.

By implementing flexible program pathways, integrating safety education into existing degree programs, and leveraging leadership in research safety training, Kansas State University is defining the future of laboratory and research safety education. These initiatives enhance safety awareness and empower students and professionals with industry-recognized certifications that improve career readiness. Establishing a

proactive safety culture that establishes safety as an integral part of research and education is essential for achieving institutional safety goals.

Conclusion

The incident analysis, development of biannual safety education and training events, and proposal for long-term, tiered curriculum in research and laboratory safety emphasize a commitment to enhanced institutional safety culture, increased risk reduction, and a shift to behavior-driven safety education and training. Safety must be imbedded into academic programs, laboratory and research environments, and creation of policies, procedures and processes at all levels. Kansas State University has leveraged the opportunity to establish as a leader in the field of safety education and training for laboratory and research environments to prepare the university community and a global population of learners for success as responsible, ethical, and safe laboratorians. In meeting the needs of today's learners in this specialty, the university is positioned for long-term success with adaptable, timely programs toward long-term, sustainable success.

Chapter 5 - Competencies

Student Attainment of MPH Foundational Competencies

The Master of Public Health (MPH) program at Kansas State University is guided by 22 foundational competencies across seven major topic areas. Foundational competencies cover topics in evidence-based approaches to public health, public health and health care systems, planning and management to promote health, policy in public health, leadership, communication, interprofessional practice, and systems thinking. MPH core coursework, including MPH 701 “Biostatistics”, MPH 720 “Administration of Health Care Organizations”, MPH 754 “Epidemiology”, MPH 802 “Environmental Health”, and MPH 818 “Social and Behavioral Basis of Public Health” collectively provide instruction across all 22 foundational competencies. All MPH program students must complete these five core courses. Table 5.3 provides the full list of foundational MPH competencies and alignment of core courses to each competency.

Students select at least five of the foundational competencies to address as part of the Applied Practice Experience through creation of public health products. Products may address a single competency or a combination of competencies; however, all five selected competencies must be addressed across the combination of products. This section details attainment of five of the 22 foundational competencies across creation of six core products during the Applied Practice Experience with Kansas State University Department of Environmental Health and Safety. Table 5.1 provides a summary of attainment of the five competencies discussed in this section and Table 5.2 aligns six core products across many of the foundational program competencies beyond the five discussed in detail in this section.

Competency 2: Select qualitative and quantitative data collection methods appropriate for a given public health context

Quantitative and qualitative data collection methods were used to support tracking and evaluation of health status and success of public health interventions. First, quantitative results were collected from responses to the Kansas State University

Incident and Near Miss Report Forms. All incident and near miss report forms submitted in 2023 and 2024 were filtered to select for incidents, injuries, illnesses, exposures, and near misses occurring within laboratory environments and within duties as part of university research. The pre-existing incident and near miss reporting form tracks critical data including incident date, incident time, incident location, individual role, individual department/unit, type of incident, body part affected, incident root cause, and research and animal-related incidents. A final report was prepared analyzing key insights from 2023 and 2024 incident reports, while excluding data that may lead to identification of individuals including specific job title, department, and specific location. The full report is available in Appendix 3.

Competency 2 was also achieved through creation, administration, and analysis of a mixed-methods post-event survey for biannual safety education and training events. The survey included both qualitative and quantitative questions aimed at stakeholder feedback and event improvement. All biannual event attendees were provided the post-event survey questionnaire form at the conclusion of each event. Results from the form were analyzed and implemented into a continuous improvement program for research and laboratory safety training and education at the university. A sample of quantitative and qualitative questions from the post-event survey questionnaire are available in Appendix 5. Coursework, including MPH 701, MPH 720, and MPH 754 were successfully completed during the MPH program.

Competency 9: Design a population-based policy, program, project or intervention

Three biannual safety education and training events were designed, implemented, and evaluated as population-based programs and interventions to respond to gaps in preexisting safety training and educational opportunities, documented laboratory and research-related incidents and exposures, and to promote a proactive, safety accountable and safety conscious organizational culture. The interventions targeted faculty, staff, students, researchers, administrators, and professionals within the university enterprise, as well as a global audience of industry

professionals and researchers. Creation of intervention evaluation methods to quantify event success and refinement, including a post-event survey and internal department metric tracking were also developed. Internal department metric tracking includes collection of attendance, presentation, and logistics data for continuous event improvement. Metrics and discussion for all three biannual events are nested in a report in Appendix 4.

The success of the biannual events necessitated a proposal for larger-scale, structured, credit-bearing credentials in safety, including microcredentials, a master badge, consistent continuing education offerings, and undergraduate and graduate coursework at Kansas State University. This proposal includes curricular design, initial Academic Innovation Fund proposal, and full Academic Innovation Fund proposal. The curricular design is available in Appendix 6, the initial Academic Innovation Fund proposal is available in Appendix 7, and the full Academic Innovation Fund proposal is available in Appendix 8.

Two systems thinking tools were applied to the biannual safety education and training events, including a process map for planning, execution, and refinement, and an innovation (change) history for the three key events thus far. These systems thinking tools are available in Appendix 1 and Appendix 2. Collectively, these tools provide a roadmap for event implementation and a pathway for event continuous improvement. Coursework including MPH 701, MPH 720, MPH 754, MPH 802, and MPH 818 were successfully completed during the MPH program for competency 9 and competency 10.

Competency 10: Explain basic principles and tools of budget and resource management

Budget and resource management are critical components of public health intervention planning, execution, and long-term sustainability. Budget and resource management was exercised in the Applied Practice Experience for biannual event planning, execution, and follow-up and for both submissions to the Academic Innovation Fund proposing long-term, sustainable safety education credentialing programs.

Academic Innovation Fund proposals proposed a three-year budget projection of approximately $113,000 to stand up and sustain safety education credentials, including microcredentials, continuing education, and undergraduate and graduate courses long-term. The budget proposal also included description of itemized investments, profits and losses, and justification of investment in alignment with imperatives and priorities of Next-Gen K-State. The full three-year budget projections and descriptions are available in the full Academic Innovation Fund Proposal in Appendix 8.

Competency 19: Communicate audience-appropriate (i.e., non-academic, non-peer audience) public health content, both in writing and through oral presentation

The Applied Practice Experience provided many opportunities to refine and strengthen audience-appropriate communication in both written and oral presentation for public health content. Competency 19, “Communicate audience-appropriate (i.e., non-academic, non-peer audience) public health content, both in writing and through oral presentation” was achieved through the design and instruction of the February 2025 Research Safety Bootcamp course, “Research Safety 101”. This foundational course was developed for a diverse, national audience of faculty, staff, students, government representatives, and industry professionals across more than 10 states. Delivered in both Zoom and in-person formats, the course was structured to meet the varying needs of participants with different levels of knowledge, professional roles, and learning preferences. Content was intentionally designed to be clear, accessible, and practical, with interactive elements and real-world examples used to enhance understanding and engagement across a wide range of sectors.

Written reports analyzing campus laboratory-related incidents and biannual event metrics also provided opportunities to provide public health communication to a wide, multisectoral audience. DMP 815 was successfully completed during the MPH program.

Competency 21: Integrate perspectives from other sectors and/or professions to promote and advance population health

Integrating perspectives from diverse industries and professions is central to advancing public health. Competency 21, “Integrate perspectives from other sectors and/or professions to promote and advance population health” was achieved throughout the process of establishing biannual safety education and training events at Kansas State University. External partner organizations, diverse university college and department contribution and participation, and a global audience of learners were paramount to the biannual event success and longevity. By fostering collaboration among industry leaders, government agencies, academic institutions, and professionals, the events successfully promoted a multidisciplinary approach to public health and safety education for the campus and global community.

Organizations that have partnered with Kansas State University for biannual safety education and training events, including through event endorsement, event marketing, contribution of technical knowledge and resources, or cohosting include:

- American Society of Safety Professionals (ASSP) Heart of America Chapter
- National Bio and Agro-Defense Facility (NBAF)
- Federal Bureau of Investigation (FBI)
- Drug Enforcement Agency (DEA)
- 3M
- Fisher Scientific vendors
- Matheson
- Labconco Corporation, and
- Cobb Refrigeration

Kansas State University Colleges and Departments that have partnered and contributed to the biannual safety education and training events include:

- K-State Research and Extension
- Department of Psychological Sciences
- Department of Communications and Agricultural Education
- Office of Research Integrity Compliance and Security

- Veterinary Diagnostic Laboratory
- College of Veterinary Medicine Libraries
- Department of Diagnostic Medicine and Pathobiology
- K-State Libraries
- K-State Career Center
- K-State Olathe
- Biosecurity Research Institute
- College of Business
- Comparative Medicine Group
- Department of Grain Science and Industry
- Department of Electrical and Computer Engineering
- College of Engineering
- Department of Biological and Agricultural Engineering

Event attendees represent a global audience of learners and professionals across organizations and industries including:

- Kansas State University (KSU)
- City of Manhattan, KS
- United States Department of Agriculture (USDA) Plains Area
- National Bio and Agro-Defense Facility (NBAF)
- Kansas Department of Agriculture (KDA)
- Radiation Detection Technologies
- University of Missouri Kansas City
- Washington College
- Bowling Green State University
- Wright State University
- Smith College
- University of Michigan
- Grand Valley State University
- University of Texas Medical Branch

- CONMED Corporation
- Northshore Health
- Northwell Health

Achieving cross-sector collaboration in public health interventions contributes to the success and sustainability of the intervention and fosters a culture of interdisciplinary learning. By integrating diverse perspectives, these initiatives strengthened public health education and prepared professionals to address complex health and safety challenges in research and laboratory environments on a wider scale.

Table 5.1 Summary of MPH Foundational Competencies

Number and Competency		**Description**
2	Select qualitative and quantitative data collection methods appropriate for a given public health context	Laboratory Incident Analysis: Quantitative Post-event Surveys: Quantitative and Qualitative Questions (Mixed-Methods)
9	Design a population-based policy, program, project, or intervention	Design and implement biannual, hybrid conference-style safety education and training events for a global and local audience
10	Explain basic principles and tools of budget and resource management	Complete a grant proposal for long-term development and implementation of safety education credentials, including budget and resource requirements for sustainability
19	Communicate audience-appropriate public health content, both in writing and through oral presentation	Developed and instructed a two hour training course for Research and Laboratory Safety topics at the Research Safety Bootcamp in February 2025.
21	Integrate perspectives from other sectors and/or professions to promote and advance population health	Collaborate with stakeholders at Kansas State University and nationally across organizations and specialties to effectively design, plan, implement and sustain safety education and training events and credentialing programs at K-State

Table 5.2 Applied Practice Experience Product and Foundational Competencies Addressed

Portfolio Product		Number and Competency Addressed	
1	Biannual event metrics: attendance, training, partnerships, post-event surveys	2	Select quantitative and qualitative data collection methods appropriate for a given public health context
		9	Design a population-based policy, program, project, or intervention
		11	Select methods to evaluate public health programs
		13	Propose strategies to identify stakeholders and build coalitions and partnerships for influencing public health outcomes
		16	Apply leadership and/or management principles to address a relevant issue
		21	Integrate perspectives from other sectors and/or professions to promote and advance population health
2	Development and administration of mixed-methods post-event survey for safety education and training	2	Select quantitative and qualitative data collection methods appropriate for a given public health context
3	Academic Innovation Fund Proposals: initial and full proposal	10	Explain basic principles and tools of budget and resource management
		13	Propose strategies to identify stakeholders and build coalitions and partnerships for influencing public health outcomes
		18	Select communication strategies for different audiences and sectors
		21	Integrate perspectives from other sectors and/or professions to promote and advance population health
4	Design and instruction of the Research Safety 101 Course: Research Safety Bootcamp February 2025	19	Communicate audience-appropriate (i.e., non-academic, non-peer audience) public health content, both in writing and through oral presentation
5	Campus Lab-Related Incident and Near-Miss Analysis Summary (2023 and 2024)	1	Apply epidemiological methods to the breadth of setting and situations in public health practice
		3	Analyze quantitative and qualitative data using biostatistics, informatics,

			computer-based programming and software, as appropriate
		4	Interpret results of data analysis for public health research, policy, or practice

Table 5.3 MPH Foundational Competencies Course Mapping

22 Public Health Foundational Competencies Course Mapping	MPH 701	MPH 720	MPH 754	**MPH 802**	**MPH 818**
Evidence-based Approaches to Public Health					
1. Apply epidemiological methods to settings and situations in public health practice	X		X		
2. Select quantitative and qualitative data collection methods appropriate for a given public health context	X	X	X		
3. Analyze quantitative and qualitative data using biostatistics, informatics, computer-based programming and software, as appropriate	X	X	X		
4. Interpret results of data analysis for public health research, policy or practice	X		X		

Public Health and Health Care Systems					
5. Compare the organization, structure and function of health care, public health and regulatory systems across national and international settings		x			
6. Discuss the means by which structural bias, social inequities and racism undermine health and create challenges to achieving health equity at organizational, community and systemic levels					x
Planning and Management to Promote Health					
7. Assess population needs, assets and capacities that affect communities' health		x		x	
8. Apply awareness of cultural values and practices to the design, implementation, or critique of public health policies or programs					x
9. Design a population-based policy, program, project or intervention			x		
10. Explain basic principles and tools of budget and resource management		x	x		
11. Select methods to evaluate public health programs	x	x	x		
Policy in Public Health					

12. Discuss multiple dimensions of the policy-making process, including the roles of ethics and evidence		x	x	x	
13. Propose strategies to identify stakeholders and build coalitions and partnerships for influencing public health outcomes		x		x	x
14. Advocate for political, social or economic policies and programs that will improve health in diverse populations		x			x
15. Evaluate policies for their impact on public health and health equity		x		x	
Leadership					
16. Apply leadership and/or management principles to address a relevant issue		x			x
17. Apply negotiation and mediation skills to address organizational or community challenges		x			
Communication					
18. Select communication strategies for different audiences and sectors	DMP 815, FNDH 880 or KIN 796				
19. Communicate audience-appropriate (i.e., non-academic, non-peer audience) public health content, both in writing and through oral presentation	DMP 815, FNDH 880 or KIN 796				
20. Describe the importance of cultural competence in communicating public health content		x			x
Interprofessional Practice					
21. Integrate perspectives from other sectors and/or professions to promote and advance population health		x			x
Systems Thinking					
22. Apply a systems thinking tool to visually represent a public health issue in a format other than a standard narrative			x	x	

Conclusion

MPH program foundational competencies were attained through targeted coursework and applied experiences. Competency 2, selecting qualitative and quantitative data collection methods, was achieved through the analysis of reported laboratory incidents and the development of a mixed-methods post-event survey for biannual event continuous improvement. Competency 9, designing population-based programs and interventions, was achieved through the creation, implementation, and refinement of biannual safety education and training events aimed at addressing training gaps in laboratory and research environments. Competency 10, explaining budget and resource

management principles, was applied through detailed financial projections for event sustainability and proposals for long-term safety education initiatives through the Academic Innovation Fund. Competency 19, communicating audience-appropriate public health content, was achieved through written reports, presentations, and stakeholder communications, ensuring that outcomes of safety initiatives reached diverse stakeholders. Lastly, Competency 21, integrating perspectives from other sectors to advance population health, was accomplished through extensive collaboration with industry, government, and academic institutions, reinforcing a multidisciplinary approach to public health education.

Student Attainment of MPH Emphasis Area Competencies

The Infectious Diseases and Zoonoses Emphasis Areas of the Master of Public Health Program (MPH) at Kansas State University has five unique competencies for students completing coursework in this emphasis area. MPH program requirements state that each emphasis area competency must be attained through required coursework and can also be integrated into the Applied Practice Experience. Applied Practice Experience and program coursework attainment of each of these competencies is described in more detail in this section.

Pathogens and Pathogenic Mechanisms

As part of the Applied Practice Experience, campus laboratory-related incidents, injuries, exposures, illnesses and near misses were analyzed for patterns and trends to evaluate current public health interventions and to design and implement new public health interventions (biannual training and education). Many academic laboratories are biological in nature, resulting in faculty, staff, and students who are exposed to pathogens in their work. Understanding pathogen types and pathogenic mechanisms is a foundational pillar of the field of biosafety, enabling biosafety professionals to establish safety programs and make recommendations to promote worker health and safety.

Biannual events collectively offered training sessions emphasizing safety with biological agents and life science laboratory work. Some topics included biosafety

levels, risk groups, transmission and routes of exposure, pathogen safety data sheets, decontamination, biosafety cabinets, laboratory-acquired infections, and disposal of infectious agents.

Coursework in AAI 852, Vaccinology, was completed as part of the MPH program. AAI 852 fulfills emphasis area competency 1, “Pathogens/pathogenic mechanisms”. As part of this course, I learned about considerations for vaccine design and administration for various human and animal diseases, and how pathogenic mechanisms that evade the immune system pose unique challenges in disease prevention.

Host Response to Pathogens/ Immunology

Prevention of infection directly relies on an understanding of routes of transmission and host response to exposure. Consideration of host response to pathogens is a key component of the risk assessment process that prescribes and initiates safety training. Some laboratory incidents and injuries evaluated had either known or probable exposure to human or zoonotic pathogens. Understanding the host immune response to pathogen types and pathogen families provides a baseline for characterizing and responding to pathogen exposures and developing interventions for mitigating risks of similar exposure scenarios.

During the Research Safety Bootcamp in February 2025, I co-taught a two-and-a-half-hour course on comprehensive research safety. As a registered biosafety professional, RBP (ABSA), I frequently teach about pathogen safety, risk assessment, risk mitigation, and microbiological practices. In the February 2025 course, I taught about reading pathogen safety data sheets (PSDS), biosafety levels and associated practices, agent risk groups, and laboratory-acquired infections (LAIs). The purpose of this course was to provide a baseline level of knowledge for hazard recognition and mitigation for various types of laboratory hazards, including biological hazards, to a national audience.

Coursework in DMP 817, Veterinary Immunology, was completed as part of the MPH program. DMP 817 instruction fulfills emphasis area competency 2, “Host Response to Pathogens/Immunology”. During DMP 817, I learned about key

components and functions of innate and adaptive immunity and clinical importance in veterinary medicine.

Environmental and Ecological Influences on Disease

Environmental and ecological influences on disease inform topics of disease prevention, surveillance, and containment. Emergence, transmission, and persistence of infectious diseases in the environment are a direct outcome of various environmental and ecological influences on disease that result in public health challenges, especially for emerging infectious diseases and zoonotic agents (spillover). Environmental and ecological influences on disease are primary or secondary focus areas of multiple research programs, including those focused on environmental protection, wildlife reservoirs, water conservation, sanitation, vector-host interactions, and antimicrobial resistance. Proper laboratory decontamination, use of engineering controls, and prudent waste management practices protect the environment from contamination from laboratory environments. Understanding environmental and ecological influences on disease allows me to have a one health approach to research safety and to view risks holistically for protection of human, animal, and environmental health.

