University of Massachusetts Lowell
UMASS
Learning with Purpose

Work Environment Alumni Survey 2020: Main Findings

Administered by the Work Environment Training Program Grant (TPG) Project of the University of Massachusetts Lowell during November – December 2020

Bryan Buchholz (PI), Laura Punnett, Pia Markkanen, Lawrence Thompson, Mary Fadden

The Project is funded by the National Institute for Occupational Safety and Health (NIOSH) from the grant number T03 OH008424.

This document is solely the responsibility of the authors and the contents do not necessarily represent the official views of NIOSH.

EXECUTIVE SUMMARY

Background

During November-December 2020, the U.S. NIOSH-funded Training Program Grant (TPG) Project administered the 2020 Work Environment Alumni Survey online. The survey findings summarized in this report show the valuable legacy of the University of Massachusetts Lowell (UML) Department of Work Environment, which offered occupational safety and health (OSH) graduate education in four academic concentrations from 1987 to 2016. Graduates have become successful practitioners and researchers, designing, and promoting production and service systems that are safe, healthy, environmentally sound, and rewarding for workers and communities. The technical capacities, skills, and achievements of the Work Environment alumni demonstrate the variety of professional responsibilities that they took on and how they are solving real-life public health and engineering challenges for the greater good of the larger society.

Since 1990, the UML Work Environment traineeship programs have been continuously supported by NIOSH funding, and consequently, more than 350 students have graduated with masters or doctorate degrees. From the very beginning, the mission of these traineeship programs has been to educate professionals in the recognition, evaluation, prevention, and control of OSH and environmental hazards as well as in the management of OSH programs.

In 2016, the Department of Work Environment was merged with the Department of Community Health and Sustainability to form a new academic Department of Public Health. The Master of Science (MSc) degree in Work Environment was closed to new students in 2017 and the Doctor of Science (ScD) degree in Work Environment closed in 2020. Currently, two OSH masters-level traineeship programs continue to be supported by NIOSH TPG funding at UML: (i) a Master in Public Health (MPH) in occupational epidemiology, in the Department of Public Health; and (ii) a Master of Science (MSc) in occupational safety and ergonomics in the Department of Mechanical Engineering, through its Industrial Engineering program. These programs continue core training in these two critical fields, with extra-curricular activities that bring together students from both departments for multi-disciplinary networking and career development. The results of the current survey will inform continued programming and networking, with a continuing commitment to the TPG mission stated above.

The Goals of the 2020 Alumni Survey

The Qualtrics-based *Work Environment Alumni Survey 2020* (Appendix 1) was developed in collaboration with the UML TPG Advisory Board. The primary goals of the survey were to:

1. Inform the UML department chairs and UML administration on the (a) societal needs for work environment professionals, and (b) societal benefits offered by the Work Environment academic programs at UML; and
2. Guide the TPG Team and its Advisory Board members on how to further develop and refine the educational curricula to impact the modern workplace and identify supportive resources for the two programs where students are currently funded.

The survey will also help the TPG Team to better track and support the UML Work Environment alumni and their OSH careers.

Key Findings

The survey was distributed to 334 graduates of the Department of Work Environment whose current email information was available. A total of 159 survey responses were received, yielding a response rate of about 48%. The vast majority of graduates are currently employed in academia, government organizations, non-government organizations and a variety of industry sectors. Alumni have become certified in various OSH fields, published their work, presented in numerous OSH and environmental conferences, served in leadership positions of professional organizations and on standard-setting committees.

The vast majority (98%, n=153) of respondents think that their Work Environment degree program was a worthwhile investment. The majority reported that the program prepared them very well to:

- Develop technical competence in the recognition, evaluation, prevention, and control of occupational and environmental hazards (n=135, 86%);
- Develop analytical skills for complex problem solving through observation, using the literature, critical analysis, and interpretation of data (n=129, 83%);
- Understand the importance of the moral, ethical, legal and professional responsibilities of occupational and environmental health and safety (n=109, 70%);
- Apply new skills to address emerging issues in health, safety and well-being in the workplace and general environment? (n=103, 67%);
- Work in collaborative teams to analyze and solve complex occupational and environmental health and safety problems (n=100, 64%); and
- Use effective oral and written communications to interact with technical and lay audiences around occupational and environmental health issues (n=85, 54%).

Conclusions

Training of future OSH professionals must continue. Work Environment traineeships at UML have resulted in numerous remarkable OSH career pathways to protect the workforce in the United States and other countries. Networking within the Work Environment alumni community is an essential, on-going resource for current trainees and those who are thinking of embarking on the OSH career path. While the current Work Environment training program is evolving into new forms, the qualities and value of the Work Environment legacy still exist in its alumni community network to support new members and students moving forward as OSH professionals.

Acknowledgements

The TPG personnel acknowledge the collaboration and assistance of (i) Natalie Brouillette for analyzing the survey data, (ii) Michael Sample for drafting the survey context and questions for the review of the entire Advisory Board, and (iii) Jon Boyer for peer-reviewing the final version of this report.

We thank all of the TPG Advisory Board members for their valuable comments, feedback, and support to develop the Alumni Survey in its final form. Current Advisory Board members are: Karla Armenti (co-chair), Marvin Lewiton (co-chair), Leslie Boden, Jon Boyer, Anthony Campana, Joel Garrett, William Lovely, Michael Sample, William Shaw, Emily Sparer-Fine, Jodi Sugarman-Brozan, and Helen Wellman.

Finally, we appreciate the funding support from U.S. NIOSH (grant # T03 OH008424).

Work Environment Alumni Survey 2020: Main Findings

Survey respondents and their satisfaction with the Work Environment graduate program

The survey was distributed to 334 graduates whose current email information was available. In total 159 survey responses were received, yielding a response rate of about 48%.

Figure 1 describes the percent distribution of Work Environment academic programs/concentrations from which the respondents graduated. Across this broad mix of degree programs, the vast majority (98%, n=153) think that the Work Environment program was worthwhile (Figure 2).

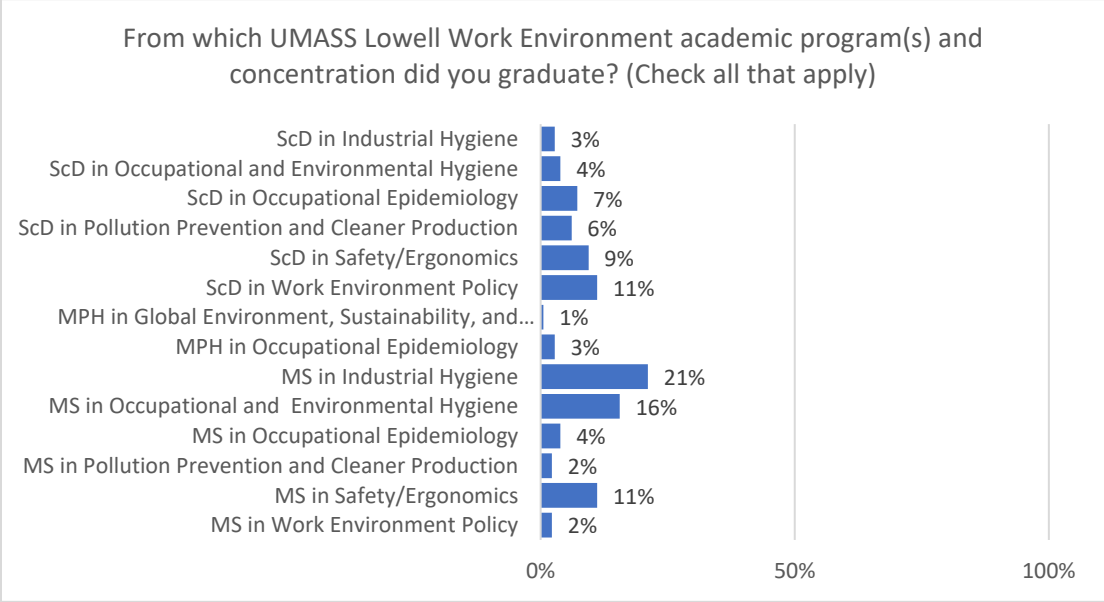
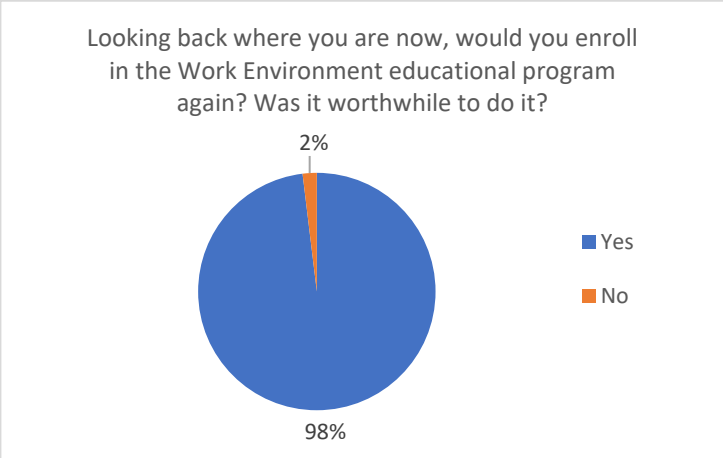


