21ST-CENTURY U.S. SAFETY PROFESSIONAL EDUCATIONAL STANDARDS: ESTABLISHING MINIMUM BACCALAUREATE GRADUATE LEARNING OUTCOMES FOR EMERGING OCCUPATIONAL HEALTH AND SAFETY PROFESSIONALS

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A DISSERTATION

Submitted to the Ph.D. in Leadership and Change Program

of Antioch University

in partial fulfillment

of the requirements for the degree of

Doctor of Philosophy

September, 2013

This is to certify that the Dissertation entitled:

21ST-CENTURY U.S. SAFETY PROFESSIONAL EDUCATIONAL STANDARDS: ESTABLISHING MINIMUM BACCALAUREATE GRADUATE LEARNING OUTCOMES FOR EMERGING OCCUPATIONAL HEALTH AND SAFETY PROFESSIONALS

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Acknowledgements

I am deeply thankful to so many for their support and patience. Closest to the fray were my wife, Peg, and our three adult children Emily, Laura, and Nate; my dad; and my two brothers. They pulled me out of the valleys of doubt, encouraged (or tolerated) my apparent epiphanies, and celebrated those success points along the journey. Each had their own way of cheering me on for which I am deeply grateful. In this circle I also appreciate Lynn, Sarah, Bob, Jim, Andy, Rodie, all coaches, mentors, and friends.

My dad's wife, Judy, and my brothers' spouses and families were my second circle of support. There are several friends, extended family, and professional colleagues who were also supportive as they accepted my declines from invitations with grace.

I feel so fortunate to have discovered the Antioch University Leadership and Change Program. My experience has been most challenging, rewarding, and rich with deep learning on many levels. Learning requires change and, at times, messy space of unlearning and relearning which was facilitated by Antioch's incredible faculty, staff, and program design. Thank you Laurien, for reassuring me in the midst of a gripping imposter syndrome; Richard, for inviting me to join you for ice cream and whacking golf balls at Young's Dairy; Deb, for online wizardry as my personal librarian; Philomena, for meeting me where I was and stretching my understanding of everyday racism; Al, for sharing higher education leadership insights; Carolyn, for teaching the art of case study; Mitch and Peter, for organization development and systems thinking; Elaine, for breaking down the myths of writing; Mugs and Wendy, for assuring information technology was in line; Elizabeth, for being supportive while demanding qualitative research expertise; and Jon, my advisor, dissertation chair, master teacher, and mentor. You modeled what you taught; managed the tension between support and expectation;

guided, encouraged, pushed back, asked, held, challenged, supported, and extended to me your patience and grace, all of which is most deeply cherished. Jon, when I read your amassed scholarship, I am so deeply humbled by the opportunity to work so close with you. And to Antioch staff Jane, Leslee, and Vickie, thank you all for organizational knowledge, support, and warmth.

Finally, without my cohort colleagues I would not have made it nor had such deep learnings. While you befriended me, I also learned so much, especially about your life experiences with racism and then how to think and act in light of it. My deepest appreciation to each of you, for accepting me, sharing your truths, and challenging me to think. Unequivocally, the richest and most diverse group I have worked with, cheers and best wishes to C6: Jane, Janet, Clarence, Gail, Wayne C., Norman, Lillian, Karen, Carolyn G., Paul, Cheryl, Carolyn L., Merrill, Claire, Martha, Naomi, Paul, Annette, Tayo, Cami, Rick, Sheng-Fu, Glenn, Abraham, Diane, Christopher, and Heather.

My dissertation committee was amazing, each with their respective areas of scholarship which they provided in full. Jon, thank you for your overall guidance and extension of higher education scholarship. Elizabeth, thank you for your depth of qualitative research methods and techniques that provided me the confidence to understand what the "data" was saying. Paul, we first met in 2004 at an ASSE Conference academic forum and, as I learned of your history and the fact that you started at Keene State College years before me, it served as one more reminder of how small a world we live in. I am deeply appreciative of your tenure of teaching environmental health and safety, knowledge of the field, wisdom of shaping higher education to assure qualified graduates, and the critical role higher education has to contribute. Thank you for your guidance and impact on my dissertation work. Michael, thank you for serving as

the external reader, using your distance from me and the Antioch University program to provide objectivity and perspective and a very thoughtful and thorough read with subsequent questions. My dissertation is stronger because of it.