Coursework in DMP 710, One Health, was completed as part of the MPH program. DMP 710 instruction fulfills emphasis area competencies 3, 4, and 5, “environmental/ ecological influences”, “disease surveillance”, and “disease vectors”. DMP 802, Environmental Health, was also completed as part of the MPH program. In DMP 802, I completed a group project evaluating endocrine disruptors and their impacts on human, animal, and environmental health.

Disease Surveillance

Working with biological agents in research and laboratory environments presents inherent risks that must be mitigated to an acceptable level for safe work. Disease risk factors vary greatly across research disciplines, individual research projects, and tasks associated with laboratory operations at Kansas State University. Each laboratory completes a Hazard Assessment outlining risks associated with current laboratory operations and controls implemented to mitigate risks. Additionally, some work with

human or zoonotic pathogens initiates occupational health program requirements to provide enhanced support and protection for worker health and safety. Advanced training on programmatic requirements and concepts in biosafety and biosecurity are supported by the biannual safety education and training events and the proposed safety educational credentials curriculum. Disease surveillance is critically important in research and laboratory safety to ensure that containment is achieved, agent work is supported by responsible microbiological practices, and risk communication and mitigation are appropriate for the level of risk encountered.

Incident reports at Kansas State University do not currently explicitly state whether laboratory-acquired infection occurred as a result of known or probable exposure. However, incident reports do track incidents that are exposures to infectious agents, providing us for a baseline to understand the most frequent routes of exposure on campus, activities with greater risks, and demographics that may benefit from target training to reduce risks of disease exposure in research and laboratory settings.

Coursework in DMP 710, One Health, was completed as part of the MPH program.

Disease Vectors

Disease vectors represent the ways in which disease spreads. Vectors, toxic plants, and toxins were not directly assessed through any single Applied Practice Experience project. Vectors were not a reported cause of laboratory-related incident in 2023 or 2024 at Kansas State University. Vectors are addressed as risks and potential causes of laboratory-acquired infections in safety awareness training.

Coursework in DMP 710, One Health, was completed as part of the MPH program.

Table 5.4 Summary of MPH Emphasis Area Competencies

MPH Emphasis Area:			
Number and Competency		**Description**	**Required Course***
1	Pathogens/pathogenic mechanisms	Evaluate modes of disease causation and infectious agents.	BIOL 530 OR DMP 814 OR **AAI 852**

2	Host response to pathogens/immunology	Investigate the host response to infection.	DMP 817
3	Environmental/ecological influences	Examine the influence of environmental and ecological forces on infectious diseases.	DMP 710
4	Disease surveillance	Analyze disease risk factors and select appropriate surveillance.	DMP 710
5	Disease vectors	Investigate the role of vectors, toxic plants, and other toxins in infectious disease.	DMP 710

Conclusion

Student attainment of Infectious Diseases and Zoonoses emphasis area competencies within the overall MPH program curriculum demonstrates program and learner commitment to comprehensive education in topics related to pathogens and pathogenic mechanisms, host response to pathogens, environmental and ecological influences on infectious diseases, disease surveillance, and diseases vectors. Targeted coursework in vaccinology, veterinary immunology, environmental health, and One Health supports foundational knowledge in each emphasis area competency. Applied Practice Experience learning objectives, activities, and resulting products provides hands-on, real-world application of the competencies in data analysis, data interpretation, public health intervention selection and implementation, written and oral communication, and collaborative teamwork across interdisciplinary teams. The combined approach of coursework and applied experiences provides learners knowledge and expertise toward meaningful contributions in the field of public health across industries.

Referenced course descriptions:

DMP 710 One Health:

“One Health encompasses the complex interrelationships among humans, animals, and the environment. This online course provides a broad introduction to One Health, incorporating original videos of leading experts, case studies, and scientific readings. It addresses zoonotic diseases and environmental issues that impact human, animal, and ecosystem health.”

DMP 817 Veterinary Immunology:

“Innate and adaptive defense mechanisms in domestic animals. Topics include Immune response to pathogens, mucosal immunity, vaccinology, immunobiology of tumors, neonatal immunity, immunopathology, tolerance and autoimmunity, immunodeficiency, and immunotherapy.”

AAI 852 Vaccinology:

“This multidisciplinary course is designed to provide the student with an understanding of vaccine development (including technology) from conceptualization through development, testing, and utilization. This course will specifically cover topics on the principles of pathogenesis of infectious diseases, immune protection, and eliciting protective immunity by vaccination; application of traditional and new technologies to vaccine development; principles of pre-clinical development, manufacturing, and clinical evaluation of a vaccine; importance of the regulatory process to vaccine development; and utilization of epidemiology to measure vaccine need and effectiveness.”

Retrieved from:

DMP Course Descriptions

https://www.vet.k-state.edu/academics/student-faculty-handbook/pdf/DMP-Course-Descriptions.pdf

Applied and Interdisciplinary Studies Courses

https://olathe.k-state.edu/academics/student-resources/courses/courses-offered/applied-interdisciplinary/

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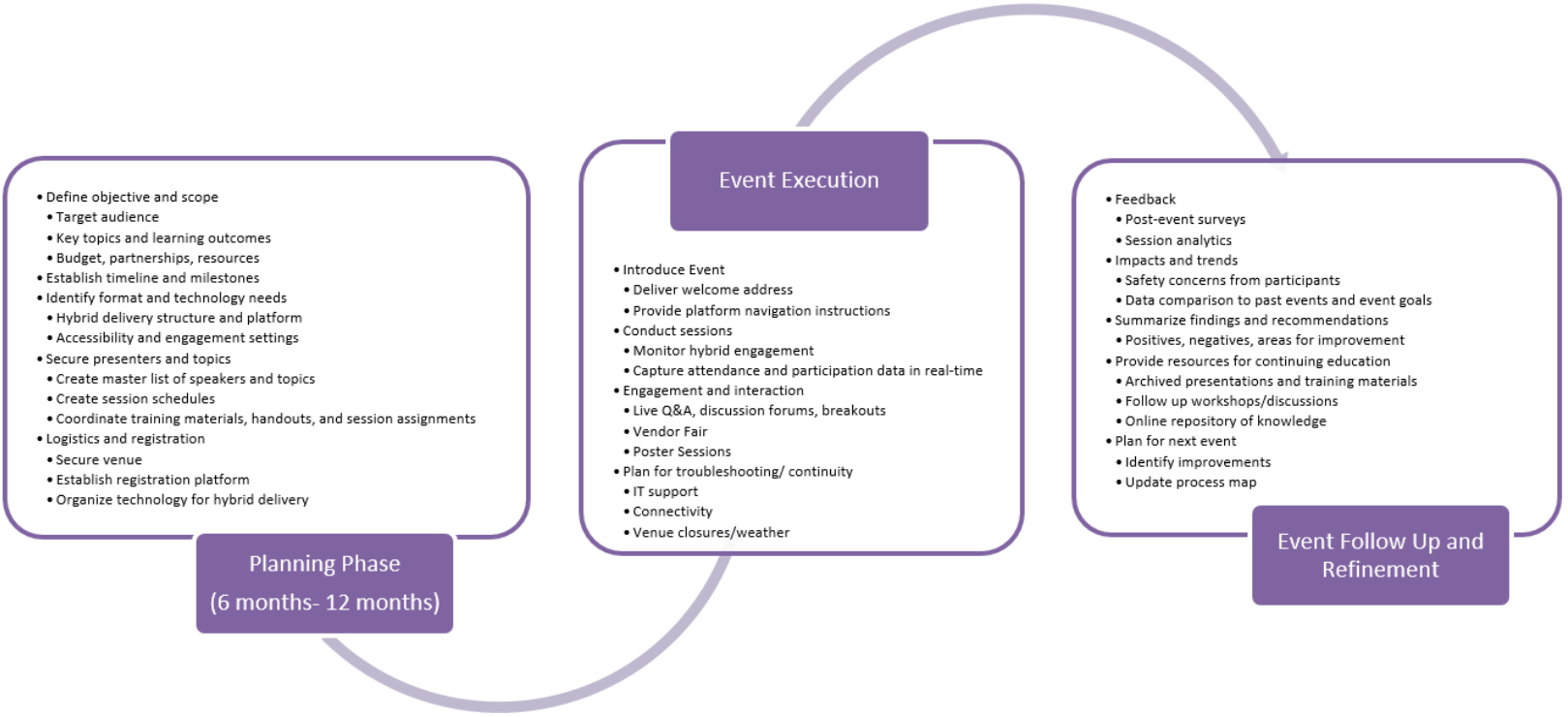
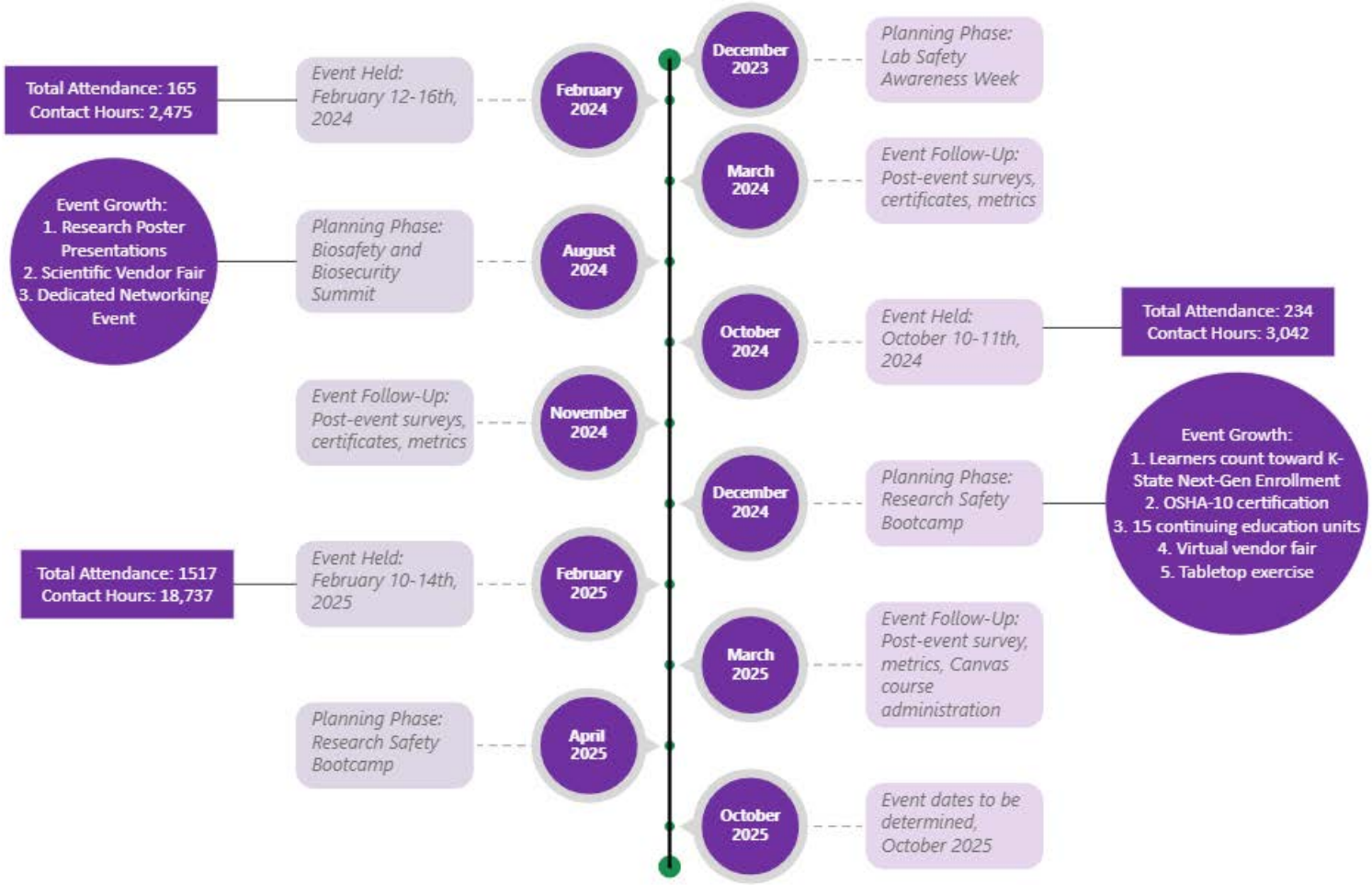
Appendix 1: Process Map for Biannual Safety Education and Training Events



Appendix 2: Innovation (Change Management) History for Key Biannual Safety Training and Education Events



Appendix 3: Analysis of Reported Lab-Related Incidents

Safety Culture Trends and Opportunities for Improvement:
A Two-Year Analysis of Reported Lab-Related Incidents

Rachael M. Weiderman, MS, MHA, RBP (ABSA), MLS(ASCP)
MPH Candidate
Kansas State University
2025

Executive Summary

The purpose of this report is to provide an analysis of reported laboratory-related incidents at Kansas State University for the calendar year 2023 and 2024. Incidents across the university enterprise are reported through a central Incident Reporting Form hosted on the Department of Environmental Health and Safety (EHS) website. Data accuracy and inferences made from data in this report are reliant on accurate and consistent reporting of incidents, injuries, illnesses, and exposures in laboratory and research settings in the university enterprise. Some data that may be used as an identifier, including college, department, job title/role, and specific lab location have been omitted from this report due to data sensitivity and concern for individual privacy.

Key Findings:

Incident Types and Affected Body Parts

1. Cuts, punctures, scrapes, needlestick injuries and chemical burn incidents were top reported incidents in both 2023 and 2024
2. Hand tools and utensils were a top cause of injury in 2023
3. Fingers, hands, and eyes were the most frequently injured body parts across incident causes and years
4. 90.9% of lab-related reported incidents in 2023 documented the use of PPE, while 61.5% of lab-related reported incidents in 2024 documented the use of PPE.
5. Gloves and lab coats were the most commonly used PPE, with gaps in eye protection.

Temporal Patterns

6. Most reported incidents occur during standard business hours (8 am – 5 pm) with peak occurrences between 10 am – 11 am and 1 pm – 4 pm. Few reported incidents occurred from midnight - 10 am and 4 pm – 7pm.
7. Seasonal peaks of incidents occurred in February, May, June, and August. These seasonal peaks may align with academic calendars.

High Risk Locations

8. Most incidents occurred on the Manhattan campus within STEM- (science, technology, engineering, and math) related laboratory and research activities and environments. **Departments have been omitted from this report due to sensitivity.**

Introduction

The purpose of this report is to identify trends in reported laboratory-related incidents in 2023 and 2024 to identify patterns, areas of concern, opportunities for risk reduction, and recommended focus areas for safety education and training programs on campus. Incidents are a lagging indicator of safety, revealing lapses in safety practices and culture. By examining reported incidents in laboratory environments on campus, including incident types, affected body parts, temporal patterns, incidents by individual role, and incidents by activity (research-related and animal-related), this analysis aims to inform targeted safety program and education initiatives at Kansas State University.

Methodology

Incident data was collected as an output from the Kansas State University (KSU) Environmental Health and Safety (EHS) Incident Reporting Form for 2023 and 2024. Comprehensive data was filtered to include laboratory-based incidents only. Data collected for each incident included incident type, time of occurrence, affected body part, role of individual, employment data (title, hire date, department/college), location data, incident root cause analysis, control mechanisms to reduce risk of reoccurrence, use of personal protective equipment, and research and animal-related indicators. **Some of this data has been omitted from this report due to sensitivity and personnel privacy, including specific incident locations, college/department of employment, and personal identifiers (employment data).**

Graphs were created and modified using Excel spreadsheet charts.

- Descriptive statistics were used to determine frequency of incidents, including frequency of incident types, affected body parts, and individual roles impacted.
- Comparative analysis was used to compare reported incidents in 2023 to reported incidents in 2024 across key categories.

Data Strengths:

- Historical comparison between 2023 and 2024 allowing for analysis of patterns and trends
- Time-based analysis possible due to incident report time stamps

- Comprehensive incident categories allow for reporting and analyzing of multiple variables (incident type, body part, PPE, location, department, time of occurrence, role, etc.).

Data Limitations:

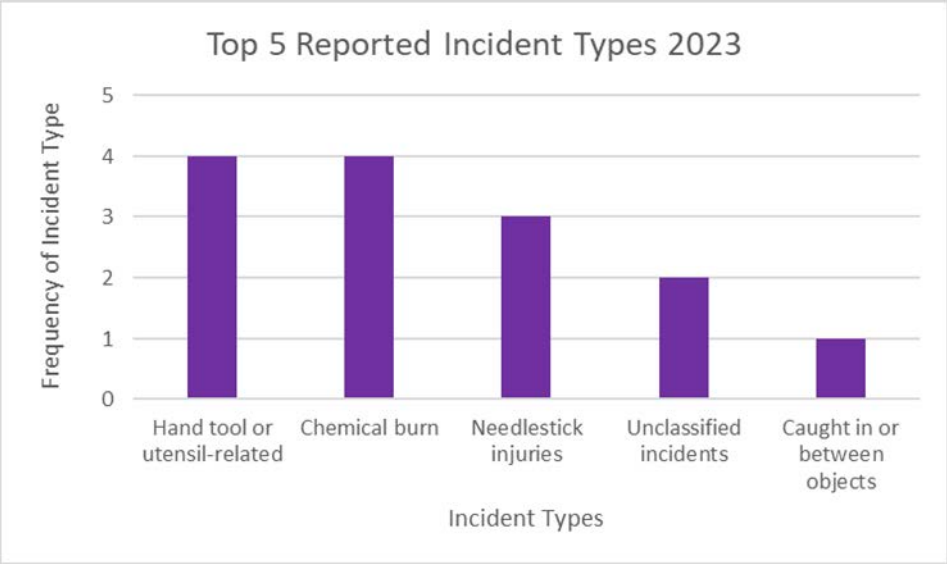
- Data completion and accuracy relies on reporting individual to complete all fields and provide full descriptions
    - Incidents may be underreported or inaccurate
- Limited context on incident causes where the incident occurrence is detailed but the incident cause is not detailed, not provided, or not known
- Incident severity is not included or measured
- Small sample size across the two years of reported incidents, especially for certain categories of incident types or body parts impacted
- External factors, such as staffing, workload, policies and procedures, training are not detailed for each reported incident, limiting the ability to identify patterns and trends
- Multiple independent incident reporting mechanisms exist across campus, with only the central incident reporting mechanism being analyzed

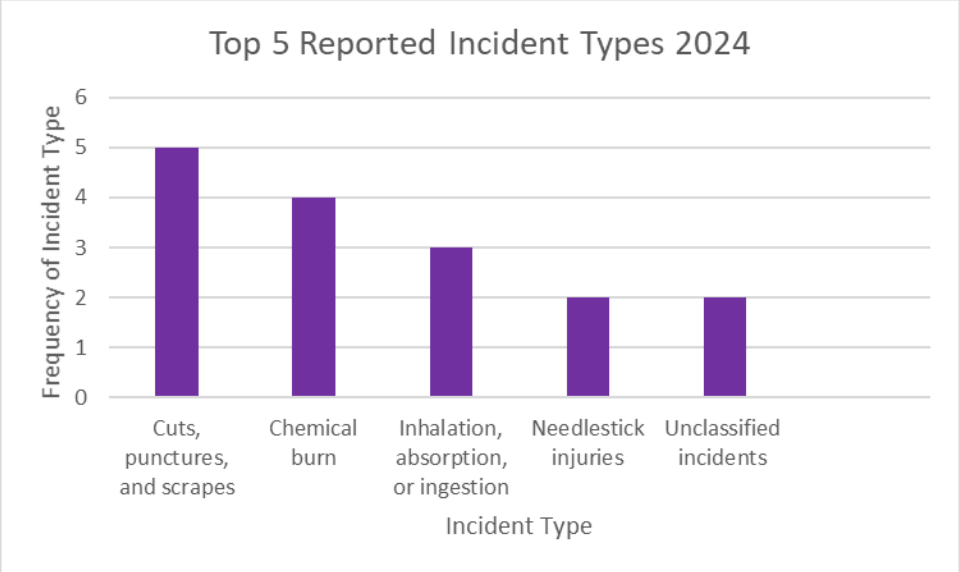
Explanation of limited time frame of lab-related incident data:

A limitation of this report is the two-year scope of analyzed incident data. While electronic incident reporting at the university began in July 2018, a transition to a new reporting system occurred in June 2022. Prior to that, a different system was in use from July 2018 through June 2022, with only limited ability to filter incidents by lab-specific designations. Lab-specific incident reporting fields were introduced for beta testing in June 2022 and fully implemented in January 2023, making 2023 the first complete year of structured, lab-specific incident data collection. Incident reporting prior to 2018 was managed exclusively through paper forms, further limiting the consistency and availability of older data for longitudinal analysis.