Figure 1: Percent distribution of Work Environment academic programs and concentrations reported by survey respondents (n=159).

Figure 2: The vast majority of respondents (98 %, n=153) reported that Work Environment program was worthwhile for them to do.



Employment of the survey respondents

Figure 3 shows the percent distribution of sectors where the survey respondents are currently employed. About 96% of respondents reported being currently employed (n=152), 3% retired (n=4), and 1% students (n=2). None of the respondents reported being unemployed; one response was missing.

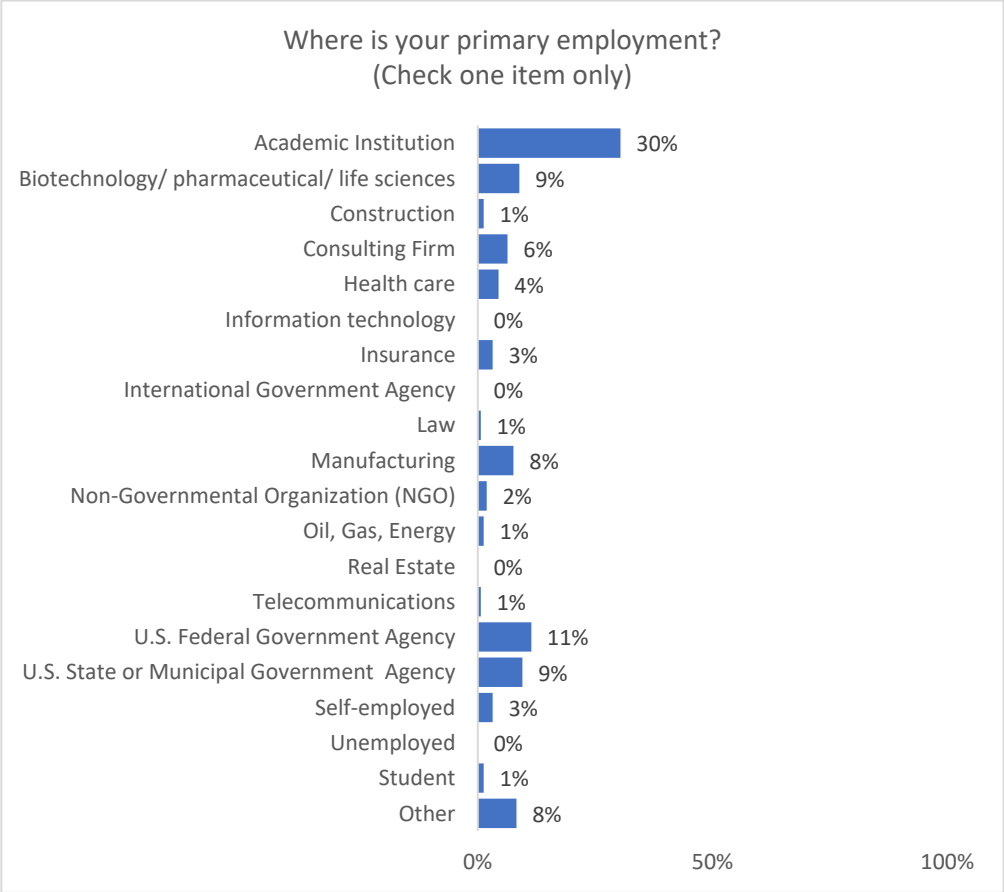


Figure 3: Percent distribution of sectors where survey respondents are employed.

An open-ended question about respondents' job title and duties also revealed a broad mix. Some reported work as professors or researchers. Many were OSH/EHS practitioners/specialists/ professionals/management or consultants related to IH or ergonomics. Some indicated epidemiology/risk assessment work.

Professional certification of survey respondents

At the time of the survey administration, about half (48%) of respondents had either earned or were in the process of earning a professional OSH certification (Figures 4 & 5 below). Of those who had earned a certification (n=80), 51% were certified industrial hygienists (CIH), 38 % were certified safety professionals (CSP), and 7% were certified professional ergonomists (CPE). Obviously, multiple certifications can be held by the same individual.

Figure 4: Certification status of survey respondents (n=151), 8 missing responses.

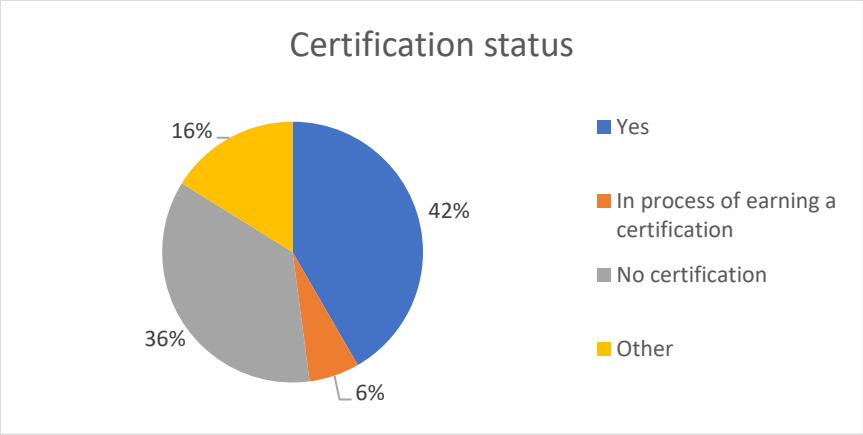
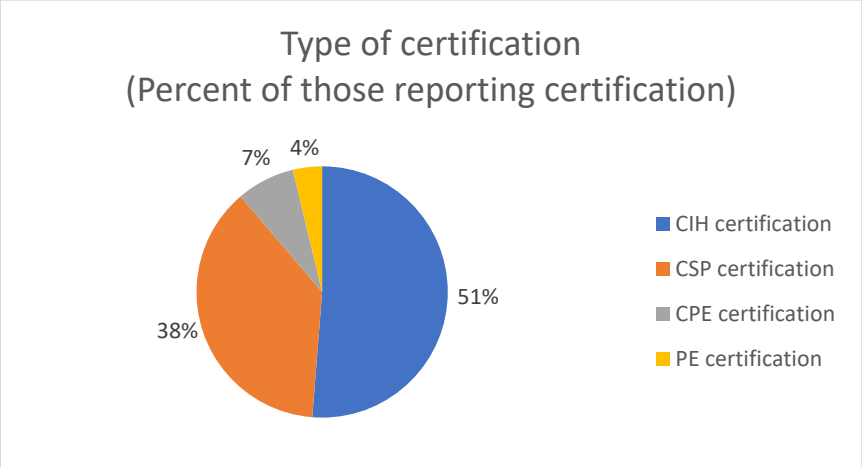


Figure 5: Type of certification held by respondents (n=80).