A special thank you to my colleagues in the ASSE (American Society of Safety Engineers): Jim Ramsay, Ph.D., Chair of the Educational Standards Committee, Dennis Hudson, Esq., and Laura Clements. Jim, you were a source of constant support, flexibility, insight, vision, and challenging questions. I have appreciated our many conversations teasing apart the health and safety profession. Also a heartfelt thank you to the colleagues of the Educational Standards Committee and Framing the Profession Task Force, and unknown ASSE Professional Members whom participated in the anonymous survey; Dennis and Laura, thank you for your support via the ASSE. Who knew that when I joined the ASSE in the early 1990s, I would benefit in so many ways.

Finally, a shout out to my colleagues at Keene State College: Melinda, Kitty, Carol, Steve, Ellen, Thomas, Mary Ellen, Jay, Donna, Pat, Becky, Margaret (Peggy), Richard (Dick), Larry, Dave, Jamie, Charlie, Rick, Donna, Anne, Dave, Rob, and many others, who offered words of encouragement, participated in a pilot project, and offered objective feedback. Thank you too for the gift of time, you covered for me at many different occasions, but especially over my semester sabbatical, you allowed me to focus my writing.

Dedication

"You can do anything you put your mind to, Wayne!"

Wilma Jean Hartz (1933 – 1985)

I dedicate this dissertation and my appetite for learning to my mother. She was my champion—extending patience, encouragement, flexibility, wisdom, and endless love. These attributes were constants, especially in the midst of my troubled early schooling. Mom was my fan club throughout her albeit short, so precious life.

Abstract

How can the public be assured of competency in those professing to protect its occupational health and safety (OSH)? Currently, in the U.S. there are 193 higher education OSH programs, 186 with baccalaureate degrees with over 55 different degree titles. This research seeks to define minimum OSH baccalaureate graduate core competencies across all programs by asking: What would employers look for in a portfolio to demonstrate competence in a new OSH graduate? Professional members of the American Society of Safety Engineers (ASSE) participated as subject matter experts in an anonymous online survey to provide framing data. The ASSE Educational Standards Committee and Framing the Profession Task Force engaged in an action research method of facilitated discussion and consensus building, (Modified Nominal Group Technique), distilling 741 portfolio examples to 22 competency themes, and 11 learning outcomes. Recommendations include: establish a standardized set of core competencies of evidence based learning outcomes across all OSH and related programs; look to the Nursing and Education professions' processes of shifting from prescribed courses to a learning outcomes model; shift pedagogy to student-centered, highly engaged, outcomes-based approach; enhance educational content for 21st-century knowledge and skills, including: teamwork, internship experience, organizational skills, ethics, critical thinking, scientific method, continuous improvement, systems thinking, sustainable applications, and strategic planning; enhance partnerships between professional safety associations and higher education for collaboration and consensus building; and collaborate with global OSH associations. The electronic version of this Dissertation is at the Ohio Link ETD Center at http://ohiolink.edu/etd.

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Chapter I: It's Class Time

On Tuesday, 1:55 p.m., I walk into a classroom of 45 seated, albeit preoccupied, 18-21 year-old college students. Their tables and chairs are aligned in five rows, parallel to the front of the room. The space is lit by overhead fluorescent lights, which reflect from white cinder block walls. There is a lot of chatter and simultaneous texting; most do not pause their texting as I enter. Ah yes, I realize, the millennial generation: multi-tasking on their smart phones, expecting 24/7 availability, and learning best by engagement (McGlynn, 2008). I am about to begin teaching a college-level course in Behavioral Safety, which is an elective course in Keene State College's Occupational Safety and Health (OSH) Bachelor of Science degree program. I designed this course based on Geller (2001), Krause (1997, 2005), McSween (1993), and Petersen (1989, 2003) to focus on how an organization's leadership and culture motivate conscious or unconscious worker behavior, which may include risk taking that sometimes results in an injury and other times results in rewards. I look around the room and smile to greet them, however, I am deeply worried that these students have no idea what is really at stake.