Safety Culture Trends Analysis

Top 5 Incident Types





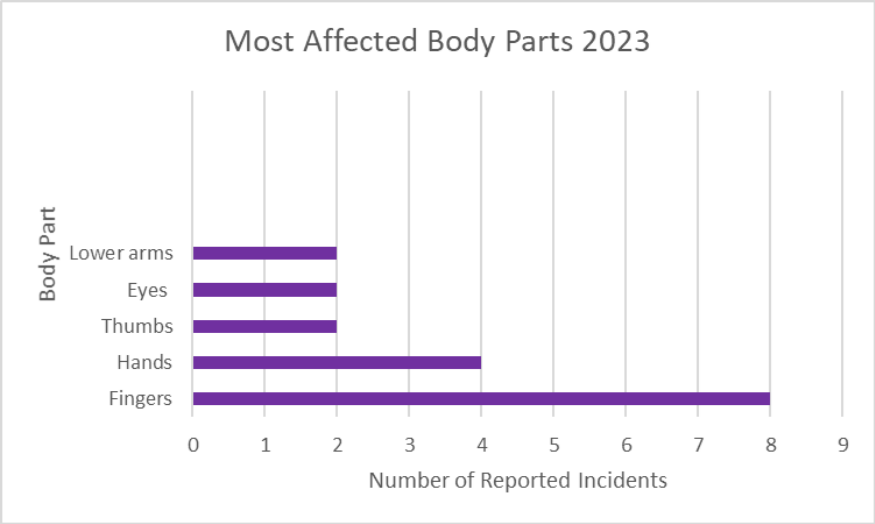
Analysis of top injury types across 2023 and 2024 reveals some trends:

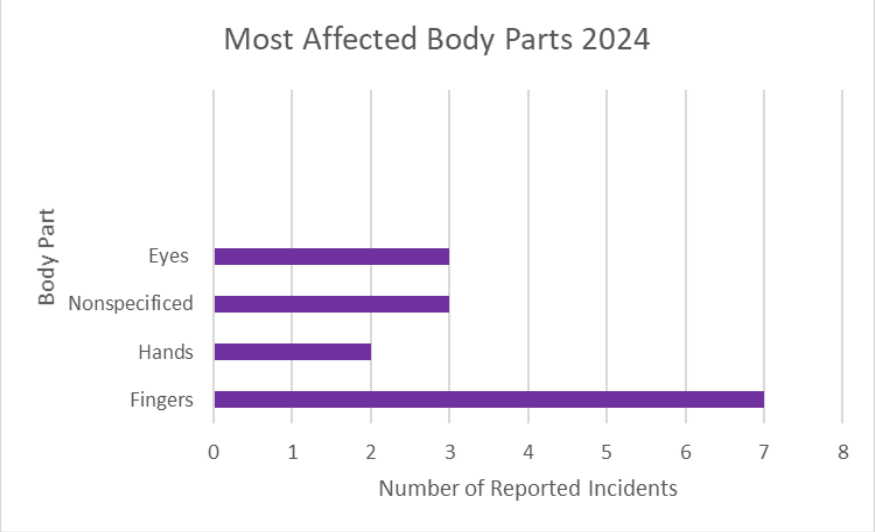
1. Cuts, punctures, chemical burns, and needlestick injuries were prominent injury types in both 2023 and 2024.
2. Caught-in or between-objects incident occurred in 2023 but not in 2024.
3. More physical injuries occurred in 2023, such as puncture wounds, cuts, and abrasions.
4. Animal-related exposures were noted in 2024.

To respond to these trends, training should focus on:

1. Consistent and appropriate use of PPE. PPE would prevent or mitigate the effects of most reported incidents in 2023 and 2024.
2. Review of pathogen safety data sheets and safety data sheets (chemicals) before working with any hazardous substance to establish control mechanisms, safe work practices, and PPE requirements prior to work.
3. Emphasis on safe handling of sharps, including needles, through training, procedures, and supplies (i.e. use of safer sharps, retractable needles, and needleless systems). Sharps disposal containers should always be located in the immediate workstation and disposed of through EHS when ¾ full.
4. Lab animal handling training, including species-specific training, animal behavior training, and safe handling resources.
5. Hierarchy of controls awareness and application training, including what control methods are available in campus laboratories and how they can be used to prevent injury, illness, and exposure for a variety of hazards and risks.

Most Affected Body Parts

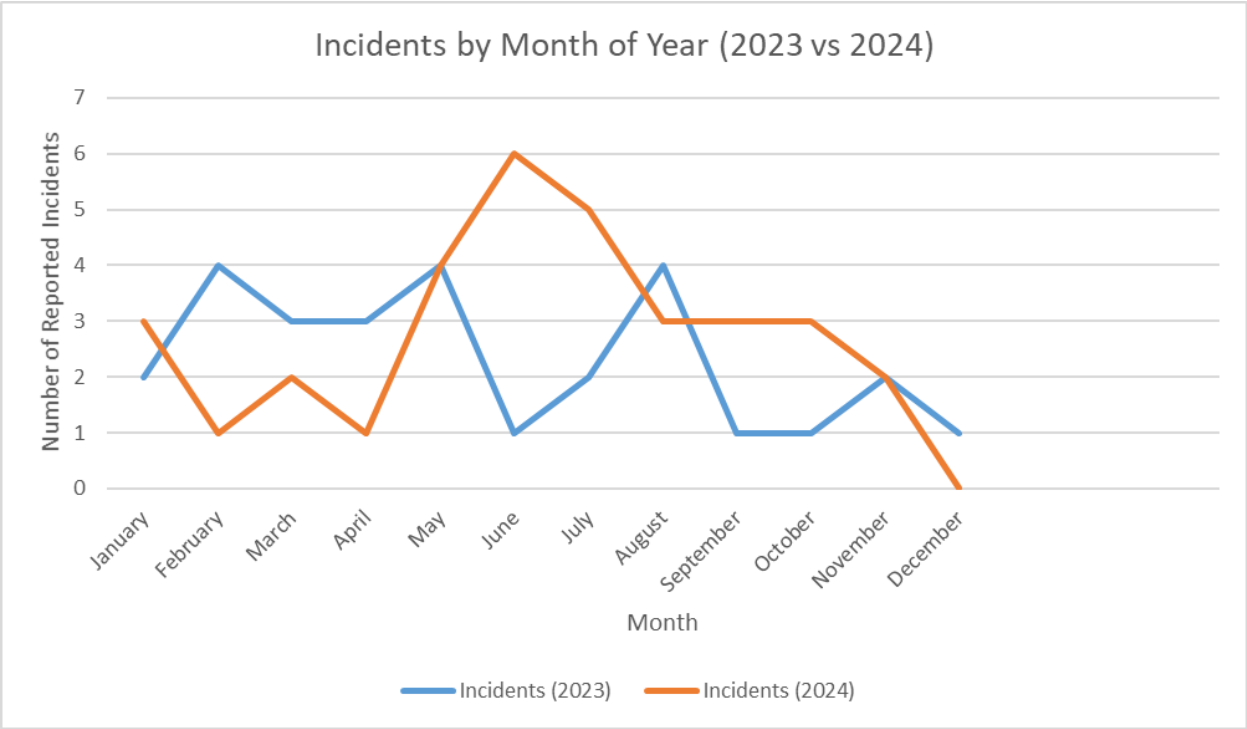




Fingers are the most affected body part in reported incidents for both 2023 and 2024. Reported finger injuries indicated the use of hand tools, sharp objects, and chemicals. Reported hand injuries are a significant concern with consistent reporting of injuries in 2023 and 2024. Hand injuries indicate a gap in consistent use of appropriate PPE and necessitate review and revision of procedures for working with equipment, handling hazardous materials, and animal work. Reported eye injuries doubled from 2023 to 2024, and reported use of PPE also decreased, indicating a potential gap in available and consistently used eye protection across campus. Back, neck, and shoulder injuries were reported each year, indicating the need for training on

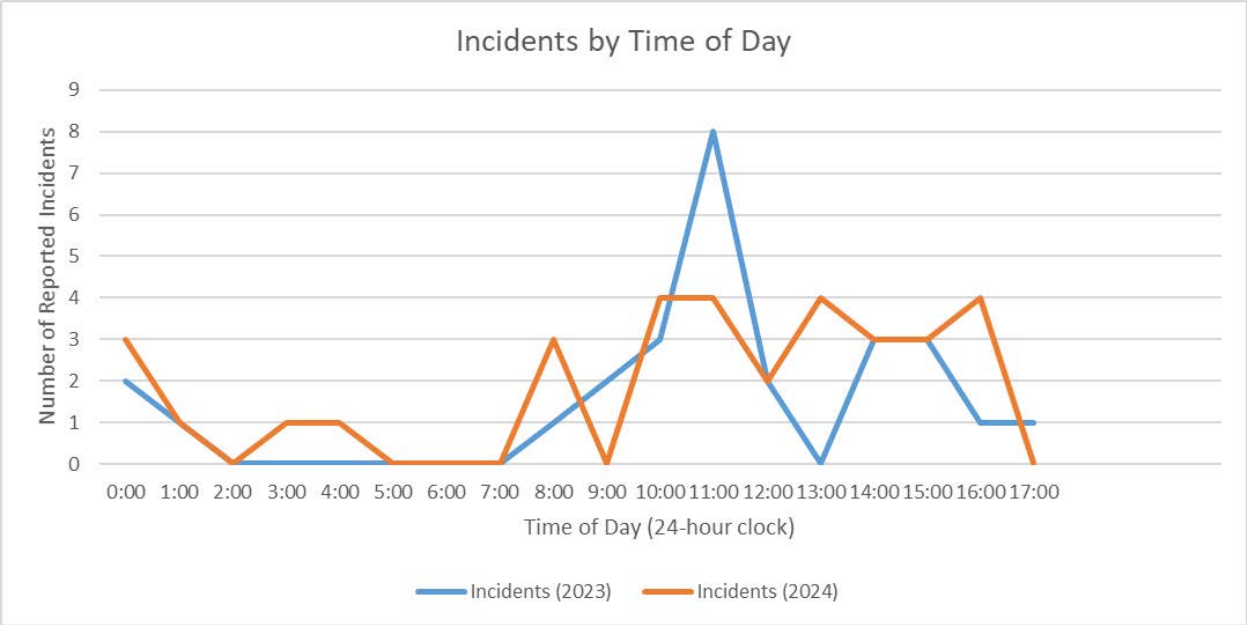
ergonomics and integration of ergonomic principles into laboratory procedures and design.

Incident Reports by Month



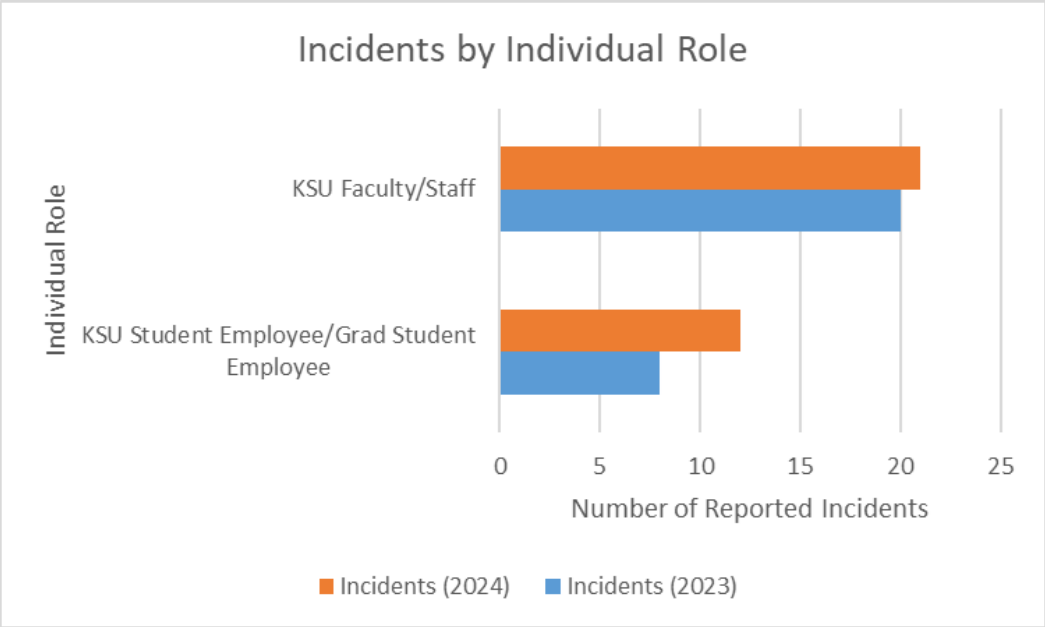
Reported incidents by time of year varied between 2023 and 2024. Reported incidents in the summer (June and July) were much higher in 2024 than in 2023, showing a six fold increase in June and a greater than double increase in July from the previous year. February and April had fewer reported incidents in 2024 than in 2023. Incidents were reported in May consistently between 2023 and 2024, revealing a stable level of risk. Overall, seasonal peaks of reported incidents occurred in February, May, June, and August. These seasonal peaks may align with academic calendars or increased research/lab activities.

Incident Reports by Time of Day



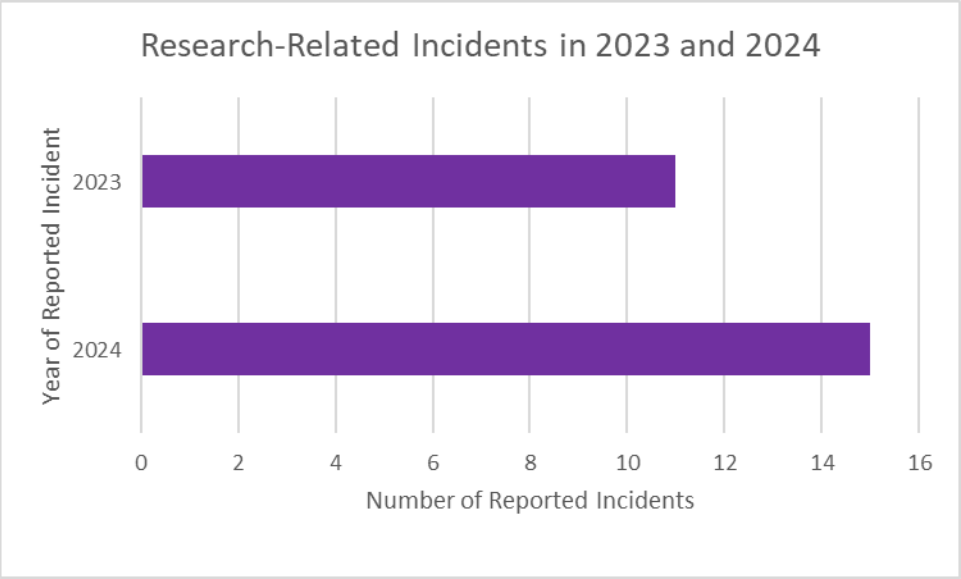
Most reported incidents across both years occurred between 10:00 and 16:00 (4:00 pm). This may align with times of increased/peak laboratory and research activities. Incidents between 13:00 and 16:00 increased in 2024, a time frame often aligned with returning to work from a break. Very few reported incidents occurred in late evening or early morning.

Incidents by Individual Role



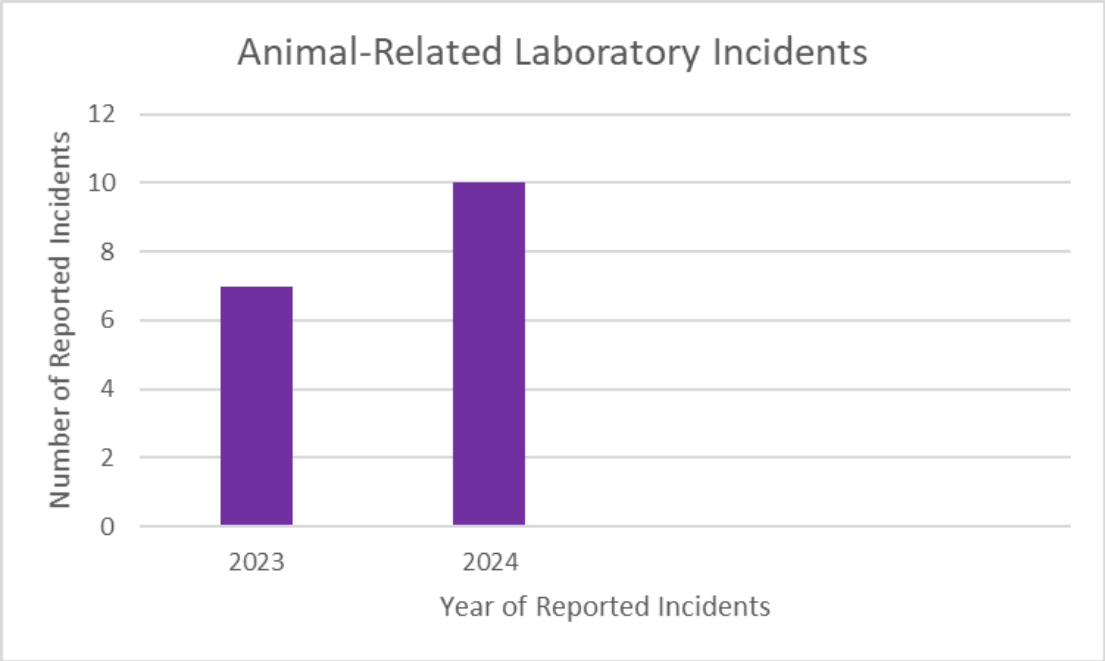
University faculty and staff have a higher number of reported lab-related incidents than students in both 2023 and 2024. Reported faculty and staff incidents increased from 20 in 2023 to 21 in 2024. Reported student incidents increased from 8 in 2023 to 12 in 2024, showing a greater increase than reported faculty and staff incidents. These results may indicate a need for additional safety training and supervision for students working in laboratory and research environments.