For Figure 4, "other" certifications (n=31, 16%) had a tremendous range, from one-week courses to additional post-graduate degrees. Most but not all were in or related to their Work Environment training. They included: law and medical degrees, licensed physical therapist, Registered Sanitarian and Certified Soil Evaluator, 40 Hr. HAZWOPER, GSP, LEED Green Associate, Certified Rehabilitation Counselor, Certified Laser Safety Officer (CLSO), Healthcare Environmental Manager (HEM), REHS/RS, Six Sigma Yellow Belt, DOT/IATA Transportation/waste management, Certified Hazardous Materials Manager (CHMM), Certificate in Sustainable Development, Registered Biosafety Professional (RBP), certified composting professional by the US Composting Council (CCP), Environmental Consultant (to the State EPA in Mexico), Teaching Credential, Occupational medicine, instructor of training courses/hazardous waste management, Korean CIH (formally, PE on Industrial Hygiene in Korea).

Publications and presentations by survey respondents

About 62% of respondents (n=106) reported making an oral presentation or publishing a poster at a professional OSH conference during the past 5 years (Figure 6). The most frequently reported conference was the American Public Health Association (APHA) annual meeting (13%, n= 22).

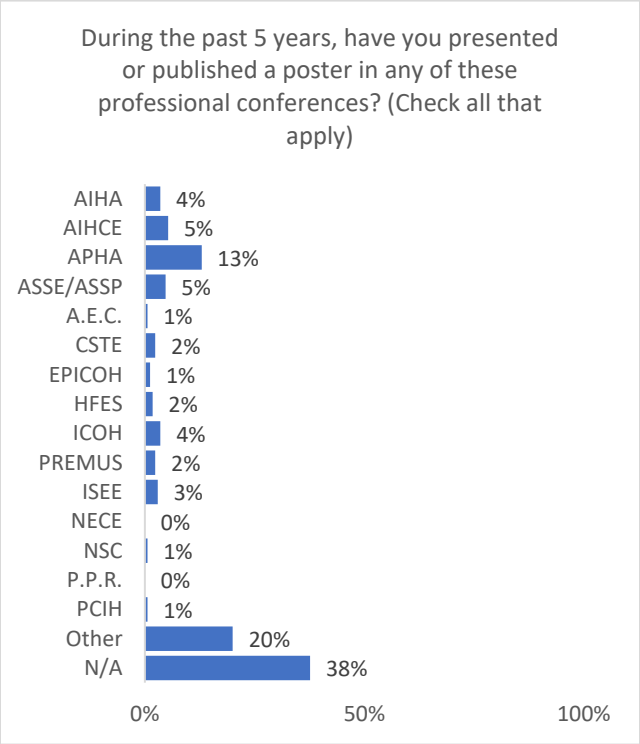


Figure 6: Presentations or poster publications in professional conferences by survey respondents (62%, n=106).

Slightly more than one-half of respondents reported publishing any peer-reviewed articles, book chapters, or other work during the past five years.

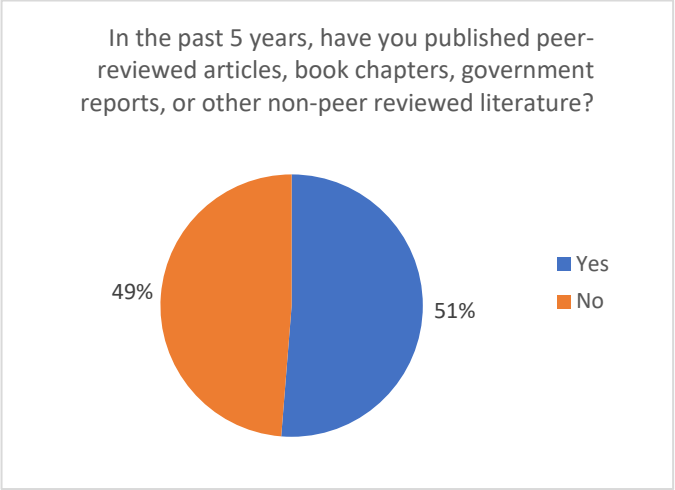


Figure 7: Any publications in the past 5 years by survey respondents (n=81, 51%).

For Figure 6, "other" conferences (n=34, 20%) included a variety of national and international conferences: Massachusetts PT Association, NEHES, MASHP, ASHP, Society for Epidemiologic Research, ASHRAE Conference, International Symposium on Alternatives Assessment, ChemWatch Global Business Forum; Helsinki Chemicals Roundtable, VA/DOD Suicide Prevention Conference, National Council for Science and Environment (NCSE), (Sustainable Consumption Research and Action Initiative (SCORAI), ACS (American Chemistry Council) Annual Meeting, World Conference on Lung Cancer, American Heart Association's Epi Lifestyle Conference, Society of Petroleum Engineers, SER and AACR annual meetings, Association of Canadian Ergonomists National Conference, ISPOR, other medical conferences, Solid Waste Association of North America (SWANA), Saudi Arabia environmental forums, International Conference on the Marine Environment of the Red Sea, IEEE-HST, International Society for Occupational Ergonomics and Safety (ISOES), Society for Chemical Hazard Communication (SCHC) and American Chemical Society (ACS), Scottish Hazards, American Physical Therapy Association, Midwest Political Science Association Annual Conference, National Environmental Health Association, NSC Local Chapter Annual Conference, World Conference on Tobacco or Health, and NIOSH Work, Stress and Health.

Leadership in professional OSH organizations & active membership in OSH standard committees

About 46% survey respondents had held a leadership position in a professional OSH organization (Figure 8). The most commonly held leadership positions were at American Industrial Hygiene Association (AIHA, n=18, 13%) and American Society of Safety Engineers/Professionals (ASSE/ASSP, n=11, 7%).

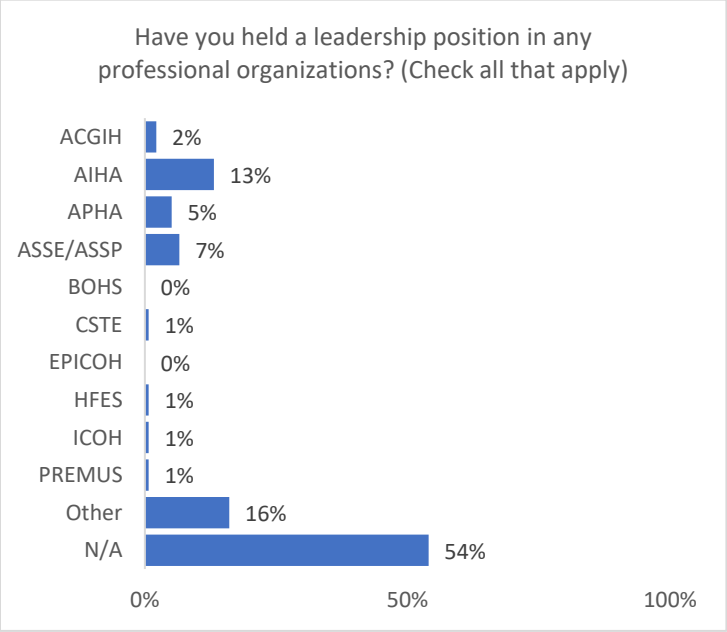


Figure 8: Leadership positions held in any professional OSH organizations by respondents (n= 63, 46%).