Daily Losses

On any given day in America, people at work risk their health and their lives unnecessarily. According to the U.S. Bureau of Labor Statistics (BLS), the risks are real and dire: on average, per day, in 2010, 13 workers died; 8,400 were injured; and an estimated 1,000 were diagnosed with work-related illnesses (BLS, 2011a). Research reveals an unknown number of workers do not report injuries for fear of employer reprisal (Government Accountability Office [GAO], 2009), and that employees of color are more at risk of injury than their Caucasian co-workers (Smith & DeJoy, 2012).

Traditional Occupational Safety?

The occupational health and safety profession makes a concerted effort to reverse the trends by improving safety at the workplace. However, at times it relies on flawed theory and misdirected competencies. Employers reportedly desire safety professionals with bachelor degrees who are ready to apply technical skills, have cross-training in related OSH fields, and show improved leadership and communication skills (McAdams, Kerwin, Olivo, & Goksel, 2011). In addition, employers require flexibility because it adds value to their organization (American Society of Safety Engineers [ASSE] & North Star Research, 2008). Research also demonstrates that an organization's "safety climate" (Smith & DeJoy, 2012, p. 72) is more effective than traditional safety and health strategies of injury prevention such as training, physical controls, and rules enforcement (Gielen & Sleet, 2006). The safety profession has been accused of lagging behind research findings and maintains outdated injury prevention strategies and paradigms (Manuele, 2011; Petersen, 2003).

Yet here I stand, resisting the charge to teach traditional injury prevention strategies commonly framed as education, enforcement, and engineering (Geller, 2001; Gielen & Sleet, 2006). Instead, my mission is to prepare the next generation of safety professionals, leveraging the research-based and demonstrated effectiveness of organizational and system theories (Alison, 2002; Allegrante, Marks, & Hanson, 2006; Johnson, 2007; Krause, 2005; Krause, Stricoff, & Bianco, 2008; Neira, 2009; O'Toole, 2002).

As I work to prepare young people for positions as stewards of the health and safety of countless employees, I cannot resist asking these questions:

- Are my expectations of student learning too high?

- Am I wrong in assuming that these students, if taught well, could be effective and efficient at reducing workplace injuries?
- How can I meaningfully engage them in this material, such that they will apply these concepts in the future?

In the past, employers have asked me if our students have had any course work or experience with behavioral safety principles, ergonomics, and policies and procedures, leading me to wonder about their motives. Do employers want to hire emerging safety professionals grounded in research and critical thinking, or simply hire a figurehead to apply well intended but rudimentary, traditional injury prevention theories to satisfy minimal legal requirements? Furthermore, why are these students enrolled in this program? Are they here because they have heeded the campus rumor that Safety Studies is an "easy" major that results in a well-paying job, or do they understand the full responsibility and opportunity before them as future safety professionals?

Standing on the student side of an oversized podium, I chat with a couple of front row students; I welcome them to the class and ask, "Why this course?" Their answers feel good to my ego: "I've been told this course and IH [Industrial Hygiene] are must-haves to get a job." But, I wonder to myself: Is that what this profession is to you, "a job?" I stop thinking about the big picture, realizing it is time to start. Then, in a loud and serious voice, I say, "Welcome to Safety Awareness or SAFE 101, a survey course of the safety field," which draws a mix of puzzling looks and some paper rattling as many search their semester schedules. I wait a few seconds, holding a straight face and even puzzled look in return; then I provide an "ete" (ear to ear) grin, and most laugh. Their laughter seems to ease the anxiety in the room, and then we officially begin the class.

My Experience

My own initial preparation as a safety professional was inadequate. Previous to my role in higher education as assistant professor, I spent 20 years as a safety practitioner and witnessed many preventable occupational incidents that resulted in needless suffering, permanent disability, and loss (fiscal and life activity). After my first six years as an environmental hygienist, I proudly secured a position as the first corporate safety/industrial hygiene specialist for a company with 5,000 regular and 5,000 temporary employees, 45 facilities, and close to one billion dollars in sales. I was quickly immersed in "permanent whitewater," which Vaill (1996) described as "surprising, novel, messy, costly, recurring…[with] unpreventable events and feelings of lack of direction, absence of coherence, and loss of meaning" (p. 16). I realized that even after a couple of years of applying the guidance from my manager and the environmental health focus of my undergraduate college education, the injury rate at this company remained unchanged and very significant.