Research-Related Incidents



The reported number of research-related laboratory incidents increased from 2023 to 2024 from 11 research-related incidents to 15 research-related incidents. This may indicate either an increase in reporting of research-related incidents or a true increase in research-related incidents on campus. A true increase in research-related incidents may be due to factors including, but not limited to, change in research activities and hazards, increase in research activity, new research staff or students performing research, or gaps in training.

Animal-Related Incidents



Reported animal-related laboratory incidents increased by 43% from 2023 to 2024. This increase may be attributed to an increase in incident reporting or a true increase in animal-related incidents, indicating a need for enhanced safety protocols, increased personnel training, and animal-handling supervision/support.

Recommendations for Long-term Safety Education and Training Programs

Strengthen PPE Training and Compliance

Incident reports throughout 2023 and 2024 revealed inconsistent use of personal protective equipment (PPE) across campus locations, activities, and individuals. Future safety education and training should emphasize the importance of the consistent availability and use of PPE appropriate for each specific task and hazard in the environment. A targeted initiative for laboratory completion of the Kansas State University PPE Assessment worksheet should be implemented to ensure that all locations identify appropriate PPE and consistently provide, and use identified PPE. Research Safety Bootcamp courses can include PPE compliance and training, including hands-on demonstrations and samples for the campus community. Laboratory-specific training should emphasize the importance of consistent use of effective PPE for all laboratory and research activities.

Targeted Safety Topics

Campus safety education and training initiatives should target key trends and patterns in reported incidents, including hand and finger injuries, needlestick injuries, chemical burns, eye injuries, research-related injuries, animal-related injuries and inconsistent use of PPE. The temporal trends reveal the timing of training is important and should include training at the beginning of each academic semester, including spring, summer, and fall. Reported injuries most often occur after downtime or staff breaks, emphasizing the importance of training on individual fatigue. General campus safety training and education, including biannual events, provide training to a global, hybrid audience for accessibility. These events will be modified to include relevant topics identified in the reported incident analysis.

Targeted Audiences

Faculty, staff, and students all benefit from safety education and training. Targeted workshops or trainings in colleges and departments based on identified hazards, reported risks, and reported near misses and incidents is a proactive next step to respond to the findings in the incident analysis report. Hands-on, engaged safety training relevant to individual roles and responsibilities addresses trends in injury type, body part injured, and location.

Improve Data Reporting

Data analysis and safety program intervention are based on reported data. Incident and near miss reporting should be consistent, accurate, and complete. Training on the importance of and access to incident and near miss reporting is a critical step toward ensuring the campus community consistently and accurately reports all incidents and near misses. Improved data reporting provides a more complete picture of campus hazards, risks, and trends.

Conclusion

In conclusion, the analysis of reported laboratory-based incidents in 2023 and 2024 highlights important patterns and trends and indicates the need for enhanced safety procedures and practices and targeted training initiatives.

Key Findings include:

Incident Types and Affected Body Parts

1. Cuts, punctures, scrapes, needlestick injuries and chemical burn incidents were top reported incidents in both 2023 and 2024
2. Hand tools and utensils were a top cause of injury in 2023
3. Fingers, hands, and eyes were the most frequently injured body parts across incident causes and years
4. 90.9% of lab-related reported incidents in 2023 documented the use of PPE, while 61.5% of lab-related reported incidents in 2024 documented the use of PPE.
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Temporal Patterns

6. Most reported incidents occur during standard business hours (8 am – 5 pm) with peak occurrences between 10 am – 11 am and 1 pm – 4 pm. Few reported incidents occurred from midnight - 10 am and 4 pm – 7pm.
7. Seasonal peaks of incidents occurred in February, May, June, and August. These seasonal peaks may align with academic calendars.

High Risk Locations

8. Most incidents occurred on the Manhattan campus within STEM- (science, technology, engineering, and math) related laboratory and research activities and environments. **Departments have been omitted from this report due to sensitivity.**
9.

By responding to these findings with initiatives toward increased PPE compliance, targeted training opportunities, and integration of critical topics into established campus safety training and education (Bootcamp), Kansas State University can take a proactive approach toward reducing risks in laboratory and research activities and promote a proactive, accountable safety culture.

Appendix 4: Biannual Event Metrics

Public Health Education for Research and Laboratories:

Summary of Three Biannual Safety and Education Training Events

Rachael M. Weiderman, MS, MHA, RBP (ABSA), MLS(ASCP)

MPH Candidate

Kansas State University

2025

Introduction

Kansas State University implemented biannual research and laboratory safety training and education hybrid, conference-style events in 2024 to enhance awareness and knowledge about risks and safe practices in research and laboratory environments. The first event, Lab Safety Awareness Week in February 2024 was inspired by the Campus Safety Health and Environmental Management Association (CSHEMA) annual Lab Safety Awareness Week campaign (CSHEMA, 2025). This campaign aims to "recognize the successes of laboratory health and safety programs and offer information and ideas on how to keep our faculty, staff, and students safe," (CSHEMA, 2025). Our participation in this campaign was the first of its kind at Kansas State University and empowered us to establish biannual safety education and training events at the university focused on topics directly related to teaching and research activities across colleges, departments, and organizations. Lab Safety Awareness Week in February 2024 focused on providing training and education in widely applicable laboratory and research safety topics including chemical safety, compressed gas safety, root cause analysis, animal safety, fume hoods, biosafety cabinets, cybersecurity, personal protective equipment (PPE), and safety culture.

The second event, the Biosafety and Biosecurity Summit in October 2024 was held in October aligned with the American Biological Safety Association (ABSA) Biosafety and Biosecurity Month. Biosafety professionals celebrate Biosafety and Biosecurity month in October to share "training, ideas, stewardship and engagement, how to foster positive relationships within the research community, and supporting responsible and ethical research throughout our [Biosafety] profession," (ABSA, 2025). Research at Kansas State University is increasingly interdisciplinary in nature, including elements of biological and life science disciplines. The Biosafety and Biosecurity Summit provided education, training, and celebration of life sciences in research, including sessions in transcriptomics and biomarker discovery, biomanufacturing, laminar flow enclosures, autoclave safety, AI-driven data integrity, cybersecurity for bioinformatics, psychological safety and safety climate, institutional biosafety committee

guidelines, field safety, clinical lab safety, and national security perspectives on biosecurity.

Lastly, the third event, the Research Safety Bootcamp in February 2025 is the culminating event of previous efforts and will be the long-term biannual event at Kansas State University. This event will be held biannually at Kansas State University to feature a variety of topics in response to campus and community needs. The first Research Safety Bootcamp offered live presentations, dedicated networking events, a scientific vendor fair, a virtual vendor fair, a comprehensive fume hood course, OSHA-10 certification, 15 continuing education (CE) units, a university credit hour, and a tabletop exercise.

Objectives

Biannual research and laboratory safety educational programs aim to address gaps in current safety training and education opportunities for faculty, staff, and students at Kansas State University and other academic institutions, government organizations, and private employers.

Biannual research and laboratory safety events enhance learning methods at the university by:

- Engaging the University community in teaching research and safety topics aligned with subject-matter expertise
- Inviting subject-matter experts across organizations and specialties to present knowledge at Kansas State University
- Including hands-on experiences and applications of topics presented
- Connecting researchers and laboratorians with vendors who provide laboratory and safety solutions and equipment
- Providing opportunities for discussions, discourse, and idea generation across attendee populations
- Encouraging interdisciplinary collaboration and partnerships

Objectives for participants include:

- Identifying potentially hazardous conditions and emerging concerns in laboratory and research environments, and using tools and reporting mechanisms to minimize risks

•Enhancing knowledge of comprehensive laboratory and research safety: chemicals, biologicals, equipment, facilities, animals, physical hazards, psychological safety, regulatory requirements

•Developing a culture of safety and responsibility, providing empowerment to prioritize and advocate for safe practices in all facilities at all levels

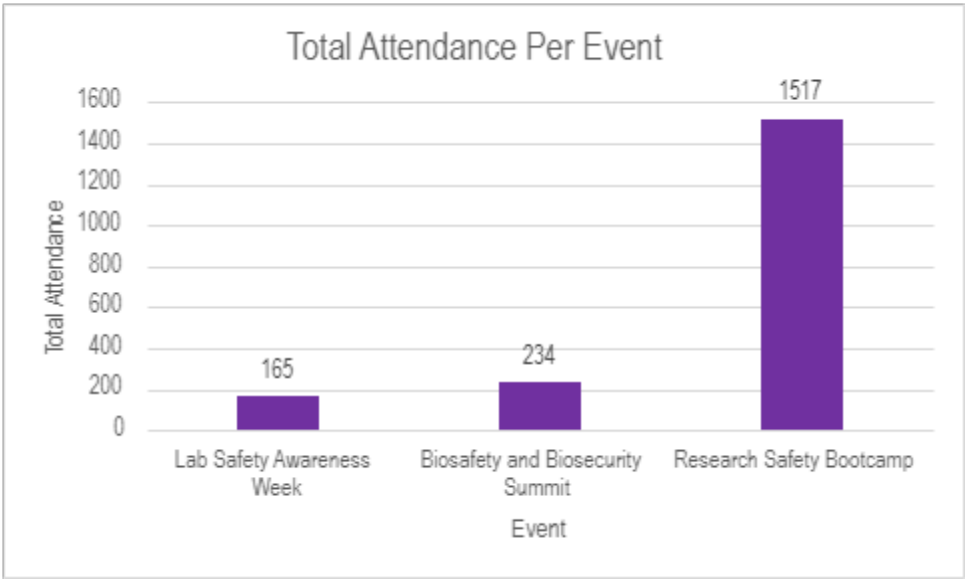
•Fostering continuous professional development by providing updated resources, certifications, and opportunities to stay ahead of emerging technologies and challenges

Methods

Kansas State University safety education and training events (Lab Safety Awareness Week, Biosafety and Biosecurity Summit, and Research Safety Bootcamp) are collaborative hybrid events designed to provide training and resources on physical (chemical, biological, equipment, PPE) and psychological safety, information security, and updates on regulations and emerging research technologies. Held twice annually on the K-State campus, these hybrid events feature presentations from government and state regulatory agencies, private industry experts, K-State collaborators, partner organizations, and campus faculty and staff. The events provide opportunities for networking, hands-on experiences, live presentations, poster presentations, tabletop exercises, and a scientific vendor fair. Most recently, the Research Safety Bootcamp in February 2025 offered 15 continuing education (CE) units, a university credit hour, an OSHA-10 certification course, and an official certificate of course completion from Kansas State University.

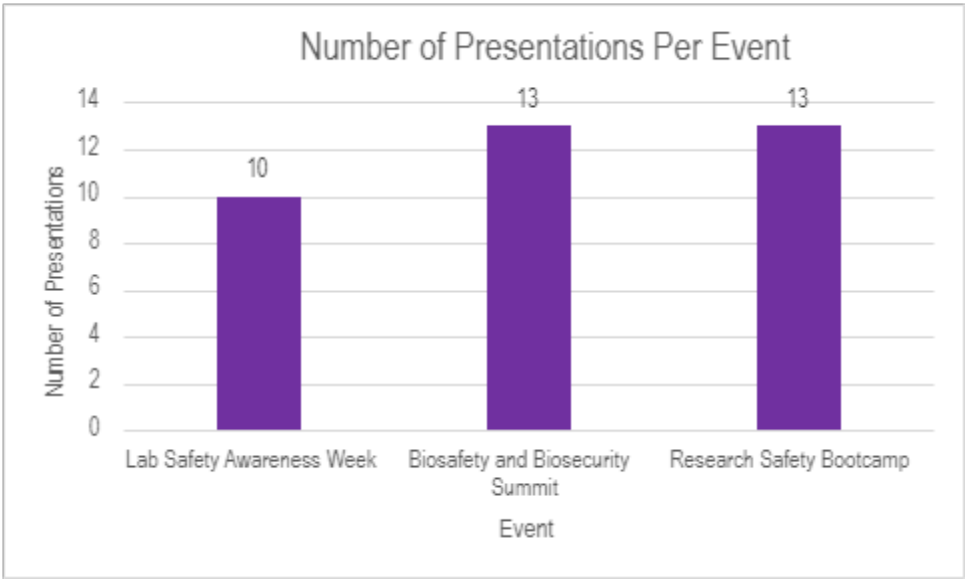
Metrics and Outcomes

Attendance

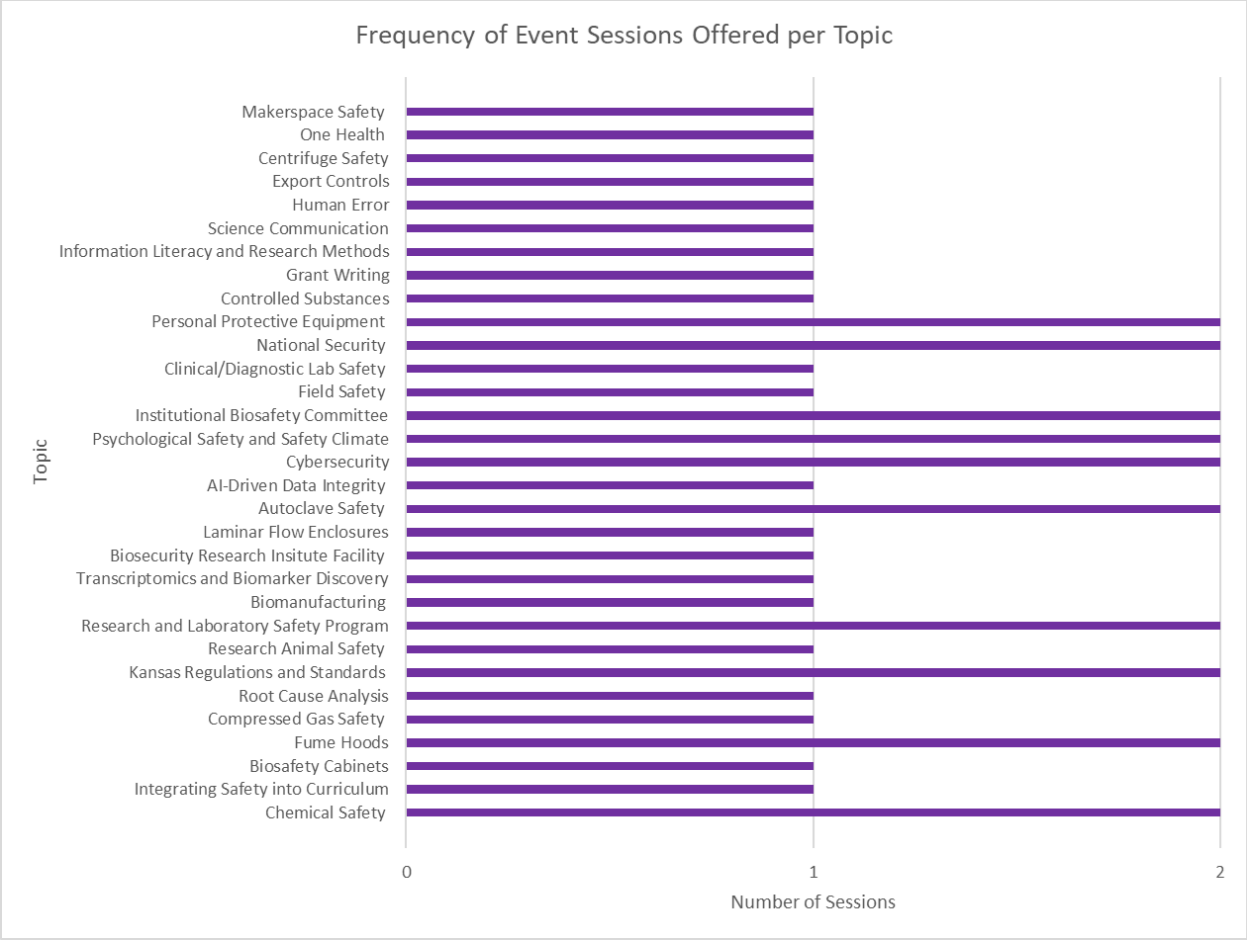


Event total attendance was measured from the total number of individuals in each presentation session either on Zoom or in person. For the Research Safety Bootcamp, total event attendance also included registered attendees completing the course by May 30, 2025, through Canvas, the university course administration software. Total event attendance has steadily increased due to targeted marketing, increased event awareness, and increased event participation with participants returning to future events and recruiting additional participants. Our goal for each session is 75 attendees to foster constructive dialogue, discourse, and valuable networking opportunities across professions and organizations.

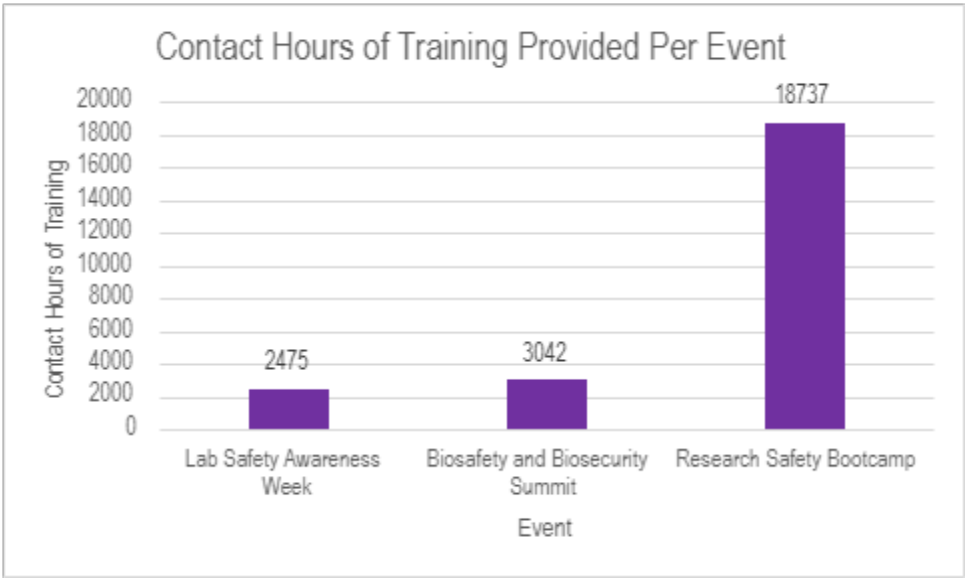
Knowledge Transfer



Live presentations are offered in hybrid modalities on campus and on Zoom. Presentations are scheduled “conference-style” with scheduled sessions and breaks, including breaks for vendor fair networking and lunch sessions. Our number of presentations per event increased from Lab Safety Awareness Week (10) to a steady number of 13 presentations per event for both the Biosafety and Biosecurity Summit and the Research Safety Bootcamp. We anticipate the number of presentations per event to continue to increase as our event grows and we can offer multiple presentation topics during each scheduled session, similar to break-out rooms. For future events, we anticipate 3-4 presentations scheduled per session slot to offer attendees multiple choices to enable them to pick those most applicable to their work and interests.