Eleven (7%) of respondents held active memberships in OSH standards committees (Figure 9).

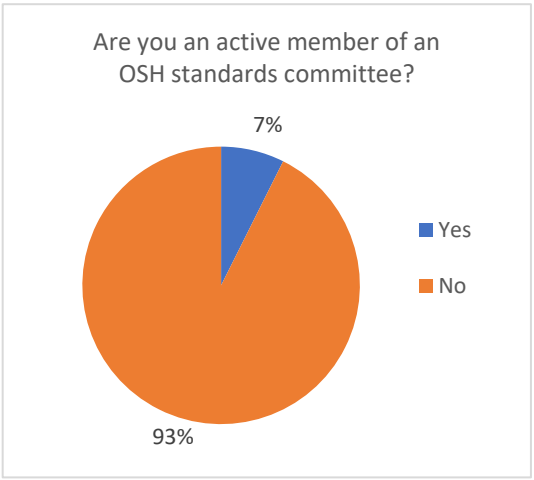


Figure 9: Active OSH standards committee membership status.

For Figure 8, other professional organizations for leadership positions (n=22, 16%) included a variety of local, regional, national, and international bodies: ASHRAE/Chair of TC 5.8/ Voting Member TC 9.2, Association for the Advancement of Alternatives Assessment, International Society for Environmental Epidemiology, ASPPH, SCORAI, International Conference Organizing Committee Member 2020, New England Local Section of AIHA (NEAIHA), Society for Epidemiologic Research, American Association for Cancer Research, ABSA Pharmaceutical Biosafety Group, NEBSA, Northeast Recycling Council, Environmental Business Council of New England, International Society of Exposure Science, Genesee Valley Safety Conference Executive Board, ABET, American Electroplaters and Surface Finishers Society, American Physical Therapy Association, NGO for social justice, Housing Education and Research Association, A vice-president of Korea Industrial Hygiene Association and a vice-president of Korean Society of Respiratory Protection, Product Stewardship Society through AIHA.

For Figure 9, answers included such standards committees as: NFPA 664, USACE Safety, NFPA 350 Technical Committee, BioPhorum, ISO 37101, ASSP Educational Standards Committee, AIHA Legal Issues Committee, Respiratory Protection Committee, Construction Committee, Teen H&S Issues Task Force, APHA, National secretary of Korean National Mirror Committee of the ISO/TC146/SC2 (Workplace atmosphere) and a member of Korean National Mirror Committee of the ISO/TC159 (Ergonomics), ANSI/ASSP A10.50 Heat Stress in Construction and Demolition, and ACGIH Chemical TLV Committee.

Importance of current or emerging OSH topics as rated by respondents

Survey respondents were asked to indicate all of the topics that they saw as important current or emerging OSH topics for their current job positions. Of the 23 topics offered on the list, five were endorsed in the high (>60) category. Eight topics were included in the medium (40-60) category and 10 topics were included in the lower (<40) category. The five topics in the "high" category were occupational safety (n=76), human factors/ergonomics (n=71), emergency preparedness (n=69), infection control and prevention (n=67), and industrial hygiene (=66). (Please note that this survey was distributed about 8 months after the beginning of the international COVID-19 pandemic.)

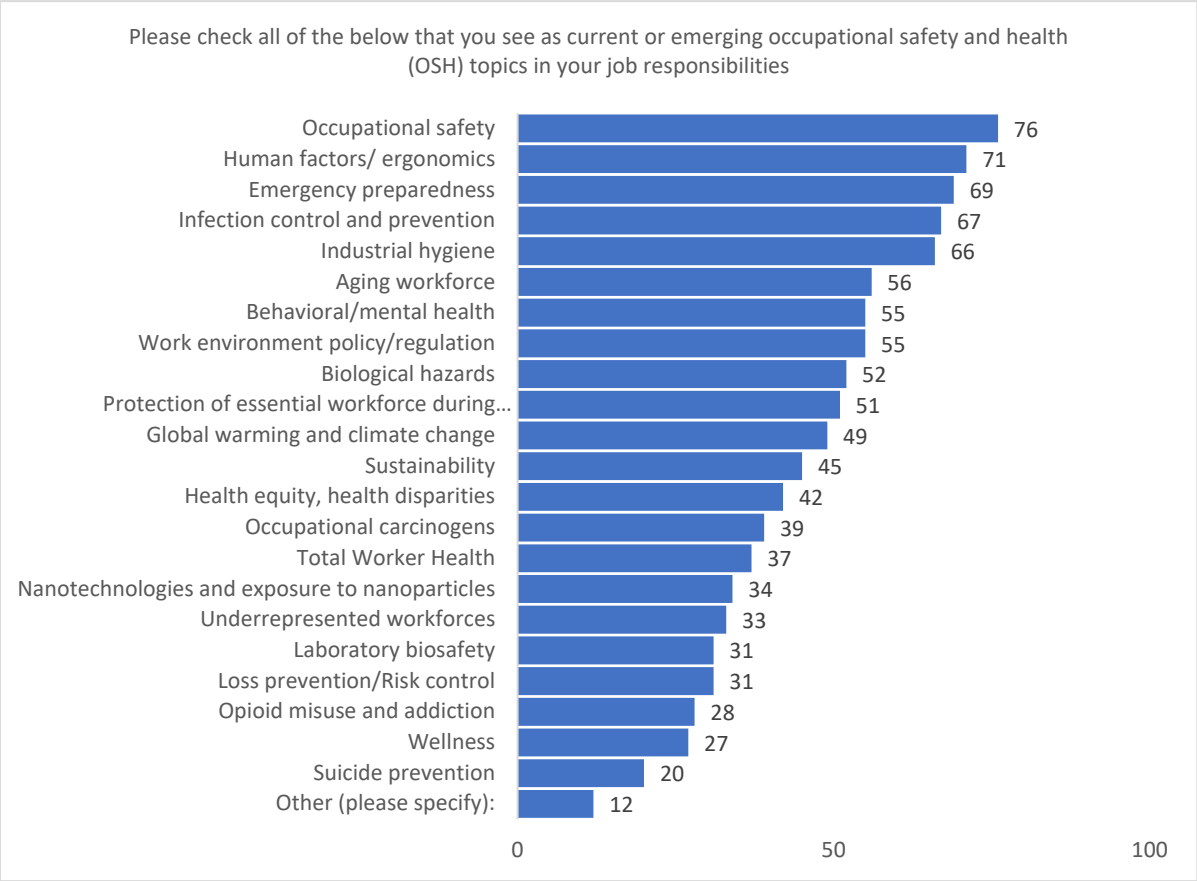


Figure 10: Counts for importance of current or emerging topics as rated by survey respondents.

The "Other" category (n=12) included topics such as work stress, work organization, Toxics Use Reduction and use of alternative cleaning & disinfecting products, temporary workers, subcontractor miscommunication, "exposomics," novel/highly potent pharmaceuticals, workforce resiliency, psychosocial work environment and migrant workers, exposure hazards (e.g. occupational mutagens, endocrine disruptors, reproductive toxins, neurotoxins, developmental toxins), violence prevention/firearms, respiratory protection, and patient protection.

