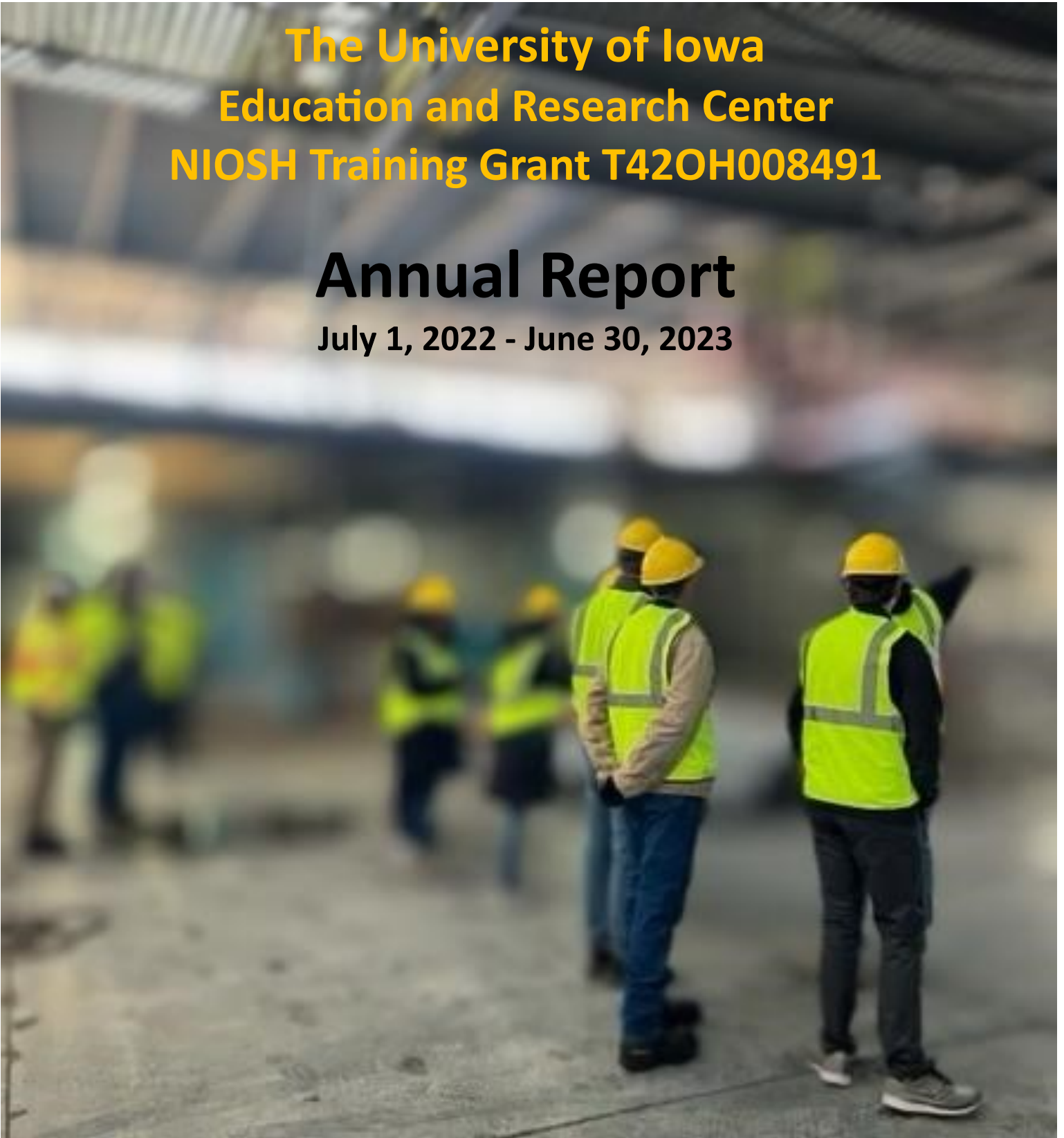


**The University of Iowa
Education and Research Center
NIOSH Training Grant T42OH008491**

Annual Report

July 1, 2022 - June 30, 2023



ERC Summary

The vision of the Heartland Center for Occupational Health and Safety is to be the leading educational and outreach resource for workplace safety and health in Federal Region VII (Iowa, Kansas, Missouri and Nebraska). The Center's mission is to reduce injuries, illnesses, and fatalities of workers by expanding and strengthening the occupational health and safety workforce with well-trained and well-informed professionals. The Center serves as a resource for the region by providing interdisciplinary graduate-level training that will increase the number of highly knowledgeable and experienced occupational health and safety (OHS) professionals. The Center consists of five academic training programs including industrial hygiene, occupational safety, ergonomics, agricultural safety and health, and occupational injury prevention. The Center's outreach and continuing education programs enhance the capabilities of occupational health and safety professionals to reduce the high rates of occupational disease and injury. These programs provide practical information for the professional development of OHS professionals, and serve as a conduit of OHS-related information throughout the region. Through the scientific and professional expertise of its faculty and staff, the Heartland Center is well positioned to address OSH issues unique to the region that is dominated by agriculture and industries supporting agriculture. A vigorous pilot grant program results in impactful research projects, many of which address these regional concerns. Heartland Center strengths include: a rigorous planning and evaluation structure; the productive research capacity of its faculty; a commitment to interdisciplinary training and research, passionate support of diversity, equity and inclusion principles, active continuing education and outreach programs, and strong institutional support of Center activities.



Relevance

The major rationale for the Heartland Center is to address OHS problems unique to Federal Region VII, in particular a demand for trained OHS professionals in this region with its high rural population. The Heartland Center trains over 30 graduate-level students each year who obtain jobs directly related to their training in industry, academia, and government agencies. The Center's continuing education program, which serves nearly 1200 professionals annually, improves their ability to reduce the high regional rates of occupational disease and injury. The Center also reaches out to over 10,000 regional businesses through an outreach program that provides consultation and current information to increase awareness of occupational health and safety issues in Region VII.