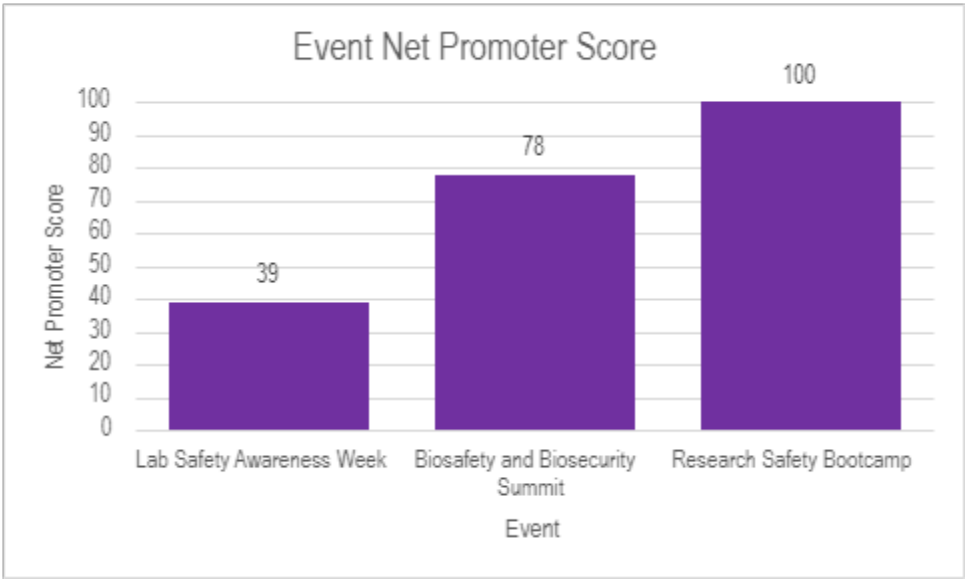


Offering timely, relevant topics is an important way the biannual safety education and training events increase participant knowledge. Over 30 topics have been offered across the three biannual events to date, with some repeated topics including personal protective equipment (PPE), national security, institutional biosafety committee compliance, psychological safety and safety culture, cybersecurity, autoclave safety, regulations and standards for laboratories, fume hoods, chemical safety, and the research and lab safety program at Kansas State University. Repeated topics are selected as topics of importance due to campus risks, hazards, incidents, near-misses, and attendee requests for further training. For future events, some topics will continue to be reinforced in new ways while implementing entirely new topics to reflect the continually changing laboratory and research landscape and the demand for up-to-date information.



Contact hours of training provided per event is a measure of the overall hours of training each event provided throughout all sessions to all session participants. One contact hour of training is equivalent to one hour of participation in an event session. While not a direct correlation of attendance or registration, contact hours of training reveals how many hours of training each event resulted in across a global audience of learners. This measure helps us to understand which sessions were most and least in demand and which populations of learners attended which session topics. Overall, our goal is for event participants to attend as many sessions as reasonably possible without putting a defined goal for number of contact hours per event. These contact hours do not capture viewing of publicly available archived event content on our website post event for the Lab Safety Awareness Week and the Biosafety and Biosecurity Summit.

Participant Feedback



The event net promoter score is a quantitative measure of event success in which participants rate the event on a scale of 1-10 (Likert scale) based on their overall satisfaction, interest in attending future events, and likelihood to recommend event to peers and colleagues. This data is current as of February 24, 2025, although new post-event survey questionnaires are collected on a rolling basis for all events.

Net promoter scores are metrics of customer experience measuring customer loyalty (Qualtrics, 2025). Net promoter score is measured on a scale of –100 to +100 where higher scores are favorable (Qualtrics, 2025). In general, promoters respond with a score of 9 or 10, passives respond with a score of 7 or 8, and detractors respond with a score of 0 to 6 on a scale of 1-10 with 0 meaning not at all likely to recommend and 10 meaning extremely likely to recommend (Qualtrics, 2025). Net promoter score is a calculation representing subtraction of the percentage of detractors from the percentage of promoters (Qualtrics, 2025). Overall, interpretation of net promoter scores is as follows:

1. Above 0 is good
2. Above 20 is favorable
3. Above 50 is excellent

4. Above 80 is world class (Qualtrics, 2025).

Using this evaluation criteria, response to Lab Safety Awareness Week February 2024 was favorable, response to the Biosafety and Biosecurity Summit October 2024 was excellent, and response to the Research Safety Bootcamp February 2025 was world class. Our goal for all research and lab safety training and education events is to provide world class opportunities and service to the campus and global community.

Qualitative participant feedback was also collected and includes suggestions on venues, presenters, presentation topics, and event logistics. Measures of both quantitative and qualitative feedback are continually reviewed to ensure emphasis on continuous improvement and assurance that programs meet learner needs.

Challenges and Lessons Learned

Participation

Local and global participation in live sessions is a continued challenge we have faced throughout each event. Faculty, staff, students, and industry professionals often have competing priorities and prior commitments that prevent active participation and real-time attendance for multi-day education and training events. Hybrid attendance offers the opportunity for global audience attendance and flexibility for local audience attendance. The ability to watch archived sessions post-event for a specified time frame allows for increased accessibility but may decrease incentive for real-time engagement. We are exploring incentives and nontraditional opportunities for real-time engagement and on campus attendance to maintain and enhance strong networking opportunities and live discussions, including:

1. Required live participation and engagement for course completion certificates, credit hours, and continuing education (CEs) units
2. Gamification and interactive live elements including games, polls, question and answer sessions, knowledge competitions, raffles, badges, and leaderboard rankings
3. Incorporation of live breakout sessions

4. Exclusive live-only content including special presentations, workshops, and guest speakers only accessible to live, real-time audiences
5. Partnering with academic departments, research labs, and professional organizations to integrate event attendance into existing training requirements, courses, seminars, or workplace safety programs

Measuring Knowledge Retention

A key challenge in hosting the biannual safety education and training events is measuring and ensuring long-term knowledge retention. To address this, the Research Safety Bootcamp in February 2025 introduced post-event quizzes for each session, requiring participants to achieve a satisfactory score for the issuance of a course completion certificate. This approach aimed to reinforce learning and assess participants' understanding of key safety concepts.

Since the inaugural event, Lab Safety Awareness Week in February 2024, there has been an increase in incident and near-miss reporting. However, it is difficult to establish a direct correlation between enterprise-wide incident reporting trends and increased awareness of risks, hazards, incident reporting protocols, and root cause analysis. Likewise, fluctuations in reported incidents—whether an increase or decrease—do not necessarily indicate the direct impact of education and training but rather reflect the overall state of the institution’s safety culture.

Additional strategies to measure knowledge retention in participants at the university may include:

1. Follow-up assessments at periodic intervals to assess how well participants retain and apply knowledge over time
2. Practical evaluations to observe implementation of safety practices in real world settings and environments
3. Including post-event survey questions aimed at understanding participant confidence in applying learned skills or best practices’
4. Including case study analysis in addition to multiple choice quizzes in post-event Canvas course activities and assessments

Adapting Content for Diverse Audiences

Biannual event audiences are diverse with varying levels of prior knowledge, varying laboratory and research expertise and experiences, and varying expectations of event outcomes and applicability.

Content adaption strategies may include:

1. Offering tiered learning tracks to accommodate participants with varying levels of prior knowledge and experience, including beginner, intermediate, and advanced sessions
2. Designing specialized breakout sessions for different attendee roles and attendance goals, including faculty, students, and industry professionals
3. Implementing case studies from various industries to increase content relevance to a broader audience
4. Encouraging participant-led discussions where attendees share experiences and challenges across
5. Adapt scenario-based learning to reflect diverse workplace environments

Conclusion & Recommendations

Hosting biannual safety education and training events at Kansas State University has provided many positive outcomes and potential future directions for education and training for a global audience. It is important to the Department of Environmental Health and Safety to continue to build upon current safety culture efforts and university-wide safety initiatives to provide safe and healthful learning, teaching, and working environments for the campus community.

Event Impacts

The first three biannual safety education and training events have significantly contributed to fostering a proactive safety culture at the university and engaged a global audience of over 1,900 participants across three events. With more than 35 presentations covering greater than 30 distinct topics, the events provided over 24,000 contact hours of training, contributing to comprehensive safety education for the campus and global community.

Attendee feedback, as reflected in Net Promoter Scores of 39, 78, and 100 indicate strong overall satisfaction and perceived value from attendees. These net promoter scores are interpreted as favorable, excellent, and world class (Qualtrics, 2025). The events have also strengthened institutional and industry collaboration through partnerships and collaboration with over 15 university colleges and departments and external organizations including the American Society of Safety Professionals (ASSP) Heart of America Chapter, United States Department of Agriculture (USDA) National Bio and Agro-Defense Facility (NBAF), Federal Bureau of Investigation (FBI), Drug Enforcement Agency (DEA), and Fisher Scientific, enhancing the scope and expertise of training sessions and event offerings. The combination of diverse learning formats, real-time engagement strategies, and accessible hybrid options has reinforced the long-term impact of these initiatives in promoting safety awareness and best practices.

Future Directions

Readily accessible and timely safety education and training are of critical importance for the campus community. Current campus initiatives, including biannual safety education and training events will continue to be offered and refined to meet the needs of learners in the campus community and the global community. Additionally, we are exploring new ways to provide important research and lab safety education and training with an emphasis on professional credentialing and upskilling.

Success and feedback from biannual safety education and training events has initiated discussion and proposal for safety education credentials at Kansas State University at a variety of levels and offered through multiple modalities. Safety professionals are in demand in all industries, and professionals in all roles and all industries directly benefit from safety education and training. Kansas State University is uniquely positioned to be the provider of choice for continuing education (CE), microcrendentials, and undergraduate and graduate courses in safety for the local and global market.

An initial and full proposal was submitted to the Kansas State University Academic Innovation Fund proposing a curriculum containing microcredentials, continuing education (CE) opportunities, and undergraduate and graduate courses

culminating into an undergraduate or graduate certificate in Research and Laboratory Safety. At the time of this report, the Academic Innovation Fund Proposal decision is pending.

References

American Biological Safety Association (ABSA). (2025). Biosafety and biosecurity month. ABSA International. https://absa.org/biosafety-biosecurity-month/

Campus Safety, Health, and Environmental Management Association (CSHEMA). (2025). Lab safety week. CSHEMA. https://www.cshema.org/index.php/events-training/lab-safety-week

Qualtrics. (2025). *What is Net Promoter Score (NPS)?* Qualtrics. https://www.qualtrics.com/experience-management/customer/net-promoter-score/

Appendix 5: Mixed-Methods Post-Event Survey Questionnaire Sample Questions

Quantitative Questions, with numerical or predefined categorical responses:

Q3. How did you hear about the Research Safety Bootcamp? (Multiple-choice)

Q4. Which best describes your role? (Multiple-choice, select all that apply)

Q5. How did you attend the Bootcamp? (Multiple-choice)

Q11. How did you find the length of the event? (Multiple-choice)

Q12. How would you rate the organization, logistics, and marketing of the event? (Scale: 0–10)

Q13. How likely are you to connect with other attendees, presenters, and summit partners after the event? (Scale: 0–10)

Q14. How likely are you to recommend this event to a friend or colleague? (Scale: 0–10)

Q15. Would you be interested in attending future lab/research safety events at K-State? (Yes/No)

Q16. Which credit are you interested in earning for attending the Bootcamp? (Multiple-choice)

Q17. Would you be interested in taking a similar Lab Safety Course or Biosafety Course for continuing education credits? (Yes/No)

Q18. What kind of course credits would you be interested in? (Multiple-choice)

Qualitative Questions, with open-ended responses:

Q6. What presentation topics did you find most applicable to your work?

Q7. What presentation topics did you find least applicable to your work?

Q8. What presentation topics would you like to see covered at future events?

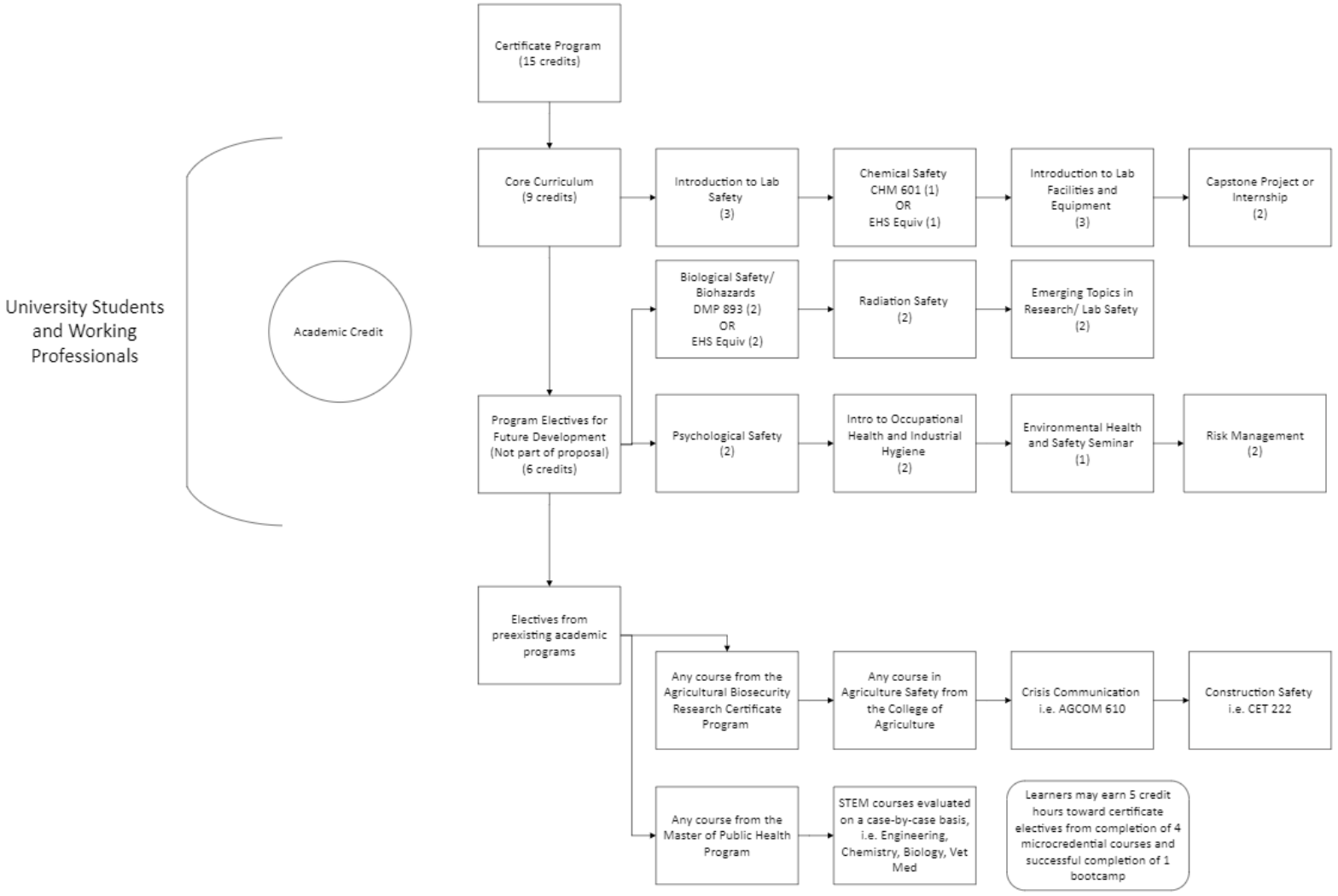
Q9. Do you have any recommendations for individuals to present?

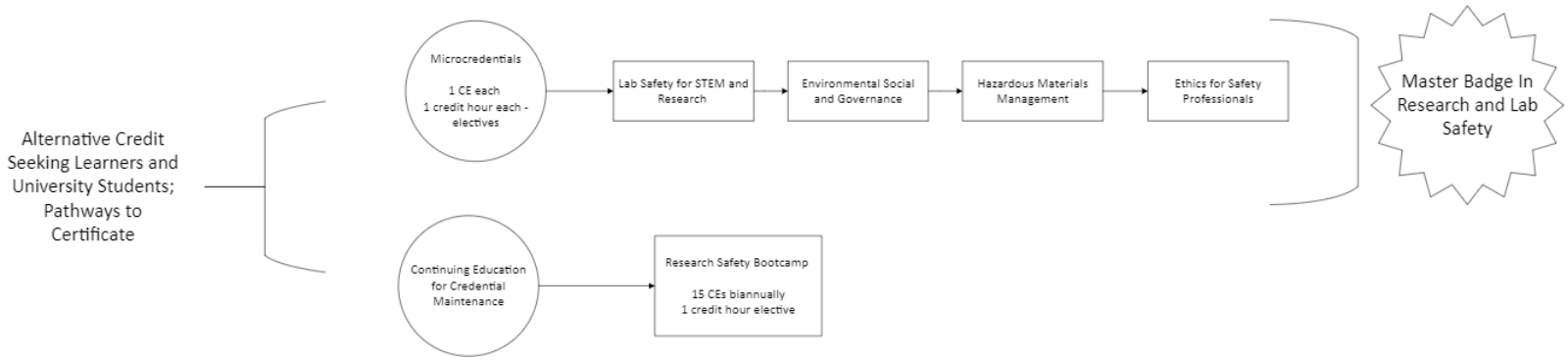
Q10. Please let us know if you have any unanswered questions or comments for the presenters.

Q19. Suggestions for future Lab Safety, Research Safety, and Biosafety Events?

Q20. If you are comfortable, please leave us a brief review of the Research Safety Bootcamp.

Appendix 6: Proposed Curricular Outline for Safety Education Credentials




Alternative Credit Seeking Learners and University Students; Pathways to Certificate
Microcredentials
1 CE each
1 credit hour each - electives
Lab Safety for STEM and Research
Environmental Social and Governance
Hazardous Materials Management
Ethics for Safety Professionals
Master Badge In Research and Lab Safety
Continuing Education for Credential Maintenance
Research Safety Bootcamp
15 CEs biannually
1 credit hour elective

Appendix 7: Academic Innovation Fund Initial Proposal Submission

Academic Innovation Fund Initial Executive Summary
Submission Deadline: October 4, 2024
For questions, email: academicinnovation@ksu.edu

Environmental Health and Safety partnering with Chemistry

Department(s) Requesting Funds

Ms. Rachael Weiderman	warhurst@ksu.edu	[redacted]
Primary Contact	**Primary Contact Email**	**Primary Contact Phone**

Dr. Christer Aakeroy	[redacted]
Primary Department Head	**Primary Department Head Email**

Dr. Joseph Whitlock, jwhitlo@ksu.edu
Additional Department Head(s)

Dr. Christopher Culbertson/Dr. Scott Tanona	[redacted]
Dean or Designee	**Dean or Designee Email**

Total Dollar Amount Requested $112,000

Safety Education Credentials
Title of Academic Program or Microcredential

New microcredentials, CEUs, and undergraduate/graduate credit offerings
What type of program is this? (e.g., new bachelor's degree, microcredential, etc.)