Value of OSH skills and further training ranked by survey respondents

The survey respondents were asked two questions to rank (i) skills for current job demands and future job needs and (ii) own desired further training and preparation. The results for these questions need to be interpreted with caution because there were a significant number of missing responses (38%, n=60). (Many unfortunately experienced technical difficulties in answering, ranking, or typing open-ended responses.)

The skills ranking question was stated as follows: "*If you are (or might be) in the position of hiring a technical staff person, what would be your highest priorities for their qualifications to meet current job demands and/or future needs? Please rank any or all of the priorities, starting to rank them from 1 as most important down to 11 as least important*." Because of the significant number of missing responses and complexity in ranking them, the data for this question are still being analyzed. From the available data, the qualifications most frequently ranked as the highest priority included the: occupational hygiene skills, safety skills, experience interacting with workplaces and working professionals, and risk assessment skills (Figure 11).

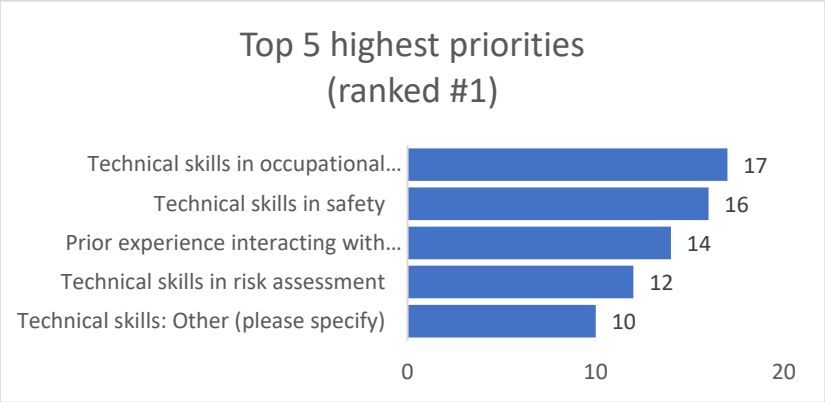


Figure 11: Top 5 highest ranked OSH skills/ qualifications. Other category included a number of technical skill areas.

The second question in this section was: "*If you were to seek out any further training or preparation, what would you be most likely to look for? Please rank any or all of the priorities, from 1 as most important down to 9 as least important*." Again, there were significant numbers of missing responses, and the data for this question are also still being analyzed. The most frequently prioritized training/preparation types were certification test preparation/CEU offerings, on-line courses, working with an OSH mentor, training in business/organizational communication, and internships/job placements (Figure 12).

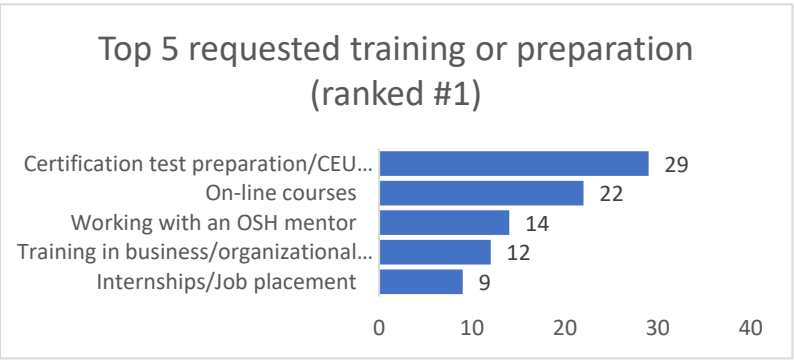


Figure 12: Top 5 ranked training or preparation opportunities. A significant number of responses were missing for this question.

How well the Work Environment academic program prepared students

The survey asked the following question for 7 different areas: "How well did the Work Environment academic program and concentration prepare you for the following?" (Answer options included Very Well, Moderately Well, Not Well).

These different areas most frequently rated as "Very Well" included:

(1) Develop technical competence in the recognition, evaluation, control, and prevention of occupational and environmental hazards (n=135, 86%);
(2) Develop analytical skills for complex problem solving through observation, using the literature, critical analysis, and interpretation of data (n=129, 83%),
(3) Understand the importance of the moral, ethical, legal, and professional responsibilities of occupational and environmental health and safety (n=109, 70%);
(4) Apply new skills to address emerging issues in health, safety and well-being in the workplace and general environment? (n=103, 67%);
(5) Work in collaborative teams to analyze and solve complex occupational and environmental health and safety problems (n=100, 64%); and
(6) Use effective oral and written communications to interact with technical and lay audiences around occupational and environmental health issues (n=85, 54%).

The question area with the lowest rating was "to engage in continuing education to include specialty training, earning professional certifications, and reading professional literature." This area was scaled as "Very Well" by 46% of respondents (n=70), "Moderately Well" by 43% (n=66), and "Not Well" by 10% (n=16).

The most valuable experiences in the Work Environment academic program

The second-to-last item of the survey was the following open-ended question: *During your time in the Work Environment academic program, what was your most valuable experience for your current role*? The below table shows five main themes with subthemes, as coded by the survey administrator, and the open-ended survey responses.

Main theme	Subthemes	Open-ended survey response report related to valuable experiences
1. Sense of community within Work Environment academic program	Professors, mentors, advisors, staff, peers	I had a strong advisor who challenged me, pushed me. I am very glad I was working full-time in IH when I attended UML.
		Studying under Professors that are pillars in the field of Occupational and Environmental Hygiene
		Being surrounded by some of the most knowledgeable and innovative thinkers and researchers in the field - learning from this novel interdisciplinary group that sought solutions to problems rather than only how to live with problems
		The faculty engaged with the students as peers and co-educators. As a result the education was very robust because it brought together the perspectives of highly-skilled faculty, students who held professional jobs and offered the frontline work perspective, and full time students who added their academic views.
		Broad training with faculty and students with advanced knowledge of different aspects of OHS.
	Networking with adjunct faculty	Completing an internship during my MPH degree. This first-hand experience with a government agency allowed me to learn the ins and outs of occupational epidemiology.

Main theme	Subthemes	Open-ended survey response report related to valuable experiences
	or industry professionals; access to resources or experiences	The networking I received from Dr. Kriebel was extremely valuable to my career experience.
		Going to school with working professionals who brought a lot of life experiences and examples to the courses.
		The networking and learning from others' careers, teambuilding, and overall open learning environment.
		Meeting, interacting, and collaborating with other EHS professionals
		Networking and developing lasting professional connections in my profession.
	Diverse, multi-cultural, international student body and faculty	The varied staff and students at the University. Excellent experience with international students, and well qualified staff from high-level, well-respected Universities nationally.
		The diversity of academic and professional background of both, faculty and students, as well as their multi-cultural background, was interesting to understand a simple concept with diverse point of views
	Creating connections	Creating connections with people at UML who I continue to work with
		Small classroom settings and personal connections with the staff
2. Hands-on, practical experience in academic program	Research, Capstone projects, dissertation studies	The capstone and practical experience were most important for me, the capstone allowed me to dive deep into a subject of importance, apply several different principles of knowledge, and utilize organizational and public speaking skills amongst my peers. The practical knowledge of working in the IH lab and going into the field prepared me for real life risk analysis and audits.
	Field work and industry experience	Field work and hands on training. Going to other workplaces and acting as industrial hygiene "consultants" was a very valuable experience. Experiential learning makes theory come to life and makes a lasting impact in the student's knowledge bank.
	Research assistant and/or teaching assistant positions	Working as a research assistant on an ongoing research project by doing data analysis and helping with manuscript preparation.
		Hands-on work as a Research Assistant where I learned how a research study runs, spanning from the application process all the way to publishing findings.
	Conferences, forums, seminars, *etc*.	Policy forums and discussions
		Dissertation advising from advisor and committee; opportunities to engage in discussions at department sponsored talks and events
		Courses in epidemiology and risk assessment. Hearing from professionals from various Agencies during brown bag lunches helped to provide context while learning.
		to have a profound understanding of the research area through mentoring from professors; attendance of department seminars, regional and national conferences; and interaction with students and visiting scholars from different backgrounds.
3. Courses and relevant coursework	Total-worker or macro-approach; exposure and risk combined	Learning about the human side of IH/OH work -- how what we do affects the workers personally and how we can help them holistically.
		All the classes and how everything interacts. In other words, talking about exposure without an understand of toxicology would be lost. I can't tell you how many times I have to explain dose response factors to people at work and how it works.
	Multi-discipline approach	To think across disciplines because occupational risks are always interrelated
		To learn interdisciplinary approaches to solving complex problems.
		Critical analysis of themes I saw at work but benefited from a different perspective. Learning about the history of workers compensation improves how I manage that topic. Understanding activism on toxic substances issues benefits how I manage that topic
		Inter-disciplinary approach of Work Environment was the key, e.g. looking work environment from policy, technical, wellbeing, community links, as well as health and sustainability elements.