Later, while still working in this corporate position, I began to teach as an adjunct in an OSH Program at a local technical college where non-traditional students were working to earn an Associate in Applied Sciences degree in OSH. It was then that I realized I had to change my injury and illness prevention strategies, or nothing would change at my workplace. In this program, I taught the last required course using the course's required text, *Techniques of Safety Management, Using a Systems Approach* (Petersen, 1989). Before this, I was unfamiliar with Petersen's work; it challenged my learned undergraduate and traditional safety theories with research. One evening a week for 14 weeks, while working with mostly experienced shipyard safety specialists, in a didactic process, I began to gain insight into how to approach my day job differently by applying my learnings. Vaill (1996) quoted Revans, framing learning as

applied: "*real* people learn with and from other *real* people by working together in *real* time on *real* problems" (p. 71).

Armed with new injury prevention ideas from my students, as well as insight gained via my participation with the company's cross functional organization development team, I began a new approach to leverage different organizational systems (Senge, 1990). I facilitated others to actions, such that espoused company and senior leader safety values gradually merged into planning and action, comparable to other key corporate strategies (R. Peixotto & M. Laflamme, personal communication, September 23, 2010). Eventually, the number and subsequent rate of injuries and illnesses steadily decreased within the company. Fewer injuries meant fewer workers' compensation claims, which eventually added up to a couple of million dollars in savings for the company. As expected, these savings gained positive attention from the senior leaders and eventually led to external verification by and recognition from the company's insurance broker and provider. These successes in the corporate sector reassured my belief that I knew what worked; and by becoming a full-time faculty member in higher education, I could better prepare the next generation of emerging safety professionals by teaching them what took me 20 years to learn.

Higher Education

When I began my role as an assistant professor in an established OSH Bachelor of Science (BS) Program, presumably preparing emerging safety professionals, my pedagogy was framed on my lived experience, teaching what I thought I knew. And my teaching style was based on my good and bad learning experiences. Additionally, my new colleagues, with the best of intentions, provided syllabi and compact discs (CDs), complete with their PowerPoint presentations. The OSH program objective stated that it prepared safety generalists who would

be able to work in any industry sector, including insurance, regulatory, construction, consulting, and manufacturing.

During my second academic year (2006-2007), however, I realized that not only did my pedagogy need an overhaul, but so did my program's pedagogy. Our program was characterized by a traditional pedagogical approach of instructing from PowerPoint and lecture, instead of high impact or engaging practices (Association of American Colleges and Universities [AAC&U], 2011) that ensure learning is lasting and authentic (Wergin, 2005).

My teaching efficacy, as judged principally by student evaluations, was very favorable. During my third academic year, however, I was disappointed when I realized students in upper level courses, whom I had taught previously, were barely able to recall, let alone apply, content I had presented to them. This disorienting dilemma (Mezirow, 1991) readied me to develop new insights into my pedagogical beliefs, their origins and implications, through doctoral studies in Leadership and Change at Antioch University.

Occupational Safety as a Profession

In the context of my doctoral studies and now dissertation research, I have realized that the safety profession of which I have been a member since 1985 has been in a state of searching. Safety professionals are charged with the weighty responsibility of protecting the health and safety of workers, yet roles, approaches, preparation, and minimum competencies are poorly defined (Ferguson & Ramsay, 2010). Consider these factors: 1) generally those in the safety profession field (or Safety and Health Environmental (SHE) professionals) strive to assure worker health and safety, protect the air, water, and soil from degradation, and protect property from loss (Accreditation Board for Engineering and Technology [ABET], 2010; American Industrial Hygiene Association [AIHA], 2011a; American National Standards

Institute [ANSI], 2003; American Society of Safety Engineers [ASSE], 2011b; McAdams et al., 2011; Sauter et al., 2002); 2). SHE roles are defined differently by many different organizations (ASSE & North Star Research, 2008; Board of Certified Safety Professionals [BCSP], 2008a; McAdams et al., 2011) [; 3) safety professionals work in a variety of settings and safety professionals' roles overlap considerably with related and self-defined occupational safety professions (ASSE , 2011b; Brauer, 2008; Industrial Safety & Hygiene News [ISHN], 2011); 4) there are many different routes of entry into the safety profession in contrast to other professions such as teaching, nursing, etc. (ASSE, 2011b; Brauer, 2008); and most importantly, 5) there are different and disputed strategies of injury prevention (Blair & Geller, 2000; Krause et al., 2008; Manuele, 2008; Petersen, 2003).