Is this proposal multidisciplinary? (●) Yes ( ) No

Intended Audience ***(select all that apply)***

☑ High School Students ☑ Traditional Learners ☑ Post-traditional Learners
☑ Alternative Credential-seeking Learners ☑ Other (describe) GTAs, Industry Professionals

Level: ☑ Undergraduate Credit ☑ Graduate Credit ☑ Noncredit

Modality: ☐ In Person ☑ Hybrid ☑ Online

Narrative

Please briefly describe your proposal. *Limit 100 words.*

K-State Environmental Health and Safety (EHS) collaborates with departments and external organizations to provide essential safety education to hundreds annually. In partnership with the Department of Chemistry, EHS aims to expand and modernize learning opportunities across all modalities utilizing existing university systems. This safety education will exceed industry standards, offering engaging content through continuing education units (CEUs), microcredentials, and undergraduate and graduate courses, ensuring learners can effectively articulate and apply comprehensive safety knowledge. Our programs will equip learners with 21st-century skills essential across safety disciplines. Academic innovation funding will establish K-State as the leading institution for safety education and credentials.

Please identify how your proposal meets regional, national or international learner or workplace needs of the future. *Limit 100 words.*

Safety education is essential across all industries, protecting life, health, property, and the environment. Offering both credit and non-credit opportunities will support a global audience of learners. Over the past decade, completions of safety-related degrees and certificates have risen by 61.1%. Unique job postings in this field increased by 66.3% in the last five years across a nine-state region, with total jobs projected to grow by 21.6% by 2032. Few universities offer microcredentials in safety, and currently, there are no programs focused on research safety. By developing these courses, we can effectively bridge the skills gap for modern learners.

Please identify how your proposal drives curricular innovation and academic excellence at K-State. What methods will you use to present up-to-date and rigorous disciplinary learning experiences? *Limit 100 words.*

Providing modern, innovative, and interdisciplinary learning opportunities in safety is essential to reflect real-world conditions. As regulations and technology evolve, EHS and Chemistry aim to meet the diverse needs of today's learners through hybrid and online programs that deliver high-quality, accessible information across various research disciplines. Our biannual in-person and online bootcamps will offer the latest regulatory updates, cutting-edge research technologies, and valuable networking opportunities, supported by online resources for continuous access. Online courses will include virtual laboratory audits, process safety exercises, and applications for PPE, while hybrid formats will focus on applied learning in industrial hygiene and hazard mitigation.

Please explain how your proposal aligns with the Next-Gen K-State Strategic Plan or realizes other key outcomes and/or differentiators. *Limit 100 words.*

Our proposal aligns with the Next-Gen K-State Strategic Plan's priorities:

1. Expanding credit-bearing and alternative education for learners in high-demand areas.
2. Proactively meeting the needs of K-State and the global market for safety education.
3. Reimagining safety education and training for K-State citizens and the world.
4. Developing a Next-Generation Land-Grant workforce in a high-demand field.
5. Integrating engaged scholarship through global partnerships.
6. Investing in future jobs and economies through skills-based education in growing sectors.
7. Pursuing operational excellence in safety education for the university and its partners.

We aim to enhance K-State's international recognition while providing high-quality opportunities for our local community.

Please explain how your proposal supports the long-term financial viability of the university. *Limit 100 words.*

K-State students are expected to graduate with a solid understanding of laboratory safety, equipping them for employment or graduate programs. Credit courses and embedded microcredentials ensure standardized verification of this knowledge across academic units.

Through our established partnerships, we will promote the proposed CEU and microcredential programs to over 40,000 certified professionals in national organizations, where certification and CEUs are vital for safety professionals. Participants will include state, federal, and private employees.

Our Laboratory Safety Bootcamp and Biosafety and Biosecurity Summit will expand to offer CEUs and virtual/hybrid options, aiming to increase attendance across industries and sectors.

After the initial AIF investment is spent, how will you sustain your program long term? *Limit 100 words.*

These programs will be self-sustaining and cost-effective, supported by dedicated EHS and Chemistry staff who are safety certified and passionate about education. The new microcredentials will be automated and available on-demand, requiring minimal management after initial development. The biannual conferences will generate funding through registration fees, sponsorships, and CEU purchases, while microcredential and credit courses will rely on registration and tuition fees. We will continue collaborating with federal, state, private, and academic institutions to market and deliver high-quality content across various modalities. These partnerships provide a customer base, benchmarking opportunities, and insights for future content development.

Please define how this submission is innovative. *Limit 100 words.*

K-State continually advances research and innovation through groundbreaking discoveries. EHS and Chemistry will complement this by delivering innovative research safety education to the K-State community and beyond, offering diverse learning opportunities that cater to learner needs through various credentialing and upskilling options. Safety is integral to the research and discovery process. We will revolutionize safety education by expanding into online and hybrid formats, including laboratory experiments, audits, and training on safety equipment. K-State will take the lead in providing this specialized, high-demand education on a large scale, ensuring comprehensive access for all learners.

Appendix 8: Academic Innovation Fund Full Proposal Submission

Academic Innovation Fund Full Proposal

January 31, 2025

Primary Contact:

Rachael M. Weiderman

Total dollar amount requested for this proposal:

113,589.58

Title of academic program or microcredential:

Safety Education Credentials (Research Safety Bootcamp, Microcredentials, Research and Lab Safety Certificate)

Is this proposal multidisciplinary (multiple units are submitting)?

- Yes

Intended audience of the project (select all that apply):

- High School Students
- Traditional Learners
- Post-traditional Learners (Typically older than traditional students, often employed, may have family responsibilities, possess varied educational backgrounds, and prefer flexible learning options to accommodate their schedules.)
- Alternative Credential-seeking Learners

Level:

- Undergraduate Credit
- Graduate Credit

- Noncredit

Modality:

- Hybrid
- Online

Describe the market need, evidence of demand (e.g., learner, employer or community interest) and competitor analysis:

The market need for credit-bearing, alternative education and training in research and laboratory safety is evident from strong learner interest, employer engagement, and a lack of directly comparable programs in the U.S. and abroad.

Post-event surveys from research and laboratory safety training pilot events in 2024 demonstrate a robust demand for continued education in this field. The events achieved a high Net Promoter Score (NPS) of 78, indicating that attendees are highly satisfied and likely to recommend the program to others. This score reflects the program's value, as NPS scores above 70 are considered "world-class." Additionally, our proposal aims to proactively respond to post-event survey findings, including:

- 54% of attendees expressed interest in continuing education unit (CEU) offerings.
- 21% sought undergraduate credit in research and laboratory safety.
- 25% desired graduate-level credit in these topics.

The 2024 biannual events that we piloted drew 399 attendees from seven states and provided 5,517 contact hours of education and training across two separate intensive five-day sessions. These metrics underscore both the reach and impact of the program, as well as the growing demand for structured, credit-eligible education in this field.

Employer interest in education and training at K-State further confirms the demand for safety training and education programs. Organizations including the Kansas Department of Labor, Kansas Department of Agriculture, and Manhattan Area Technical

College have expressed enthusiasm for these offerings. Current partner organizations include high-profile entities such as:

- American Society of Safety Professionals (ASSP) Heart of America Chapter
- National Bio and Agro Defense Facility (NBAF)
- Federal Bureau of Investigation (FBI)
- Drug Enforcement Agency (DEA)
- 3M
- Fisher Scientific
- Matheson
- Labconco Corporation, and
- Cobb Refrigeration

These partnerships represent a needed and future-forward approach to employer engagement, interdisciplinary interest, and broad applicability across industries, underscoring the transformative and far-reaching impact of expanded educational opportunities at K-State.

K-State's existing interdisciplinary expertise strengthens the proposed program, with contributions to 2024 safety events from over 15 colleges and departments, including:

- K-State Research and Extension
- Department of Psychological Sciences
- Department of Communications and Agricultural Education
- Office of Research Integrity Compliance and Security
- Veterinary Diagnostic Laboratory
- College of Veterinary Medicine Libraries
- Department of Diagnostic Medicine and Pathobiology
- K-State Libraries
- K-State Career Center
- K-State Olathe
- Biosecurity Research Institute

- College of Business
- Comparative Medicine Group
- Department of Grain Science and Industry
- Department of Electrical and Computer Engineering
- College of Engineering
- Department of Biological and Agricultural Engineering

This extensive collaboration enhances the quality, reach, and relevance of safety education while leveraging the university's diverse strengths.

Our proposal offers biannual bootcamp-style events that provide continuing education (CE) credits, one credit hour (available once during a student’s time at K-State), a certificate of training, and an industry-recognized certification like OSHA-10 or OSHA-30 General Industry. Additionally, we propose four microcredential courses: Lab Safety for STEM and Research, Hazardous Materials Management, Ethics for Safety Professionals, and Environmental Social Governance. Each microcredential course will award one CE credit and one elective credit hour toward our Research and Laboratory Safety certificate program. Completing all four courses will earn students a Master Badge, which can be combined with a certificate or other K-State programs.

Our certificate program integrates electives from various K-State programs, making it accessible to students from diverse academic backgrounds. The program requires 9 hours of core coursework and 6 elective credits and is offered at both undergraduate and graduate levels to support career readiness and workforce development. The Bootcamps and Microcredentials also provide a practical pathway for working professionals to earn CE credits and gain a college certificate in research and laboratory safety, expanding our target audience and reaching a new cohort of students.

A review of competitors reveals limited programs focused on research and laboratory safety, with no direct competitors offering similar interdisciplinary microcredentials and certificate programs in the U.S. Current programs in the U.S. address safety in niche areas such as drilling, construction, and supply chain management, while international programs focus on general health and safety, fire safety, and construction. This

underscores a market gap that K-State is uniquely positioned to fill, particularly with its emphasis on laboratory and research safety in diverse disciplines. Additionally, K-State's physical location and partnerships within the biotechnology hub and animal health corridor between Manhattan and Kansas City provide an ideal opportunity for research- and laboratory-specific safety education programs and student internship opportunities.

The data demonstrates a strong and growing demand for research and laboratory safety education. By addressing a unique market gap, engaging key employers and partners, and building on interdisciplinary strengths, K-State has a significant opportunity to establish itself as a leader in this critical area of education, training, and workforce development.

Upload your Market Demand Report - ATTACHMENT

Explain why the university should fund this request (e.g., What inspired you to submit this proposal? What do you see as the unique purpose of this proposal? Please define how this submission is innovative.)

K-State Environmental Health and Safety (EHS) collaborates with departments and external organizations to provide essential safety education to hundreds of students and professionals annually. In partnership with the Department of Chemistry, EHS aims to expand and modernize learning opportunities across all modalities using existing university systems. This safety education will exceed industry standards, offering engaging content through continuing education units (CEUs), microcredentials, and undergraduate and graduate courses. With a focus on research and laboratory environments, these offerings ensure learners can effectively articulate and apply comprehensive safety knowledge.

As safety professionals and scientists, we recognize the importance of safety education for students, faculty, staff, and professionals in laboratory and research environments. We are committed to fostering a culture that empowers individuals to prevent accidents, mitigate risks, and uphold ethical practices. Safety education equips graduates with the skills to excel in diverse, high-paying careers across industries, where they can use

their STEM expertise to protect human, animal, and environmental health. By prioritizing excellent safety training, we ensure that future professionals are prepared to tackle complex challenges in research and industry while maintaining the highest standards of safety and compliance

The proposal for safety education credentials in research and laboratory safety represents a transformative investment in the university's commitment to excellence in education, research, and workforce preparedness. This initiative is inspired by the growing demand for specialized safety training in high-stakes research environments and the critical need for professionals equipped to navigate the complex challenges of laboratory safety in compliance with evolving regulatory standards and emerging technologies. This proposal also targets core areas of the Next-Gen K-State Opportunity Agenda, including Global Food Security and Biosecurity and Enabling Technologies, as program priorities support underlying drivers of safety, sustainability, global health and security, innovative technologies, and security of research data.

Available safety education and training does not provide credentials or targeted upskilling. It does not provide hands-on experiences and engaging instruction. Our proposed safety education credentials aim to reimagine our current university safety training with verifiable credentials and academic programs that include real-world scenarios and applied learning experiences.

Our biannual hybrid bootcamps offer the latest regulatory updates, innovative research technologies, and topics in research and laboratory safety presented live by subject-matter experts across the K-State enterprise and within partner organizations and private sector institutions. These weeklong events are supported by hands-on applied practice, a vendor fair, and dedicated networking events to provide a fully immersive experience for participants. We are requesting and integrating applied learning into every presentation topic and exploring interactive event-long activities including outbreak investigations and escape rooms.

Online courses, including microcredentials and credit-bearing courses will offer learning experiences including virtual laboratory audits, process safety exercises, and applications for PPE with real-time feedback. Hybrid courses will provide applied learning opportunities to tour facilities, gain experience using safety equipment, and conduct projects to identify and mitigate hazardous conditions in various settings. This proposal provides a unique opportunity for local and global learners to gain real-world experience in research and laboratory safety regulations, practices, and theory regardless of prior experience, knowledge, training, and physical location in the world.

Page 4

DESIGN: Using the fields below, illustrate how a learner will move through the curriculum (e.g., sequencing of courses, use of non-standard timeframes like intersession or 8-week classes, planned modality such as in-person, online or blended). If there is anything else unique about the curricular design, please describe.

Our proposal includes three stackable and integrated programs: biannual bootcamps, four microcredential courses, and an undergraduate/graduate certificate.

The biannual, hybrid bootcamps are interdisciplinary programs offering CE credits, industry certifications, a certificate of training, and one elective credit hour for K-State students enrolled in the certificate program. The bootcamp serves as a pathway to both the microcredentials and the undergraduate/graduate certificate in Research and Lab Safety. CE credits are also required for industry professionals to maintain certification in various fields, increasing the diversity of our student body and enhancing our appeal to non-traditional learners.

Microcredentials serve as a pathway from bootcamps to K-State enrollment. The four microcredential courses—stacked into a Master Badge in Research and Laboratory Safety—each provide one CE credit and one elective credit hour. Completing these microcredentials offers an alternative-credit pathway toward the certificate program.

The Research and Laboratory Safety certificate requires 9 core credit hours and 6 elective credit hours. Core courses include Introduction to Lab Safety, Chemical Safety,

Lab Facilities and Equipment, and a final Capstone or Internship. Completing the bootcamp and microcredentials provides 5 elective credits, leaving one elective credit hour remaining. A new seminar course developed by EHS will provide one additional elective credit hour, introducing students to career opportunities in safety across various sectors. Additionally, EHS has identified valuable certificate elective course opportunities in existing K-State academic programs for certificate students to choose from, including courses in agricultural biosecurity, agricultural safety, crisis communication, construction safety, engineering, and public health.

This certificate can be a standalone program or integrated into existing undergraduate and graduate degrees at K-State to provide students pathways into the safety field, and valuable safety education for enhanced workforce readiness. The flexible certificate curriculum, including diverse elective course options and credit offerings for microcredentials and the bootcamp accommodates diverse backgrounds and industries, ensuring accessibility and success.

The biannual bootcamps welcome students, faculty, staff, and industry professionals to reinforce skills and grow professional networks. Microcredentials will be available on-demand, allowing global enrollment alongside academic coursework, enhancing the program's flexibility and reach. All courses will be offered for access globally, including our certificate program core courses. Accessible, high-quality courses and real-world, integrated learning experiences are the foundation for our proposed programs.

The sample curriculum illustrates a full-time certificate student with no prior elective credits. However, completing the bootcamp elective credit hour and four on-demand microcredential course elective hours—either prior to or concurrently with the certificate coursework—makes it possible to graduate within one calendar year. This flexible pathway is ideal for working professionals looking to upskill or transition to a new career, as well as college students seeking to gain additional knowledge, credentials, and documented applied learning to stand out in a competitive job market across industries.

Year 1 Curriculum Sequence: Fill in as applicable:

	Course #	Course Name	Semester Credit Hours
Year 1: Fall	CHM XXX	Intro to Lab Safety	3
Year 1: Fall	CHM 601	Safe Chemical Lab Practices	1
Year 1: Fall			
Year 1: Fall			
Year 1: Spring	CHM XXX	Intro to Lab Facilities and Equipment	3
Year 1: Spring	CHM XXX	Elective	1-3
Year 1: Spring			
Year 1: Spring			

Year 2 Curriculum Sequence: Fill in as applicable:

	Course #	Course Name	Semester Credit Hours
Year 2: Fall	CHM XXX	Elective	1-3
Year 2: Fall	CHM XXX	Elective	1-3
Year 2: Fall			
Year 2: Fall			
Year 2: Spring	Capstone	Capstone Project or Internship	2
Year 2: Spring			
Year 2: Spring			
Year 2: Spring			

Microcredential Outline and Curricular Sequence

Program Overview:

The Master Badge in Research and Lab Safety is a foundational program designed to provide learners with essential knowledge and skills in research and laboratory safety. The program consists of four microcredential courses, each contributing one CE credit and one elective credit hour toward the proposed Research and Lab Safety certificate program. The microcredentials can be taken in any order, offering flexibility for learners. Each microcredential course will take about 15-20 hours of independent study to complete, equivalent to a one credit hour, 16-week course at K-State. The course can be completed at the learner's speed, allowing for flexibility for students and working professionals to earn credentials alongside other commitments. These courses are relevant to research and laboratory settings but also provide transferable skills applicable to other industries.

Microcredential Courses:

1. Introduction to Research and Lab Safety
    - Modules: 6
    - Titles:
        - Research Basics and the Scientific Method
        - Introduction to Lab Safety Practices
        - Identifying and Assessing Hazards
        - Risk Management and Safety Controls
        - Common Chemical, Biological, and Radiological Hazards
        - Regulations, Standards, and Safe Lab Environments
    - Interactive Activities:
        - Virtual simulations on hazard identification and risk assessment.
        - Quick lab audits for safety compliance.
        - Case study discussions on common lab incidents.
    - Assessments:
        - Short quizzes with instant feedback.

- Quick-response safety scenarios.
- Final activity: Create a simple safety checklist for a lab task.

2. Hazardous Materials Management
   · Modules: 4
   · Titles:
     - Identifying Hazardous Materials
     - Safe Handling and Storage
     - Waste Disposal Best Practices
     - Emergency Response and Spill Control
   · Interactive Activities:
     - Quick labeling exercises for hazardous materials.
     - Interactive decision-making exercises for storage and handling.
     - Spill response mini-scenarios.
   · Assessments:
     - Multiple-choice knowledge checks with real-time feedback.
     - Short hazard assessment exercise.
3. Ethics for Safety Professionals
   · Modules: 4
   · Titles:
     - Introduction to Ethics in Research and Safety
     - Conflict of Interest and Transparency
     - Ethical Challenges in Lab Safety
     - Decision-Making in Safety and Compliance
   · Interactive Activities:
     - Short case studies on research misconduct and safety ethics.
     - Role-playing ethical decision-making in safety scenarios.
     - Incident investigation mini-exercise.
   · Assessments:
     - Quick reflection questions on ethical dilemmas.
     - Multiple-choice scenario-based questions.
4. Environmental Social Governance (ESG)

· Modules: 4
· Titles:
    o ESG Basics and Its Role in Safety
    o Sustainability in Laboratory and Research Settings
    o Social Responsibility and Safety Culture
    o Regulatory Compliance and Governance
· Interactive Activities:
    o Quick sustainability planning activity.
    o Virtual audits on ESG compliance.
    o Case study discussions on ESG in research.
· Assessments:
    o Knowledge checks with real-time feedback.
    o Brief proposal for a small ESG improvement in a lab setting.