Key Personnel

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High Impact Accomplishments

The 2022–23 reporting period comprised a number of high-impact accomplishments of faculty, staff, and trainees of the Heartland Center Education and Research Facility (ERC) at the University of Iowa (UI). The most notable of these are provided below.

Occupational Injury Prevention Trainees Receive Prestigious Awards

Victor Soupene, PhD candidate in the Department of Epidemiology, received two prestigious awards for academic excellence and innovation, and dedication to the practice of injury and violence prevention. Mr. Soupene was awarded a position in the 2024 Dare to Discover campaign sponsored by the UI Office of the Vice President for Research. This campaign promotes research and scholarship of outstanding students and postdocs from across the university. A banner is displayed



in downtown Iowa City for several months and then moved to the recipient's College. OIP trainees have been successful in receiving this prestigious award, including Dan Corry (Picture: banner hanging in the College of Public Health Building), Chelsea Hicks, and Robyn Espinosa. Mr. Soupene was also the recipient of the 2023 Rising Star Award from the Safe States Alliance, which is the leading professional organization in the U.S. for the practice of injury and violence prevention. The Rising Star award recognizes students and professionals who are making great strides in the injury and violence prevention field.

Occupational Safety Trainee Studies Safe Courses Of Action When Making Occupational Decisions



Michael Shultz, a recently graduated MS trainee in Occupational Safety, investigated the impact of life and work-related stress on employee safety decision-making. Specifically, he focused on three cognitive biases known to inhibit safety participation: recency, melioration, and the free-ride social dilemma. Michael employed Life and Work Stress instruments, a COVID-19 stress questionnaire, and analyzed participants' work history to document stress levels. He then conducted three decision-making simulations to examine conditions that accentuate these biases.

The results indicated that perceived life stress was not a significant predictor of safety engagement under any cognitive biases studied. However, work-related stress significantly influenced safety participation, particularly under the Recency bias. Conducted at the height of the COVID-19 pandemic, the study also found that the experience of losing someone close due to COVID-19 had a significant impact under all three bias conditions. Work history also had a significant impact on the three cognitive biases. Contradictory effects of various variables across different biases suggest a need for further research to understand how these biases affect safety.