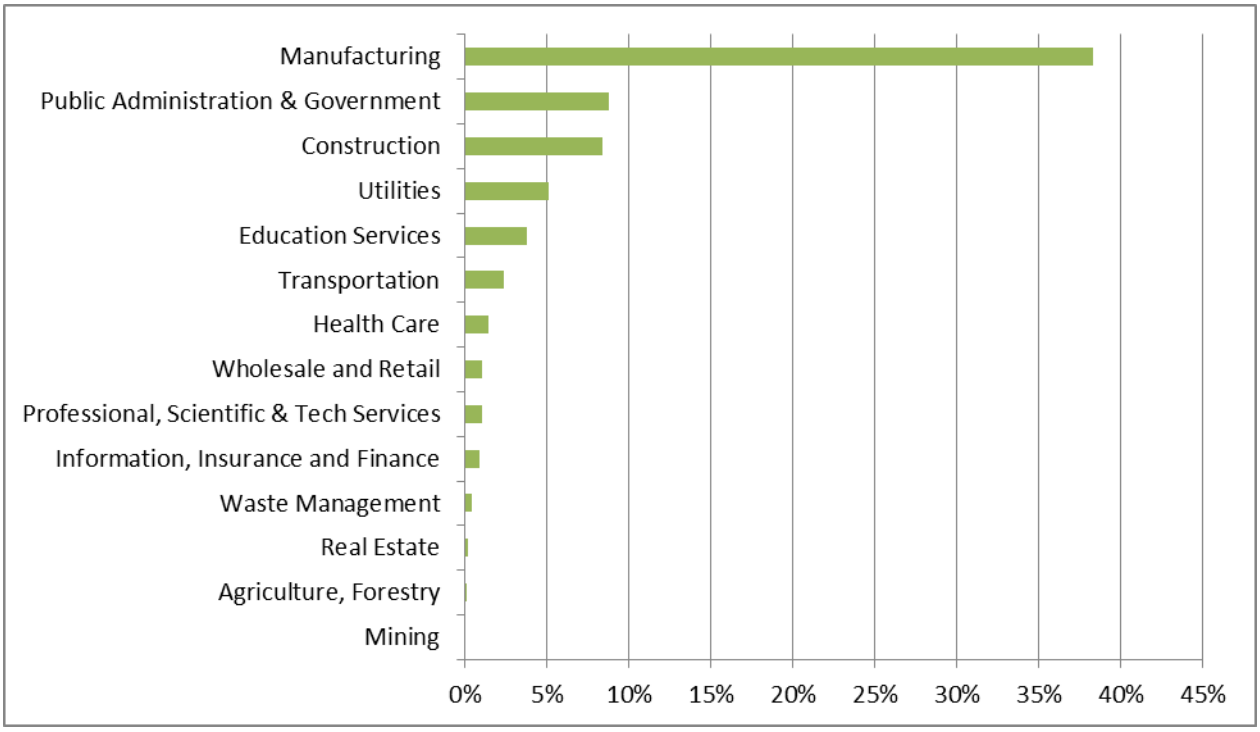

Figure 1.1. Distribution of safety practitioners within industry groups. Adapted from information provided in Brauer, 2008.

Higher Education and Safety Degrees

On the one hand, higher education appropriately constructed several degree options to address broad ranging and overlapping fields, evidenced on the ASSE's college and university web directory (ASSE & Clements, 2012). On the other hand, higher education has unintentionally contributed to employer confusion about best practices in preventing workplace injury and illness. A current ASSE taskforce charged to frame the profession described higher education programs as having an "incoherent structure and lack of defined consensus in OSH educational outcomes" (ASSE, 2011j, p. 5).

In hindsight, I realize now my doctoral studies required cycles of questioning with new insights, deconstructing and constructing new understandings, where my beliefs were "revisited with increasing degrees of sophistication in order to make sense" (Sheppard, Macatangay, Colby, & Sullivan, 2009, p. 192). This process brought me back to the very question I asked myself upon moving to higher education in 2004: What should I expect OSH Baccalaureate program graduates to know and consequently be able to apply as emerging safety professionals?