Learning Experience:

Each course integrates virtual simulations and interactive research environments, allowing learners to practice problem-solving, hazard identification, and safety decision-making. Optional in-person training and lab facility tours are available for those near Manhattan or willing to travel. Learners will receive real-time feedback and engage with program instructors and industry professionals to build connections in the field.

Completion & Recognition:
Completing all four microcredential courses earns the learner a Master Badge in Research and Lab Safety, demonstrating their foundational expertise in lab and research safety.

ENGAGEMENT: Describe how you will enhance or transform the learner experience (e.g., use of applied learning experiences).
To enhance and transform the learner experience in safety education credential programs, we will integrate applied learning experiences, real-world scenarios,

interactive technologies, and collaborative learning opportunities into the curriculum. This approach will span across continuing education, microcredentials, and undergraduate and graduate courses, ensuring that learners gain practical skills and knowledge with direct industry applications.

Biannual hybrid continuing education events provide a dynamic learning and networking environment. Learners attend live presentations delivered by subject-matter experts, network across colleges, departments, and research disciplines at dedicated events, explore a large vendor fair, tour campus facilities, and gain applied experience in research and laboratory safety topics. These events are collaborative, interactive events fostering discussion, idea generation, and networking across K-State and industry professionals nationwide.

Engagement for credit-bearing courses will incorporate multiple real-world applied learning opportunities featuring virtual laboratory simulations, tours of laboratories and research facilities, real-world case studies, root-cause analysis, incident investigations, laboratory audits, risk assessments, and guest speakers from a variety of industries in safety and research professions.

We will incorporate cutting-edge technologies including the Sunderland Foundation Innovation Lab position-aware immersion studio to virtually transport learners to different environments and scenarios to apply knowledge and solve problems in real time. Courses will be designed using interactive learning platforms, including Articulate Storyline, to design a virtual immersive environment with real-time feedback for learners to practice decision making, scenario response, and leadership in laboratory settings. Additionally, we will provide opportunities for training and hands-on experience in using laboratory equipment, including centrifuges, fume hoods, biosafety cabinets, and autoclaves. Industrial hygiene equipment, consisting of photoionization detectors, velometers, particle counters, noise dosimeters, training AEDs, training fire extinguishers, and confined space meters will be used throughout the courses with the opportunity for learners to operate the equipment.

The final course for the certificate program is an applied learning project or internship. We have established a list of partner organizations, including the Kansas Department of Labor, that will offer applied learning internships or projects to certificate students and alternative credential-seeking learners, as desired. K-State EHS also has opportunities for internships, projects, and mentorship for students seeking practical, hands-on training in diverse safety programs.

Microcredential courses will include our virtual laboratory simulations and interactive online research environments for problem-based learning where learners gain experience in solving real-world, complex challenges in research and laboratory safety. These will include selecting laboratory controls for research protocols, auditing virtual environments and processes for compliance with defined regulations and standards, conducting incident investigations, conducting research, and giving safety recommendations for emerging technologies. Learners based near Manhattan or willing to travel can access in-person training and lab facility tours
Local and global learners in credit-bearing and alternative-credential seeking programs will have opportunities throughout each course to apply learning, receive real-time feedback and guidance, and establish relationships with program instructors and professionals in our extensive network of partner organizations and professional membership organizations.

Relationship of proposal to the university's mission and/or strategic plan
Our proposal to further develop and expand safety education programs and safety credentials at K-State aligns with the values and priorities of the Next-Gen K-State Strategic Plan. Our programs embody the Next-Gen K-State values of connection, courage, impact, learner-focused, and people-centered.

Connection: Our current continuing education programs thrive on connection, celebrating success through contributions from over 15 university colleges and departments; partnerships with government, private sector, and professional organizations; and participation from individuals across more than seven states, including universities, research institutions, government, and industry. Our

microcredentials and undergraduate and graduate courses will continue to celebrate and invest in One K-State, highlighting faculty and staff expertise across research disciplines.

Courage: We embrace innovation. Programs focused on research and laboratory safety education are in demand and provide significant value for faculty, staff, students, and the world; however, K-State will lead the field by pioneering certain courses and learning formats globally. Our partnerships with state and federal government organizations and private sector professionals will provide real-world, versatile, and contemporary education and exposure for K-State.

Learner-focused and people-centered: Our programs are learner-focused. Safety is an integral part of all laboratory and research operations, and safety professionals come from diverse backgrounds and experiences. Designed for all learners, everywhere, at all career stages and disciplines, our programs support professional development for students, faculty, staff, government, and industry professionals. Continuing education programs offer opportunities to earn continuing education (CEs), certificates of training, and industry-recognized OSHA certifications for resume building, credentialing maintenance, and career growth.

Proposed microcredential courses will provide real-time, on-demand access to world-class safety education in emerging topics, regulatory compliance, and safety credentialing programs for examination preparation and credentialing maintenance. Undergraduate and graduate courses in research and laboratory safety topics are designed to be integrated into existing degree and certificate programs as electives and to stack towards a certificate in Research and Laboratory Safety.

We will collaborate with employers, professionals, auditors, the Career Center, and faculty across the university to ensure our courses are value-added, high-quality, and support job-ready graduates. Additionally, we will develop internships, mentorship programs, and applied learning experiences to ensure graduates have opportunities to

apply knowledge and connect with professionals in health, safety, and research professions, thereby enhancing the learner experience.

Strategic Imperatives: Our proposal aligns with the Next-Gen K-State Strategic Plan's priorities and imperatives, including:

1. Expanding credit-bearing and alternative education for learners in high-demand areas.

   Offering CEs and microcredentials expands opportunities for alternative credential-seeking learners toward our university goal of 5,000 – 7,000 enrolled by 2030. We are actively contributing to this expansion through safety education and training. This encompasses our biannual events including the upcoming Research Safety Bootcamp in February 2025.

   Expansion of our safety education programs to undergraduate and graduate courses provides a unique opportunity for science students and safety professionals to obtain coursework and certificates in research and laboratory safety at K-State. Degree and certificate completions across these CIP codes in the United States have increased by 61.1% in the past ten years, indicating a high demand for these educational programs. The ten-year percent change for all baccalaureate degrees in the United States is –1.0%.
2. Proactively meeting the needs of K-State and the global market for safety education.

   High-quality, readily accessible safety education with applied learning experiences is in high demand to support career readiness, align with industry job market trends, and address workplace priorities such as total worker health and safe working environments. K-State is uniquely positioned to fill this need on campus and in science and research organizations locally and globally.
3. Reimagining safety education and training for K-State citizens and the world.

   Traditional safety training and education offerings are perceived as low-value-added requirements that are subject to the forgetting curve. When safety training includes hands-on applied experiences, internships, live presentations, and professional networking opportunities; is multifaceted and embraces expertise

across all levels of the university; and leverages global partnerships, safety education programs become high-quality-and, high –value assets, not only to originating organizations, but to learners and industry stakeholders.

4. Developing a Next-Generation Land-Grant workforce in high-demand fields.
   Safety education is a priority for all industries, including STEM. There are over 90,000 safety professionals employed in the United States, and the highest five-year percent change in unique job postings was in Kansas (within the nine-state region) of 170.7%. Lightcast projects that the total number of jobs in related occupations will grow 21.6% by 2032 (Salas, 2024).
   STEM graduates will enter the workforce through a variety of areas including government organizations, contract research organizations, academia, and private industry, with advanced safety knowledge and practices because of transformative, high-quality educational programs at K-State.
5. Integrating engaged scholarship through global partnerships.
   The proposed programs offer engaged scholarship opportunities for K-State learners and partner organizations. EHS and partner organizations will provide applied experiences, internships, and mentorship opportunities for students interested in safety careers or applying research and laboratory safety knowledge. These opportunities will be integrated into their education at K-State, with a focus on safety or research careers across many industries."
6. Investing in future jobs and economies through skills-based education in growing sectors.
   The top hiring organizations for graduates of safety degree and certificate programs represent a range of industries including education, banking and financial services, healthcare, hotels, real estate, and engineering services. The top thirty hiring organizations posted between 68 and 358 unique job postings in safety-related occupations in 2023. Targeting identified skill gaps between applicant profiles and industry job postings in our offerings supports learner workforce preparedness and career success. Out of the 30 specialized skills for health and safety in the Market Demand Report, 28 will grow in job postings in the United States in the next two years. Our programs focus on upskilling in key

areas such as data collection and analysis, process improvement, risk management, root-cause analysis, auditing, regulatory compliance, risk analysis, key performance indicators (KPIs) and metrics, safety culture, and foundational science coursework. These efforts are designed to prepare students for the jobs of the future.

7. Pursuing operational excellence in safety education for the university and its partners.

   K-State can set the benchmark for safety education in STEM and research fields. By offering opportunities for undergraduate students, graduate students, faculty, staff, and alternative-credential-seeking learners, K-State positions itself to provide comprehensive, learner-focused programs. These programs aim to enhance knowledge and skills, preparing participants for future workforce trends

Implementation timeline and key milestones:

Continuing education (CE) credit offerings:

We have seen immense success piloting the Lab Safety Awareness Week (February 2024) and the Biosafety and Biosecurity Summit (October 2024). We plan to continue these and enhance them by offering CE and pathways to advanced skills with microcredentials and credit certificates. The goal of these opportunities is to bring innovative, engaging training opportunities to campus and the surrounding community. Based on feedback and success of the pilot, the Research Safety Bootcamp will continue to be offered biannually. This year, we will offer a virtual option, incorporate feedback from past events, and provide CE credits for the first time. Presentations and materials for both in-person and virtual attendees will be available on Canvas Pro (LMS) for an extended period after the event. We will continue to host week-long training opportunities with CE offerings and industry-recognized credentials (OSHA-10) in the fall and spring. We will conduct post-event surveys, participant feedback interviews, presenter feedback interviews, and partner feedback interviews after each event for continuous improvement.

Microcredential courses:

We propose establishing four core microcredentials for on-demand learning with global accessibility. These initial microcredentials include Lab Safety for STEM and Research, Hazardous Materials Management, Ethics for Safety Professionals, and Environmental Social Governance. These microcredentials reflect in-demand topics and skills based on interviews with partner organizations and regulators, requirements for credential maintenance, and industry trends. Our timeline for development and implementation of microcredentials is as follows:

Each microcredential will be developed within a 6–9-month timeline with multiple defined milestones. We have conducted extensive market research and stakeholder consultations, so we can start right away with approvals and course development. These will be developed simultaneously, and the expected time for the microcredentials to be available to learners is 12-18 months.

Phase 1 (4 months): Design and Content Development: Define course objectives, learning outcomes, course structure, create content in Articulate Storyline, record lectures in campus studios and invite partners to record lectures and provide resources for special topics and areas of expertise, begin integration of course content into Canvas

Phase 2 (2 months): Pilot Testing: Pilot our course for internal reviews with a small group of learners, initiate faculty review of course content allowing for flexible and respectful time for review

Phase 3 (2 months): Refinement of Course: Based on pilot feedback, refine course to ensure course objectives and learner outcomes are achieved, and course supports engaged, active learning

Phase 4 (Month 8-9): Course Launch

Phase 5 (Continuous Improvement): Our microcredentials will be adapted in response to feedback and changes in industry trends and emerging technologies. We will provide opportunities for continuous feedback from learners and adjust the courses as needed to ensure high-quality learning

Our goal for launching our initial four microcredential courses is staggered launches throughout 2026. We will continue to explore microcredential opportunities and topics on a continuous basis after the successful launch of our initial four courses.

Undergraduate and graduate courses:
Our undergraduate and graduate courses will build upon content from our microcredential courses and include additional content to expand topics and introduce new topics in depth. Our proposed core curriculum for our 15-credit certificate program includes four courses and 9 credit hours. Our proposed core courses include Introduction to Lab Safety (3 credits), Chemical Safety (CHM 601 or proposal equivalent, 2 credits), Introduction to Lab Equipment and Facilities (3 credits), and an Applied Learning Project or Internship (2 credits). Introduction to Lab Safety and Introduction to Lab Equipment and Facilities will have some content overlap with our microcredential, Lab Safety for STEM and Research, with additional modules and more in-depth content. Chemical Safety is offered on campus as CHM 601, and an equivalent may be developed modeled from preexisting course content and structure to support larger student enrollment. Our Applied Learning Project or Internship course will engage students in a project or internship with EHS on campus or with our partner organizations.

Development for undergraduate and graduate courses will follow the same path and milestones as microcredentials, with a timeline of 9-12 months per course, developed simultaneously. Our goal for launch of the four core courses is Spring and Fall 2027. Our timeline considers faculty senate approval and formal addition to the K-State course catalog. Our goal is to open the stackable certificate program enrollment in Spring 2027.

We have designed our undergraduate and graduate certificate program to include electives from a variety of pre-existing campus programs, such as the Agricultural Biosecurity Research Certificate Program, Diagnostic Medicine and Pathobiology (Biological Safety), agriculture and construction safety courses, the Master of Public Health Program, crisis communication courses, and STEM courses across disciplines. By offering these electives, we enhance the learner experience through diverse options and interdisciplinary collaboration. Additionally, integrating these electives with existing degree requirements creates more opportunities for students to earn the safety certificate alongside their degree.

Although not part of the current proposal, we plan to grow and fully develop our programs at a sustainable pace, expanding opportunities for learning and skill-building. Looking ahead, we aim to introduce program-specific elective courses in biological safety, radiation safety, psychological safety, occupational health and industrial hygiene, and risk management, to meet the increasing demand for specialized safety education in research and laboratory settings. Courses will address industry trends and align with cutting-edge research in lab safety and health, ensuring that K-State remains at the forefront of safety education in the STEM fields. These electives will be rolled out in phases over time, beginning with the most in-demand topics based on current industry needs and program growth after the launch of our core courses. This approach allows us to build a robust and responsive curriculum that meets both academic and industry needs without overcommitting resources early in the program’s development. The result will be a comprehensive, high-quality safety education program that evolves alongside industry advancements benefiting students, faculty, and the broader research community.

Identify any potential risks or losses you may encounter

While the proposal to establish safety education credentials offers significant benefits, it is essential to consider potential risks and challenges to ensure the program's success and long-term viability at Kansas State University. Our consideration of risks, solutions, and mitigating efforts are summarized below.

Risk 1: Program Viability and Demand

Some of the key measurements of success for any academic program are enrollment metrics, graduation rate, and financial viability. To mitigate the risk of low demand for the program, we have conducted careful, extensive market research and analysis to identify current trends and competition in higher education, industry needs and skill gaps for safety professionals. Additionally, in 2024, we hosted two safety education and training events on campus—Laboratory Safety Awareness Week and the Biosafety and Biosecurity Summit—to pilot safety education programs. These events allowed us to build partnerships with local and national organizations and gather feedback from faculty, staff, students, government employees, and private sector professionals. We gained valuable insights into the need for safety education programs, desired outcomes, job outlook for graduates, and the market scope and scale. Our third safety education and training event, the Research Safety Bootcamp, hosted February 10-14th on campus is our largest event to date. We are piloting a virtual option and will have attendees from other universities, state government organizations, federal government agencies, and private sector organizations both regionally and nationally. We have established these events as self-sustaining by partnering with K-State units and industry.

Risk 2: Faculty/ Instructor Expertise and Availability

Appropriate teaching faculty and instructors are crucial to the success of academic programs, offering expertise, mentorship, and guidance to students in their specialized fields. The availability, capacity, and qualifications of faculty are critical for developing and implementing new academic programs and curricula in safety and laboratory topics. To mitigate risks related to specialized faculty, we have established strong interdisciplinary partnerships across colleges and departments, integrated already established courses as electives, and engaged government and private industry organizations eager to contribute to specialized, skill-specific content.

Our education and training events are led by a diverse group, including K-State faculty and staff, state and federal government employees, and private sector professionals with deep expertise in safety topics. Microcredentials will be delivered by subject-matter experts, including K-State faculty and staff from EHS and the Department of Chemistry,

who have specialized credentials and extensive experience in safety education. Faculty and instructor areas of expertise directly match courses and skills throughout the Bootcamps, microcredentials, and certificate courses.

One instructor from the Department of Chemistry currently teaches chemical safety and holds a PhD in Chemistry with diverse laboratory experience and laboratory administration responsibilities.

One of our EHS instructor holds a PhD in Safety Sciences, with 15 years of teaching experience in health and safety as an Adjunct Professor, over 30 years in safety leadership positions, and certifications including Six Sigma Lean Black Belt, OSHA Outreach Trainer for General Industry, ISO 9001/14001 Lead Auditor, FEMA NIMS Incident Commander, Wastewater Treatment Operator, Risk Management Assurance, Certified Safety Professional (CSP), Certified Industrial Hygienist (CIH), and Certified Hazardous Materials Manager (CHMM).

Additionally, another EHS instructor has 6 years of experience in research in laboratory safety, including biosafety, select agents, and high-containment laboratories in academia, healthcare, and federal laboratories. This instructor holds certifications as a Lean Six Sigma Black Belt, Registered Biosafety Professional (RBP), OSHA-10 General Industry, DOT/IATA, FEMA ICS 100, 200, 700, and 800, and is a Medical Laboratory Scientist with the American Society for Clinical Pathology. Their degrees include a BS in Medical Laboratory Sciences, an MS in Biotechnology, an MHA in Healthcare Administration, and an MPH in Infectious Diseases and Zoonoses (anticipated May 2025).

In addition to these core instructors, other instructors within EHS and Chemistry bring subject-matter expertise in research and laboratory safety, offering real-world experience that enhances the student learning experience and mentorship. Their involvement ensures that students receive both academic knowledge and practical insights, preparing them for success in the field.

The undergraduate/graduate certificate program will feature three core courses taught by EHS and Department of Chemistry faculty, ensuring high-quality instruction in safety topics. The program will also include a final project or internship with industry partners and electives from the existing K-State course catalog. This interdisciplinary and expert-driven approach guarantees the sustainability and long-term viability of the proposed programs while prioritizing faculty availability and expertise.

Risk 3: Market and Industry Changes

It is critical for academic programs to evolve with market needs, technological advancements, and industry trends. Program enrollment and job placement rates for graduates are critical measures of program success. Our curriculum is designed to be flexible and adaptable. Our continuing education events on campus are critically reviewed by attendees and adapted every six to nine months to provide high-quality, timely, and in-demand topics and courses. Our on-demand microcredential courses will be evaluated for enrollment on a pre-defined cycle, and we will use attendee post-course surveys to continually adapt our microcredential offerings and replace offerings as indicated with new, on-demand courses. Our credit-bearing courses will be updated continuously and provide students with opportunities and knowledge driven by market and industry trends.