Agricultural Safety and Health Trainees Produce “FarmSafe” Podcast

Agricultural Safety and Health trainees, Matison Bentley (PhD, 2025) and Anna Proctor (MS, 2022; PhD 2026), produced the FarmSafe podcast. Working with the Outreach team they developed podcasts addressing relevant topics for farmers. This includes a series of podcasts focused on the different roles women have in the agricultural industry and health and safety issues that impact women. This includes farmer, forester worker, FFA leaders, and agricultural input dealers.

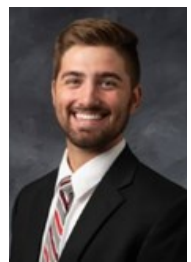
Agricultural Safety and Occupational Therapy Unite to Address Farmer Mental

Alumnus Erin Morley (MS, 2019) completed a capstone project for her Occupational Therapy doctorate with Agricultural Safety and Health Director, Dr. Diane Rohlman. She developed and evaluated a training for occupational therapy students and professionals addressing farmer mental health in their practice. The training was developed to reflect the OT process by outlining ways to identify and address mental health conditions in farming patients through evaluation, assessment, intervention, and referral to outside resources. She also provided screening and assessment tools, resources addressing financial stress, and further educational opportunities to learn more about protecting the health and safety of farmworkers.

Industrial Hygiene Trainees Produce Series of Multi-phase Pesticide Sampler Studies



Under the mentorship of IH Faculty and Center Director Dr. O’Shaughnessy, several trainees have achieved recognition for their research into pesticide sampling. Pesticides, when sprayed, release tiny droplets and vapors that can be harmful. An efficient sampler should ideally capture both: vapors on an adsorbent medium and droplets on a filter. Two trainees, Shaunae Alex (MS IH 2018) and Matthew Sovers (MS IH 2020), analyzed a dual-



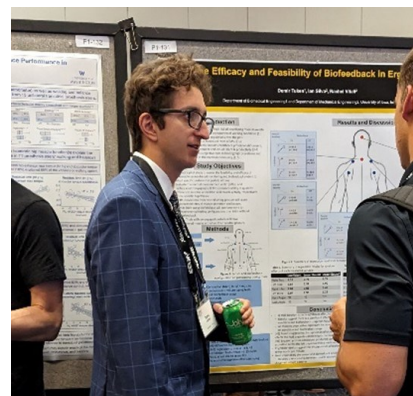
phase sampler's effectiveness. Their research culminated in two master’s theses and a notable scientific paper that received accolades as the best aerosol-centric article in the Journal of Occupational and Environmental Hygiene. Additionally, Spencer Baker (MS IH 2023) conducted a comparative study using the samplers on local groundskeepers and those in the lawn care industry. The primary objective of these investigations is to gauge the efficacy and potential drawbacks of using new dual-phase samplers for pesticide monitoring.

Agricultural Safety Trainees Develop Educational Information

Agricultural Safety and Health trainees work with various organizations as part of their preceptorship. Trainee Mary Rhodes (PhD, 2025) developed a report for Farmworker Justice, a non-profit advocacy group located in Washington DC, focused on injuries among migrant workers in the dairy industry which will support their advocacy and policy efforts. As part of his preceptorship, Ernesto Mendez (PhD, 2025) worked with AHSA to develop and delivered content for the Gear Up for Safety program and assisted with evaluation, particularly whether students prioritized working fast or working safely. This work was presented at ISASH and a manuscript is in preparation.

Ergonomics Trainee Aids the Dental Profession With Sensors to Reduce Ergonomic Risks

Demir Tuken (MS, 2024), an Ergonomics trainee, is evaluating the effectiveness of wearable sensors for ergonomics and biomechanics applications intended for medical professionals, specifically those associated with oral healthcare. Mr. Tuken's use of inertial measurement units to measure motion, surface electromyography to measure muscle activation, and vibrotactile biofeedback to assess and influence dentists' postures in a clinical setting is the first step towards quantifying the ergonomic challenges afflicting clinicians. His research aims at developing models for disadvantageous postures among dental clinicians and use real-time biofeedback to reduce ergonomic risks during daily practice.