Rationale for the Study

This research is supported by three categories of data:

Needless suffering and loss.

- On average, 12 people die per day on the job (BLS, 2011b).
- Unintentional injury-deaths are the fifth leading cause of death in the U.S. for all ages (National Safety Council [NSC], 2011).
- Economic impact: From 1982-1992, there were "64,333 civilian workers who died from injuries sustained while working in the U.S., generating a total

> societal cost of over $53 billion…costs of a fatal occupational injury for these years were $831,000 and $838,000, respectively" (National Institute for Occupational Safety and Health-Centers for Disease Control [NIOSH-CDC], 2011a, p. 2).

Safety is in a process of professionalization.

- There is a significant range of higher education opportunities with no consistent means to evaluate or be assured of graduate competencies. There are 193 colleges and universities that advertise OSH education on the ASSE college/university directory. Of 184 baccalaureate degree titles, 50 share 14 degree titles, and the balance are unique (ASSE, 2012a).
- Of the "2,845 graduates of OSH programs across the United States…about 70 percent were from safety programs" (McAdams et al., 2011, p. 124).
- The ASSE has 34,000 members, making it the largest U.S., member-based OSH organization (ASSE, 2011b).
- In 2008, the U.S. DOL reported 55,800 Occupational Safety Health Specialists in the workforce (BLS, 2011c).
- There is a wide range of responsibility: The ASSE estimates distribution of OSH professionals: Insurance - 22%, Manufacturing and Production - 19%, Consulting - 15%, Petrochemical - 15%, Government - 9 %, Other Industries - 9 %, Construction- 5 %, Utilities and Communication - 4%, and Transportation – 2% (ASSE, 2011c).
- In 2011, the ASSE reported 23 Partners, revealing the breadth of colleagues focused on Occupational Safety Week (ASSE, 2011d).

- BCSP (Board of Certified Safety Professionals), the largest, voluntary, individual safety certification reports applicants reported over 100 safety-related certifications (BCSP, 2008a, 2008b).
- Federal laws do not require licensure or certification defining OSH educational requirements, allowing anyone to claim competence (ASSE, 2011e).
- NIOSH (National Institute for Occupational Safety and Health) estimates the hiring demand for bachelor degree graduates will be twice the production rate (McAdams et al., 2011).

Difficulties in achieving consensus.

- ASSE (2011k) "commissioned a study in 2003 by Knapp & Associates, resulting in a report entitled, *Safety as a Profession: Framework and Recommendations*. [While making]…five observations on what must exist for safety to be a profession [number three is]: outcomes-based educational programs that focus on core competencies"(p. 2).
- Petersen (1989) questioned who was determining the safety professionals' role in these areas: Occupational Safety and Health Administration **(**OSHA), Insurance, and Industry. ASSE noted: "The incoherent structure and lack of defined consensus in OSH educational outcomes means that there is no universal way for an employer to be reassured that he or she is hiring a fully qualified and competent OSH professional" (2011j, p. 5).
- Ferguson and Ramsay (2010) stated, "more than 90% of safety programs not accredited…any program can call itself a safety program, and any graduate can call him/herself a safety professional…exacerbated by those employers who do

not…understand the safety profession or the risks safety professionals seek to mitigate, and who ultimately hire personnel from unaccredited programs" (pp. 29-30).

- NAOSH (National Assessment of Occupational Safety and Health professionals), 2011 report found employers "are generally satisfied," while also providing a list OSH new hires expectations (McAdams et al., 2011, pp. xviii).
- "In Europe, the EU-funded EUSAFE project was launched in November 2010 with the goal of establishing a universal qualification and training framework for OSH professionals across Europe, in order to improve international recognition of practitioners' competences and qualifications" (ASSE, 2011k, p. 5.).
- "In Australia, HaSPA (Health and Safety Professionals Alliance)...in 2009 to define the core Body of Knowledge and core competencies for the OSH generalist professional… will have a systemic, long term effect on OHS professional education, resulting in improved quality of OHS advice and more effective prevention activities" (ASSE, 2011j, p. 3).
- The ASSE (American Society of Safety Professionals), largest U.S. member-based professional safety organization, is "dedicated to protecting people, property, and the environment" (ASSE, 2013c, p. 1) has published educational standards, which are not applied to 90 percent of the college and university programs (ASSE, 2005, 2010, 2011f; Ferguson & Ramsay, 2010).