Risk 4: Competition

Competition from existing programs and other academic institutions is a risk faced when other reputable universities or colleges offer similar programs. We conducted a thorough competitor analysis detailed in our Market Demand Analysis that determined that our proposed programs are in a unique space. Our programs will also be offered across a diverse, extensive learner spectrum including undergraduate and graduate students, industry professionals, faculty, and staff seeking credit-bearing and alternative education opportunities. By offering CEs, microcredentials, and credit-bearing courses leading to a certificate, K-State is uniquely positioned for success in research and laboratory safety education. Most competitor programs specialize in construction safety,

fire safety, or general health and safety at certification, associate, or baccalaureate levels.

Risk 5: Long-term Sustainability

Academic innovation funding will establish K-State as the leading institution for safety education and credentials. Self-sustaining and cost-effective programs with established partnerships will sustain safety education and credentials at K-State for the long term. Dedicated EHS and Chemistry staff are safety certified and passionate about the success of K-State and bringing accessible, innovative research and laboratory safety education programs to campus. Our biannual offerings generate funding through registration fees, partner sponsorships, and the newly incorporated CE revenue. The current direct costs for hosting these events are marketing and indirect costs are staff hours. Campus room reservations, event food, and safety and research product samples are entirely supported by partner organizations and vendors. Profits from biannual events will be reinvested into student education and program development for the safety education credential programs. Microcredential courses will be offered on-demand, requiring minimal management after development. Registration, tuition, and course fees will support microcredential courses and credit-bearing courses. We will continue collaborating with federal, state, private, and academic intuitions to develop new partnerships and market and deliver high-quality content across modalities. These partnerships provide a customer base, benchmarking opportunities, and insights for future content development aligned with industry trends.

Many safety professionals obtain funding from their employer for continuing education for credential maintenance and tuition reimbursement for further education. We are collaborating with professionals and organizations to identify these opportunities and ensure our marketing strategy effectively reaches alternative-credit seeking learners. Our hybrid and online offerings are designed to attract professionals with educational reimbursements and career specialties that can benefit from these courses. Additionally, EHS membership in over 10 professional organizations offers scholarship opportunities for students enrolled in credit-bearing safety education programs. This

support helps reduce education-related costs for students in our certificate program while also providing valuable opportunities to connect with industry professionals and gain membership in professional networks.

Some of our professional network memberships include American Chemical Society (ACS), the Accreditation Board for Engineering and Technology (ABET), American Society for Clinical Pathology (ASCP), American Society for Safety Professionals Heart of America Chapter (ASSP), Board of Certified Safety Professionals (BCSP), American Biological Safety Association (ABSA), American Society of Safety Engineers (ASSE), American Industrial Hygiene Association (AIHA), Alliance of Hazardous Materials Professionals (AHMP), Campus Safety, Health, and Environmental Management Association (CSHEMA), Institute of Internal Auditors (IIA), and the Institute for Hazardous Materials Management (IHMM). These provide unique funding sources, integrated learning experiences, networking opportunities, and jobs for students across industries.

A. Expenditures [List amounts in dollars. Provide explanations as necessary. Please double-check the math.] (From KBOR)
Personnel – Reassigned or Existing Positions

	First FY	Second FY	Third FY
Faculty	12,600	12,978	13,367
Administrators (other than instruction time)	7,360	7,580	7,807
Graduate Assistants	1,500	1,545	1,591
Support Staff for Administration (e.g., Office Assistant)	0	0	0

Fringe Benefits (total for all groups)	3,604	3,712.11	3,823.47
Other Personnel Costs	400	1200	1200

Start-up Costs - One-Time Expenses

	First FY	Second FY	Third FY
Library/Learning resources	200	0	0
Equipment/Technology	11000	0	0
Physical Facilities: Construction or Renovation	0	0	0
Program Marketing	0	0	0
Other (Describe)			

Operating Costs - Recurring Expenses

	First FY	Second FY	Third FY
Supplies/Expenses	0	0	0
Library/Learning resources	0	0	0
Equipment/Technology	1374	1374	1374
Travel	0	0	0
Program Marketing	6000	6000	6000
Other (Describe)			

Provide total expenses

	First FY	Second FY	Third FY
Grand Total Costs	44,038	34,389.11	35,162.47

B. Funding Sources

	Current	First FY (new)	Second FY (new)	Third FY (new)
Tuition/State funds	0	10,500	86,860.40	126,790.60
Student fees	0	0	4500	6,750
Other sources	1000	2400	4,000	6,000

Projected Surplus/Deficit +/-

	First FY	Second FY	Third FY
Total Funding minus Total Costs	- 31,138	+60,971.29	+104,378.13

Expenditures and Funding Sources Explanations (from KBOR)

Personnel Costs:

Faculty Instructors: We have three existing full-time faculty members who will dedicate a percentage of their time to the development and instruction of the programs. Each faculty member is projected to spend an average of 3%, 5%, and 5% of their full-time capacity, respectively, on program-related activities such as course design and instruction.

Administrative Support: Three full-time administrators will spend, on average, 5% of their time on program development, course content creation, and program maintenance. Their administrative support will be critical for the continued success of these offerings.

Graduate Assistants/Students: Two part-time graduate assistants will spend an hour per week supporting the program. Their roles will involve grading, assisting with course content review, and providing valuable experience in teaching and program development.

Fringe Benefits: The percentage of fringe benefits reflects the actual staff time dedicated to the programs outlined in this proposal. These benefits will be allocated in proportion to the time faculty and staff commit to program development and delivery. These vary by position type and have been verified with a K-State Budget Fiscal Officer.

Faculty Course Review: Additional costs are associated with faculty review of courses. At a rate of $25 per hour, each faculty member will spend eight hours reviewing each course (including CE, microcredential, and certificate courses), ensuring continuous quality and relevance.
Startup and Equipment Costs:

Materials and Supplies: We have allocated $200 for student materials and supplies, ensuring that students have the necessary tools and resources for effective learning.

Safety Equipment: An investment of $6,000 will be made to purchase commonly used safety equipment in the industry, such as industrial hygiene tools (including a photoionization detector) and a training AED (automated external defibrillator). Additional equipment from EHS and Chemistry departments will be utilized to supplement these items.

Interactive Learning Tools: $2,500 will be invested in two iPad Pros with cases and pencils to facilitate interactive learning experiences and course design. These tools will enhance student engagement and provide a dynamic environment for skill-building.

Course Design Software: Annual software costs of $1,374 will be used to access Articulate Storyline, a tool essential for course design and delivery. Pre-existing software from EHS, Chemistry, and the university will supplement this expenditure.

Marketing and Outreach:
Marketing Budget: We have allocated $6,000 per year to market all three proposed programs at K-State. This budget will ensure the programs reach potential students and stakeholders, driving enrollment and awareness.

Revenue Projections:
Research Safety Bootcamp: Our current funding source is the February 2025 Research Safety Bootcamp, with an attainable goal of $1,000 profit. For the first time in Spring 2025, we will charge a fee, following successful pilot programs in 2024 that gathered valuable feedback and marketing insights.

Microcredential Course Enrollment: For the first fiscal year, we aim to enroll 30 students per course in individual microcredential courses (at $350 each) and achieve 30 paid registrations for each of our biannual bootcamps, generating a projected profit of $2,400.
Certificate Program Enrollment: In the second FY, the core courses of our certificate program will launch. We anticipate enrolling 20 students in the 9 core courses, with a total tuition revenue of $86,860.40. This includes 40 individual microcredential enrollments and $4,000 in additional revenue from bootcamp enrollments.

Long-Term Growth: By the third FY, we aim to enroll 30 certificate students in the core courses, 50 individual microcredential enrollments, and 150 bootcamp participants across both biannual events. These projections are based on conservative estimates and current market trends, with substantial growth anticipated as the program expands its reach.

Sustainability:
Our funding strategy is designed for long-term sustainability. With a current network of over 40,000 safety professionals and growing partnerships across the K-State enterprise and in over nine U.S. states, we are well-positioned for continued growth. The addition of professional marketing support and expertise will help drive future program success. Furthermore, our stackable program model allows students to be simultaneously enrolled across bootcamps, microcredentials, and certificate programs, increasing enrollment opportunities and program efficiency.
The total three-year projected surplus is $134,210.82, which reflects the sustainable growth of these programs. Beyond the three years of proposal funding, we will continue to expand and offer low-maintenance programs that generate long-term, self-sustaining revenue.

The proposed funding structure is designed to build a world-class, in-demand safety education program at K-State. Through a combination of faculty expertise, investment in quality materials and equipment, and strategic marketing efforts, this program will position our graduates for success while fulfilling a critical need in the safety industry. With a clear plan for growth and sustainability, we are confident that this initiative will have a lasting impact on both K-State students and the broader safety community.

Highlight the anticipated return on investment – financial and/or nonfinancial

Financial Return on Investment:
The financial return on investment (ROI) for Kansas State University through these safety education programs is substantial, with multiple revenue-generating opportunities and long-term growth potential. Additionally, by establishing professional safety certifications and engaging in partnerships with safety organizations, we expect to unlock new funding avenues, including student scholarships, sponsorships, and future endorsements.

Research Safety Bootcamp:
Our current funding source is the February 2025 Research Safety Bootcamp, where we aim to generate a modest yet attainable profit of $1,000. This marks the first time we will charge a fee, following successful pilot programs in 2024, which provided valuable feedback and marketing insights. The success of this bootcamp will enhance the visibility and credibility of our programs, contributing to future growth.

Microcredential Course Enrollment:
In the first fiscal year, we anticipate enrolling 30 students per course in individual microcredential courses ($350 each), along with 30 paid registrations for each of our biannual bootcamps. This will generate a projected profit of $2,400. As we build partnerships with professional safety organizations, the value of these credentials will continue to grow, attracting more students and contributing to a steady stream of revenue.

Certificate Program Enrollment:
In the second fiscal year, we plan to launch the core courses of our certificate program, with an anticipated enrollment of 20 students in the 9 core courses, generating tuition revenue of $86,860.40. This will be supplemented by 40 individual microcredential enrollments, generating an additional $14,000, and $4,000 in revenue from bootcamp registrations. Our partnerships with safety professional organizations are expected to increase the visibility and marketability of our certificate program, boosting enrollment and student retention.

Long-Term Growth & Future Endorsements:
By the third fiscal year, we aim to enroll 30 certificate students in the core courses, 50 microcredential students, and 150 bootcamp participants across both biannual events. These projections are based on conservative estimates and current market trends. As our program expands, the potential for increased student scholarships through professional safety organizations, sponsorships, and endorsements will provide additional revenue streams.

In addition, we foresee future endorsements from professional safety organizations and certification boards, which will allow K-State to offer CE credits for credential maintenance. Our 2025 Research Safety Bootcamp was advertised and endorsed by the American Society of Safety Professionals Heart of America Chapter, American Chemical Society, and Alliance of Hazardous Materials Professionals. These partnerships and endorsements attract a wider pool of learners seeking professional development and create a sustainable model for growth and long-term financial stability.

Enhanced Marketing Opportunities:
While our projections are based on conservative estimates, professional marketing of the programs will significantly enhance enrollment figures and revenue generation. By leveraging the expertise of dedicated marketing resources, we can reach a larger audience and achieve broader visibility for both our microcredentials and certificate programs.

Nonfinancial Return on Investment:
Developing specialized safety education programs positions the university as a leader in safety education, enhancing its reputation both locally and globally, and communicates that student, faculty, and staff safety is a priority. Through these credentials and programs, the university will provide high-quality, relevant, and timely training in an area of increasing importance across industries, such as STEM and healthcare. This distinction can attract students, faculty, staff, and increase industry partnerships. Additionally, offering comprehensive safety education programs builds strong relationships with industry partners, regulatory bodies, and governmental organizations leading to increased collaborations with industry experts, strong ties to key sectors and organizations, and internship and job opportunities for graduates.

Students who complete safety education programs gain valuable credentials and knowledge, and when they highlight this, they can increase their employability and career prospects. These programs also enhance students' confidence in their ability to handle real-world safety challenges, preparing them for leadership roles in their future

careers. This contributes to better student outcomes and higher post-graduation success rates across majors, disciplines, and career fields.
Safety education programs that span multiple disciplines, colleges, and departments encourage interdisciplinary collaboration among faculty, staff, and students. This fosters innovation, cross-departmental partnerships, and the development of integrated safety solutions that can address the multifaceted nature of research and industry challenges. These interdisciplinary collaborations across campus form relationships and partnerships beyond the scope of the safety education credentials program, leading to research collaborations, idea generation, and One K-State values.

A focus on safety education at the university level helps instill a culture of safety, responsibility, and awareness among both students and faculty. This can have a lasting impact on the university's operational environment, reducing the likelihood of accidents, injuries, and increasing regulatory compliance on campus. The culture of safety extends beyond academic settings, influencing how safety is viewed in students' personal and professional lives and the message that students will carry to future employers

Additionally, robust safety education programs and a proactive organizational safety culture can significantly reduce costs by mitigating risks to human health, safety, and property. By addressing unsafe conditions before they lead to injury, accident, or illness, organizations can achieve both direct and indirect financial savings. These savings include reductions in workers' compensation claims, lower insurance premiums, decreased employee absenteeism due to injury, protection of employees' ability to perform critical tasks, and a reduction in liability insurance premiums. Investing in safety not only safeguards employees but also enhances operational efficiency, leading to long-term cost savings and a more resilient workforce.

An organization that prioritizes research and laboratory safety demonstrates its commitment to safeguarding human, animal, and environmental health as fundamental values. At Kansas State University, we firmly believe that conducting research safely is paramount, and we uphold responsible research practices and environmental

stewardship as core principles. These values guide our efforts to create a safe, sustainable, and ethical environment for scientific exploration and discovery.

The development of safety education credentials at K-State yields significant nonfinancial returns on investment, contributing to long-term strategic benefits that enhance the university's reputation, student career readiness, and success, while transforming the institutional safety culture. Implementing an interdisciplinary and collaborative safety education program benefits both the university and the community, positively impacting industry standards, public health, workforce development, and the well-being of the K-State community. This initiative will establish K-State as the premier university for safety education credentialing programs.

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Learning Outcome 1

Learners will identify hazardous conditions and emerging safety considerations in laboratory and research environments, using tools, controls, and reporting mechanisms to minimize risks to human, animal, and environmental health. This outcome emphasizes the application of proactive safety strategies to create safe research environments, ensuring that students are equipped to assess and mitigate risks while supporting scientific progress.

Assessment of Learning Outcome 1: Describe how you will evaluate learners and measure outcomes to ensure learners are uniquely positioned for immediate success.

Learners will:

This learning outcome directly addresses key competencies identified in safety job postings from our Market Demand Analysis report, including risk management, root cause analysis, risk assessment, safety culture, and effective risk mitigation strategies.

- **Apply** the hierarchy of controls (elimination, substitution, engineering controls, administrative controls, and personal protective equipment) to new research protocols, mitigating risks without hindering progress.

- **Analyze** real-world incidents and near-misses through root-cause exercises, identifying causes and proposing corrective actions.

- **Use** industrial hygiene equipment (e.g., air monitors, chemical safety tools) to assess hazardous conditions and exposures in research settings, evaluating technical skills and the ability to interpret results.

- **Complete** and review mock incidents and near-miss reports, making recommendations to improve safety outcomes and prevent injuries.

Learning Outcome 2
Learners will integrate environmental, health, and safety (EHS) best practices into daily research and laboratory operations, ensuring that safety, compliance, and ethical standards are upheld throughout research processes. This outcome will enable students to apply EHS principles to create safe and sustainable research environments, effectively managing risks and promoting continuous safety improvements.
Assessment of Learning Outcome 2: Describe how you will evaluate learners and measure outcomes to ensure learners are uniquely positioned for immediate success.

Learners will:

- **Research** emerging technologies and industry trends to develop recommendations for safe, ethical work, assessing their ability to analyze safety risks and propose solutions aligned with best practices.

- **Simulate** virtual laboratory management exercises to establish safety management systems (SMS), evaluating their decision-making, risk management, and leadership in safety initiatives.

- **Solve** case studies to apply safety management systems, assessing their problem-solving skills, regulatory compliance knowledge, and ability to implement corrective actions.

- **Collaborate** on partner organization projects to improve operational efficiency and safety, focusing on the learners' ability to assess challenges, provide recommendations, and demonstrate leadership in real-world environments.

This learning outcome directly addresses key skills identified for safety job postings from our Market Demand Analysis report, including essential competencies such as use of key performance indicators, auditing, data analysis, root cause analysis, risk management, regulatory compliance, safety culture, and safety management. By participating in these applied learning opportunities, learners will be uniquely positioned for immediate success in safety roles across research and laboratory settings. This is especially impactful, as students and professionals can apply skills and tools from applied learning immediately.

Learning Outcome 3
Learners will deeply understand global, national, and local safety regulations and standards, applying this knowledge to assess and improve laboratory and research safety programs.
Assessment of Learning Outcome 3: Describe how you will evaluate learners and measure outcomes to ensure learners are uniquely positioned for immediate- success-.
Learners will:

- **Conduct** audits of virtual or physical laboratories using a compliance checklist for global, national, and local regulations (e.g., OSHA, CDC, NIH, EPA), identifying risks, gaps, and non-compliance, and providing detailed reports with corrective recommendations.

- **Write** or **audit** a safety program (e.g., Bloodborne Pathogens or Hazard Communication Program), evaluating compliance and suggesting improvements to demonstrate expertise in safety regulations and communication skills.

- **Analyze** case studies involving safety compliance challenges, identifying breaches, and proposing solutions that align with relevant safety standards, testing critical thinking and decision-making in regulatory contexts.

This learning outcome directly addresses key skills identified for safety job postings from our Market Demand Analysis report, including essential competencies such as communication, problem-solving, research, innovation, analytical skills, auditing, regulatory compliance, risk analysis, and knowledge of safety standards. By successfully completing these assessments, learners will be uniquely positioned to contribute to research and laboratory safety programs, applying regulatory knowledge to enhance safety practices and ensure compliance in current and future careers.

Learning Outcome 4
Learners will demonstrate the ability to lead safety initiatives in their organizations by effectively communicating safety risks and advocating for the value of safety programs at all levels.
Assessment of Learning Outcome 4: Describe how you will evaluate learners and measure outcomes to ensure learners are uniquely positioned for immediate success
Learners will:

- **Deliver** a presentation to a mock leadership team, explaining the importance of safety programs and demonstrating how to communicate their value to various stakeholders, assessing communication effectiveness and clarity.

- **Write** detailed safety reports that assess risks and propose mitigation strategies, evaluating their ability to convey technical information clearly and advocate for safety improvements.

- **Participate** in peer review and self-assessment activities to evaluate safety communication strategies, encouraging critical thinking and self-reflection.

- **Create** a comprehensive safety program proposal for an organization, including a communication plan, assessing their ability to integrate and apply learned concepts into a real-world, actionable plan.

This learning outcome directly addresses key skill gaps identified in applicant profiles for safety job postings from our Market Demand Analysis report, including essential competencies such as communication, leadership, writing, presentation skills, interpersonal communication, verbal communication, influencing skills, report writing, computer literacy, and decision-making. Learners will acquire the ability to effectively communicate safety risks, lead initiatives, and advocate for safety programs, equipping them with a comprehensive skill set highly sought after in the safety job market.