Main theme	Subthemes	Open-ended survey response report related to valuable experiences
	Focus on long-term solutions rather than short-term	The knowledge of how to assess issues from a wide preventative perspective rather than just implementing short term reactionary solutions.
	Emphasis on building models	Courses that emphasized building models to represent how workers react to workplace stressors, allowing for variability in the response within and between workers, to assess risk.
	Accumulative courses	Cumulative build up to capstone
4. Technical skills	Data collection; data analysis; reporting findings	The most valuable experiences were the application of lecture materials in facility and/or lab assessments and projects that involved compiling the data collection and results in reports with presentation/discussions of the findings.
	Laboratory and sampling experience	Going out and seeing different types of work environments. Learning to use sampling equipment and other hands-on exercises.
	Writing skills	Writing skills in grant writing and analytic skills in study design
		Developing skills as a writer.
	Applying skills in field work or public policy	Applied science, solving real world problems
	Analytical thinking, information synthesis	My epi and quantitative courses prepared me to think critically and problem solve. They taught me to think about what I've learned about a problem, what it might mean, and what comes next.
	Critical review of scientific literature, standards, *etc.*	Critical review skills to review epi studies, risk assessments, etc.
		Reviewing OSHA programs/documents/Standards
	Public speaking	The capstone and practical experience were most important for me, the capstone allowed me to dive deep into a subject of importance, apply several different principles of knowledge, and utilize organizational and public speaking skills amongst my peers.
5. Tangible results	Career	My most valuable experience with the work environment program was the Capstone class where we found an internship and worked on a specific research project. My internship with Mass DPH gave me the experience that I needed to find a job after graduation and also exposed me to the research process. This experience was invaluable.
	Peer-reviewed publications	Working on a subject area topic related to my job that lead to peer reviewed publications.
	Preparation for real-life work scenarios	presenting health information and risk assessment strategies to construction employees as part of the COHP. Learning to interact w people who are not interested in your primary purpose is good preparation for future challenges.
6. Summary of experience	Example of the multi-disciplinary approach utilized in the WE program	Many. Working on the Construction Occupational Health Project (Buchholz, Punnett, Moyer, Paquet, Kummar/Kittusamy) exposed me to utilizing risk quantification tools (i.e. PATH). Classroom/lab exposure to risk quantification tools still used today: RULA, REBA, OWAS, Keyserling time studies, etc. I gained experience with leading a Methods in Work Analysis lab with MS and PhD students. Began the foundation of understanding the cognitive aspects of work with Karasek's worker level of demands and control. Also, appreciated a deep introduction to industrial hygiene methods which complements a larger conversation with clients and their occupational exposures. (Woskie). And the introduction to how important data (exposure, injury, epidemiological, etc.) would be in my coming career. Finally, an appreciation for the academic world and institutions that work behind the scenes so practitioners can apply findings with organizations and thousands of workers.

Missing elements in the Work Environment academic program

The last item of the survey was the following open-ended question: *During your time in the Work Environment academic program, what element was missing that could help you in your current role*? The below table shows four main themes with subthemes as coded by the survey administrator, and open-ended survey responses.

Main theme	Subthemes	Open-ended survey response report related to missing elements
1. Job skills and career placement	Internship	A formal internship program. I ended up finding my own, which was incredibly helpful both in terms of knowledge gained and professional connections. I stated at the time, and still believe that an internship should be a required element in any occupational health and safety degree program. Classroom instruction is essential, but can only go so far- students need to see how that information relates to the real world
		An internship program that's a formal part of the curriculum. I was able to obtain one by myself, and found it to be incredibly helpful, both in terms of gaining technical knowledge and personal connections for the future. Formal classroom instruction is essential, but I believe that students, particularly those with limited expertise in the field, need to gain some real-world experience in order to perform well following completion of the program.
		Internship opportunity/work in an industrial or manufacturing environment
		I wish there had been co-ops for 6 months at a specific company or organization that could then turn into the capstone report/project. If someone was interested in continuing and staying in the academic research field, they could then choose that option for research.
	Networking	Industrial Hygiene leads and connections. We continually could use help with industrial hygiene experience professionals.
		Clear outward visibility of young researchers, I hope this has improved. Walking out of a programme with exceptional technical skills is one important achievement of the programme. Ability to assist a new generation of researchers become networked and visible within the scientific and policy community is another important aspect I thought the programme could have some more during my time.
	Conferences	More exposure to/discussion on opportunities w/ professional conferences, abstract deadlines. I did not often hear about any activity around this topic in class or at the beginning of class as a quick plug to students.
	Job placement	Job placement.
		Better support with job search/career advancement.
		Assistance with finding relevant jobs to apply for after graduation.
		During my studies, the program did not have "career conversations" but I understand it was implemented in the program later on which is good.
		If I were to be critical, maybe a greater exposure to career opportunities related to these disciplines. Maybe a few sessions by other guest speakers that work in industries that apply the solid baseline knowledge obtained. I.E. insurance industry, private consultants, government program leaders, etc. Also, for most students with a health background, we were not traditionally exposed to data analysis tools, methods, software, etc. like students with engineering degrees. Thus, if there was an intro class relative to data tools, it could help get health background students more comfortable. That was 20 plus years ago so maybe health curriculum's have changed.
		I wished I could have received more help about job searching and networking.
	Hands-on experience	More opportunities to get hands on experience in ergonomic worksite analysis.
		Provide more training for the students to use the most advance instrumentation in the field of OEH. Provide more practical training for the students (e.g. visits to workplaces, writing reports...)
		More applied work in the field/experience with experts in the field
		Professors had limited real world exposure in a work place setting.