Currently, Mr. Tuken has conducted a pilot study to evaluate the efficacy of this wearable sensor-based biofeedback system, which he presented at the annual meeting of the American Society of Biomechanics in Knoxville, TN. He is now extending that preliminary work by using a similar protocol with dental students in working practice. Mr. Tuken is working under the mentorship of Prof. Rachel Vitali (PhD, 2019), the director of the Human Instrumentation and Robotics (HIR) Lab in the Mechanical Engineering Department at the University of Iowa. A significant line of research in HIR Lab concerns quantifying, monitoring, and understanding human health, behavior, and performance in natural settings using wearable sensors. Mr. Tuken's project represents the critical groundwork necessary to address the needs of a relatively underserved population (i.e., medical professionals) for which qualitative survey data show are affected by a variety of musculoskeletal disorders that develop typically over years-long time scales.

Heartland Center Trainees Receive Scholarships



The Heartland Center continuing education program is seeing event attendance back to pre-pandemic levels. The Center partners with the Iowa Occupational Safety and Health Advisory Council to plan and execute the annual Iowa Governor's Safety and Health Conference. This conference attendance averages 250 OSH professionals from across Iowa. Included in those attendees are the occupational health and safety trainees from Heartland Center programs. The Iowa Occupational Safety and Health Advisory Council provides academic scholarships to both traditional and non-traditional OSH trainees. In 2022, the council awarded \$7,000 in scholarships to Heartland Center trainees, five of whom are pictured here.

Occupational Safety Trainee Characterizes the Influence of Responder Mental Models on the Quality of Radiological Dispersal Device Incident Response

Angela Leek, PhD trainee in the Occupational Safety Program, is exploring the cognitive framework of HAZMAT technicians during Radiological Dispersal Device (RDD) incidents. RDDs present a unique challenge in emergency response due to their low-probability yet high-impact nature. Angela developed a rigorous methodology for evaluating the responders' mental models concerning response to radiation and risk.

The first phase of this research utilized an expert focus group to develop an Expected Mental Model State (EMMS) for HAZMAT technicians in RDD incidents. The methodology used qualitative grounded theory to create an influence diagram architecture to conceptually capture and code key areas relevant to effective emergency response. Angela then developed an *EMMS Diagnostic Matrix* that is used to map responders' actual mental model to the EMMS and allows identification of areas where gaps in understanding or incomplete mental models exist. Implemented in conjunction with a VR-simulated RDD incident, responders are assigned a quality score that reflects their application of these principles in a response. Regression analyses then identifies relationships between any incomplete areas of the MMS and the response quality score. This approach assists in weighing the possible impact of incomplete mental models and prioritizing where to focus future targeted training.

Angela's work has a substantial impact beyond her research. Angela's mental model elicitation methodology and the associated *EMMS Diagnostic Matrix* framework offer a versatile methodology that can be adapted across various types of emergency responders and high-risk situations, including the broader chemical, biological, radiological, and nuclear spectrum or workers in hazardous occupational settings.



Award-winning Iowa-Illinois Industrial Hygiene Student Association Broadens Interdisciplinary Scope

The Iowa-Illinois Industrial Hygiene Student Association proudly received the “best student local section award” by the American Industrial Hygiene Association (AIHA) in 2021. Following this achievement, our trainees have worked with trainees collaborated with peers from related programs, broadening their membership to encompass various disciplines. This led to the formation of committees dedicated to updating the association's objectives, constitution, and name to ensure inclusivity. In October 2022, the initiative resulted in the birth of the Occupational and Environmental Health Student Association at Iowa (OEHSAI). The association regularly invites industry experts to shed light on the field and mentors to hone essential professional skills, such as personality assessments and resume-building workshops. Beyond academic pursuits, the association also emphasizes the importance of community building, encouraging interactions amongst budding professionals across the ERC and more. The current leadership includes an ergonomics trainee, Alex Barnett, serving as president; IH trainees, Holly Rowland and Emily Huber as vice-president and treasurer respectively; and Graham Siegel as the IH student representative to the national AIHA. Other key positions are held by students from the OEH and Toxicology departments.