		More lab work
		I could only suggest utilizing more IH equipment, and also accounting principles for preparing department budgets.
		I think the topic of "Managing or Selling Safety Issues" was missing from a ground level (i.e. site level or department level). I would have like to learned about organization structures or even scenarios (i.e. mergers, fear of layoffs or outsourcing, or budget crisis) and the issues that may make selling safety solutions difficult.
		only one course in research methods...wish I had the option to learn more.
	Translation of skills to careers	trying to help people who do not want to be helped
		Application to the business world
		Risk assessment/hazard assessment/ Root cause analysis How Safety translates to the Business/additional business acumen
		Relationship of politics, economics, and media on environmental/occupational health & safety.
		more training on how to make business case for EHS
		Corporate politics; budgeting; interacting with regulatory agencies;
		Interpersonal communications skills, I.e., how to present/convince people of your ideas
		I failed at succession planning, but it was a good hard lesson. I have succeeded in developing the leaders to successfully succeed me in the three projects I have built since then.
		communication skills to overcome setbacks
	More emphasis on technical skills	There was a lot of emphasis on policy and not much on the technical skills, particularly analytical or writing skills. And the few classes that had technical focus were myopic and seemed to prepare students for a career in government or academia - definitely not consulting. Expectations and grading were very lenient, which was surprising. I have hired a few graduates from the program (currently one is on our team) and their technical skills (analytical, writing and fundamental IH sampling) were subpar. I wind up paying someone with a MS and getting someone with very little value for two years as they are trained up.
		More publishing opportunities.
		Training in creating public outreach materials for lay audiences.
		Presenting study results to a medium to large audience.
		More skills in quantitative analysis programs. SAS, R, Stata etc.
		Written communication skills are very important in my role. There could be more emphasis on writing short/concise technical reports.
		More data analysis experience. As a person that hopes to be an epidemiologist, I felt there was a lack of practice with learning SAS.
		Writing for journals/publications/ or presentations
		Writing research papers
		More practice with technical writing, summarizing key points of studies. Basically, learning how to quickly recognize the most important aspects of literature being reviewed.
		A variety of report writing was missing. In my current job now no client wants a 15 page paper. Having more realistic assignments that reflect current industry standard would've been helpful. To have a breath of different writing styles, It felt very academic heavy.
	Publishing	Number of publications. Due to small size, I had rare opportunity to publish papers as a group compared to top schools. Some of my students publish 5-10papers when they graduate because there are many opportunities to join research.
		To provide better elements (training, courses) on how to publish articles in scientific journals in a more systematic way.
		Peer review article Publication as a requirement for Doctoral students
2. Critiques related to	Format	Online classes
		I also would have enjoyed having classes earlier in the day, as al the classes I took occurred during late afternoon/evening.

courses or teaching	Disconnect between course information and industry experience	The professors had a lot of really dated information. A lot of the students were currently in the field, keeping up to date with the latest news. We can easily notice when slides have not been updated in 10 years- and that is not good.
	Emphasis on specific field of study	Heavier ergo emphasis.
		The ability to do more field work in a specialty area like ergonomics
		the biggest regret I have had is that the policy major never taught us how to do any sort of actual policy analysis or evaluation. what we learned about policy making was extremely valuable, but I never learned the technical skills involved in analyzing the impact of a proposed policy (analysis) or the impact of a policy that has been implemented (evaluation). these are really important things that someone working in policy should know how to do.
		Any overviews of related Safety program like- fall protection, confined space, electrical, machine guarding, life safety, or IEQ assessments
		The program is light on biostatistics. I recommend a total of seven or eight three credit classes on biostatistics and related topics (excluding epidemiology classwork).
		Biosafety. I feel like I had no relevant biosafety coursework.
		There should be a course on EPA, OSHA, MA, NH, RI & CT regulations. There should be at least one lesson in a core course on being prepared for and how to react to a regulatory inspection. Maybe a Biosafety elective.
		The biostatistics training I received was very good; but I feel I could have benefited from more advanced biostatistics courses, particularly in the area of high dimensional data analyses.
		More course work in environmental and safety management.
		As an Epidemiologist, I would of liked to have spent more time learning about different infectious diseases, disease transmission, and infection prevention. This is something that I had to teach myself in my current role.
		Additional psycho-social epidemiology skills
		More business learning skills for the industrial hygiene profession. I had to go to Business School to learn these.
		More safety and ergonomic related studies. Industrial hygiene is a very specific field. In my experience, you are limited to consulting.
		In the risk and exposure assessment class, we learned a lot about the process of exposure assessment, and it would have been great if we'd had more time to delve into the pitfalls of risk assessment as well. Just a little more course material on this topic would be helpful, I think.
		More hands-on classes, and the professors need to make teaching as much of a priority as their research. There was one professor that we didn't get anything back until the last day of class, yet they gave us grades on our site visit assessments as if we had been getting feedback from him throughout the course; that was very frustrating considering all the students had looked forward to improving their site visit assessment reports. I learned more at my hands-on job. Had I been paying it out of pocket instead of gaining my education as a Research Assistant. More engineering courses on cleaner production, the TUR planner course, and biochemistry.
	Connection between environmental and public health	Environmental health as it relates to public health (septic systems and the direct impact they have on basic health, water quality, etc)
	Addressing care/service workers	More focus on care workers, service sector employment in social services and social work
	Preparing for certification	Certification prep (CIH & CSP)
	Lack of connection	More opportunities for student-led activities involving all graduate students in Work Environment, not subgroups in EPI, IH and Policy.

	between students of different concentrations	Intersectionality between the different concentrations
		Respect from others/peers
		More interaction across the subpopulations of the dept.
3. Ongoing learning	Continuing education	I would like to have some refreshers about some of the topics and courses to review them again and have more meetings and hangout with our instructors again at university.
		Information on how to conduct worker interviews to gather qualitative data. The basics were covered, such as the importance of speaking with workers and getting their input and perspective, but I could benefit from an overview or seminar on the specific "dos and don'ts" when obtaining interview data for qualitative analysis. Perhaps a single explanation in online video format given by a WE professor may be a viable option? I am open to continued education if professors want to send out short "refresher" videos or updates on current topics.
4. Organization of the WE department	Structural organization of academic program within UML	That's a good question. It's been 14 years since I received my degree, and I only look back on my memories and experiences at Lowell as overall, positive. Maybe the one item that comes to mind is the School's affiliation with Degrees they award. I was in the middle of the transition where my degree could either come from the School of Engineering or School of Work Environment. I picked Engineering, because that was the specialty of my degree. I liked that there was a choice. I'd pick the School of Engineering over again if given the choice, because that is the School that gives me the appropriate recognition for my current field of practice. Maybe that could be retained. That sounds like a logistical nightmare for an administrator of the SWE, but I found it fantastic.
	Dissolution and reorg. of WE department	I was sad see the program downsize and ultimately be eliminated by Dean McKinney.
		The program was more than adequate for my needs. I am deeply disappointed in the failure to maintain the ABET approved IH program and would not currently recommend young professionals to the UMASS Lowell Work Environment program if they were interested in occupational hygiene.
		The Department of WE should have developed an UG graduate to help ensure that it would maintain its viability as a department into the future. The dissolution of the department and reorganization is not helpful to me as I work in my current role.

Appendix 1: 2020 Work Environment Alumni Survey

Q1 From which UMASS Lowell Work Environment academic program(s) and concentration did you graduate? (Check all that apply)

- ☐ Doctor of Science (ScD) in Industrial Hygiene (1)
- ☐ Doctor of Science (ScD) in Occupational and Environmental Hygiene (2)
- ☐ Doctor of Science (ScD) in Occupational Epidemiology (3)
- ☐ Doctor of Science (ScD) in Pollution Prevention and Cleaner Production (4)
- ☐ Doctor of Science (ScD) in Safety/Ergonomics (5)
- ☐ Doctor of Science (ScD) in Work Environment Policy (6)
- ☐ Masters of Public Health (MPH) in Global Environment, Sustainability, and Health (GESH) (7)
- ☐ Masters of Public Health (MPH) in Occupational Epidemiology (8)
- ☐ Masters of Science (MS) in Industrial Hygiene (9)
- ☐ Masters of Science (MS) in Occupational and Environmental Hygiene (10)
- ☐ Masters of Science (MS) in Occupational Epidemiology (11)
- ☐ Masters of Science (MS) in Pollution Prevention and Cleaner Production (12)
- ☐ Masters of Science (MS) in Safety/Ergonomics (13)
- ☐ Masters of Science (MS) in Work Environment Policy (14)

Q2 Where is your primary employment? (Check one item only)

- ○ Academic Institution (1)
- ○ Biotechnology/ pharmaceutical/ life sciences (2)
- ○ Construction (3)
- ○ Consulting Firm (4)
- ○ Health care (5)
- ○ Information technology (6)
- ○ Insurance (7)
- ○ International Government Agency (8)
- ○ Law (9)
- ○ Manufacturing (10)
- ○ Non-Governmental Organization (NGO) (11)
- ○ Oil, Gas, Energy (12)
- ○ Real Estate (13)
- ○ Telecommunications (14)
- ○ U.S. Federal Government Agency (15)
- ○ U.S. State or Municipal Government Agency (16)
- ○ Self-employed (17)
- ○ Unemployed (18)
- ○ Student (19)
- ○ Other (please specify): (20) _____

Q3 What do you do in your job? Please give your job title or a brief general description of your work.

_____

_____

_____

Q4 Have you earned any professional certification? (check all that apply)

- ☐ CIH (Certified Industrial Hygienist) (1)
- ☐ CSP (Certified Safety Professional) (2)
- ☐ CPE (Certified Professional Ergonomist) (3)
- ☐ PE (Professional Engineer) (4)
- ☐ I am in process of earning a certification (5)
- ☐ No certification (6)
- ☐ Other, please specify: (7) _____

Q5 In the past 5 years, have you published peer-reviewed articles, book chapters, government reports, or other non-peer reviewed literature?

- ○ Yes (1)
- ○ No (2)

Q6 Have you held a leadership position in any professional organizations? (Check all that apply)

- ☐ American Conference of Governmental Industrial Hygienists (ACGIH) (1)
- ☐ American Industrial Hygiene Association (AIHA) (2)

- [ ] American Public Health Association (APHA) (3)
- [ ] American Society of Safety Engineers (ASSE)/ American Society of Safety Professionals (ASSP) (4)
- [ ] British Occupational Hygiene Society (BOHS) (6)
- [ ] Council of State and Territorial Epidemiologists (CSTE) (7)
- [ ] Epidemiological Section of ICOH (EPICOH) (8)
- [ ] Human Factors and Ergonomics Society (HFES) (9)
- [ ] International Congress of Occupational Health (ICOH) (10)
- [ ] International Scientific Conference on the Prevention of Work-Related Musculoskeletal Disorders (PREMUS) (11)
- [ ] Not Applicable (13)
- [ ] Other, please specify: (12) _____

Q7 During the past 5 years, have you presented or published a poster in any of these professional conferences? (Check all that apply)

- [ ] American Industrial Hygiene Association (AIHA) (1)
- [ ] American Industrial Hygiene Conference and Exposition (AIHCE) (2)
- [ ] American Public Health Association (APHA) (3)
- [ ] American Society of Safety Engineers (ASSE)/ American Society of Safety Professionals (ASSP) (4)
- [ ] Applied Ergonomics Conference (6)

- ☐ Council of State and Territorial Epidemiologists (CSTE) (7)
- ☐ Epidemiological Section of International Congress of Occupational Health (EPICOH) (8)
- ☐ Human Factors and Ergonomics Society (HFES) (9)
- ☐ International Congress of Occupational Health (ICOH) (10)
- ☐ International Scientific Conference on the Prevention of Work-Related Musculoskeletal Disorders (PREMUS) (11)
- ☐ International Society of Environmental Epidemiology (ISEE) (12)
- ☐ National Ergonomics Conference and Exposition (NECE) (13)
- ☐ National Safety Council (NSC) (14)
- ☐ Pollution Prevention Roundtable (15)
- ☐ Professional Conference on Industrial Hygiene (PCIH) (16)
- ☐ Not Applicable (17)
- ☐ Other, please specify: (18) _____

Q8 Are you an active member of an OSH standards committee?

- ○ Yes, please specify which one(s): (1) _____
- ○ No (2)

Q9 Please check all of the below that you see as current or emerging occupational safety and health (OSH) topics in your job responsibilities

- [ ] Aging workforce (1)
- [ ] Behavioral/mental health (2)
- [ ] Biological hazards (3)
- [ ] Emergency preparedness (4)
- [ ] Global warming and climate change (5)
- [ ] Health equity, health disparities (6)
- [ ] Human factors/ ergonomics (7)
- [ ] Infection control and prevention (8)
- [ ] Industrial hygiene (9)
- [ ] Laboratory biosafety (10)
- [ ] Loss prevention/Risk control (11)
- [ ] Nanotechnologies and exposure to nanoparticles (12)
- [ ] Occupational carcinogens (13)
- [ ] Occupational safety (14)
- [ ] Opioid misuse and addiction (15)
- [ ] Protection of essential workforce during emergencies/public health crises (16)
- [ ] Suicide prevention (17)

☐ Sustainability (18)

☐ Total Worker Health (19)

☐ Underrepresented workforces (20)

☐ Wellness (21)

☐ Work environment policy/regulation (22)

☐ Other (please specify): (23) _____

Q10 If you are (or might be) in the position of hiring a technical staff person, what would be your highest priorities for their qualifications to meet current job demands and/or future needs? Please rank any or all of the below priorities, starting to rank them **from 1 as most important down to 11 as least important**.

_____ Technical skills in safety (1)
_____ Technical skills in ergonomics (2)
_____ Technical skills in occupational hygiene (3)
_____ Technical skills in risk assessment (4)
_____ Technical skills in environmental science (5)
_____ Technical skills: Other (please specify) (6)
_____ Prior experience interacting with workplaces and working professionals (7)
_____ Business/organizational communication skills (8)
_____ Public speaking and presentation skills (9)
_____ Writing and publishing skills (10)
_____ Other (please specify): (11)

Q11 If you were to seek out any further training or preparation, what would you be most likely to look for? Please rank any or all of the below priorities, starting to rank them **from 1 as most important down to 9 as least important**.

_____ Certification test preparation/CEU offerings (1)
_____ Internships/Job placement (2)
_____ On-line courses (3)
_____ Summer classes (4)
_____ Training in business/organizational communication (5)
_____ Training in public speaking and presentation skills (6)
_____ Training in writing for publication (7)
_____ Working with an OSH mentor (8)

_____ Other: (specify) (9)

Q12 How well did the Work Environment academic program and concentration prepare you for the following: (Answer options scaled as Very Well, Moderately Well, Not Well)

	Very Well (1)	Moderately Well (2)	Not Well (3)
to develop technical competence in the recognition, evaluation, control and prevention of occupational and environmental hazards? (1)	○	○	○
to work in collaborative teams to analyze and solve complex occupational and environmental health and safety problems? (2)	○	○	○
to develop analytical skills for complex problem solving through observation, using the literature, critical analysis, and interpretation of data? (4)	○	○	○
to apply new skills to address emerging issues in health, safety and well-being in the workplace and general environment? (5)	○	○	○
to understand the importance of the moral, ethical, legal and professional responsibilities of occupational and environmental health and safety? (6)	○	○	○
to use effective oral and written communications to interact with technical and lay audiences around occupational and	○	○	○

environmental health issues? (7)			
to engage in continuing education to include specialty training, earning professional certifications, and reading professional literature? (8)	○	○	○

Q13 Looking back where you are now, would you enroll in the Work Environment educational program again? Was it worthwhile to do it?

○ Yes (1)

○ No (2)

Q14 During your time in the Work Environment academic program, what was your most valuable experience for your current role?

_____

_____

_____

Q15 During your time in the Work Environment academic program, what element was missing that could help you in your current role?

_____

_____

_____

End of Block: Default Question Block