Dissertation Purpose

The purpose of this dissertation is to define baccalaureate program safety professional learning outcomes. This study is designed to capture, analyze, and distill how expert safety

professionals from many occupational settings describe competency evidence. The data from defined experts will then be used as a starting place, priming a nominal technique with the American Society of Safety Engineers Education Committee and Framing the Profession Task Force. This qualitative survey will ask experts to answer this question: Imagine that you are looking over the portfolio of someone who is a baccalaureate-prepared safety professional. What kind of evidence would you want to see in a portfolio that would demonstrate competence (knowledge, skills, and dispositions)?

These results will be used to inform and shape my own college's OSH program and perhaps be useful to the American Society of Safety Engineers (ASSE) Educational Standards Committee's (ESC) in a process of review and revision of the ASSE's 2004 Curriculum Guidelines.

Literature. Germane literature primarily from the last 30 years, which defines the safety profession, explores myths and research-based evidence of effective processes to prevent injuries, and identifies research from governmental agencies, professional associations, peer review journals, and reference books. During the course of my literature search, I realized that there are several stakeholders, and not surprisingly, all with different perspectives. As of February 2012, I surveyed approximately 200 sources related to this line of inquiry. The focus of the literature search is pedagogy, assessment, quality, and value, as related to undergraduate occupational safety and health programs. The literature guides this research and will provide a framework to report a perspective from expert safety professionals regarding baccalaureate competencies.

Methods. The method will require two phases, a qualitative survey followed by a modified nominal group technique meeting. Expert safety professionals or those designated by

the ASSE as professional members will be invited to participate via an email sent by the ASSE, in an anonymous survey. By agreeing to participate, the survey will collect minimal demographic information to allow comparison to the ASSE membership. Participants will also be able to forward the electronic survey to others they believe are experts, defining chain or snowball sampling within a field (Biernacki & Waldorf, 1981). Anonymous sampling will rely on participant honesty of self-reporting (Hwang, 2010). Survey data will be analyzed with qualitative software (QSR NVivo) to identify and generate common themes. The goal of the survey is to collect 50-60 responses to create a prompt for the second phase, or modified nominal group technique.

Nominal techniques are characterized by following a procedure to ensure group members participate in a deliberation, and have an equal voice in providing ideas and theming results (Van de Ven & Delbecq, 1974). The method can be modified by collecting data before a designated group meets to review and theme results. Survey results will be forwarded to the Educational Standards Committee and Framing the Profession Task Force, who will then participate in a Nominal Group Technique (NGT) process meeting, which I will facilitate. The NGT process will assist in clarifying and prioritizing results to generate baccalaureate education standards.

Position statement. In the spirit of disclosure, I have been a longtime professional member of the ASSE, and have purposefully targeted this organization given its presence and declared roles within higher education (ASSE, 2010, 2011b, 2011c, 2011d, 2011e, 2011f, 2011g). The ASSE reports an individual member base of 35,000 in 80 countries and includes 19 practice specialties [such as: Academics, Ergonomics, Management], 150 chapters, 40 professional sections and 70 student sections (ASSE, 2013c, p. 1).On behalf of the Keene State

College OSH program, I have served as the ASSE Student Chapter Advisor and have written several student recommendation letters resulting in their success with scholarships within ASSE. I have presented at two ASSE-sponsored functions, a leadership conference, and an academic forum (Hartz, 2006; Hartz & Treadwell, 2009). I have also participated in the ASSE Academic Specialty Planning Committee and the Educational Standards Committee; first as an ad hoc and most recently as a voting member.

Chapter II: Literature Review

This chapter explores the literature from the last 30 years focused on higher education preparation of safety professionals. This exploration of literature includes stakeholder voices such as employers, students, parents or guardians, teachers, affiliated organizations, regulatory agencies, higher education accrediting bodies (both institutional and programmatic), and voluntary safety-related certifying organizations. The literature reveals unprecedented pressures on the value and quality of higher education and the safety field itself, as it continues to refine its identity as a profession.

Defining the Scope of Safety

Because this study is focused on defining baccalaureate educational outcomes for safety professionals, a central question becomes: who should define or set the outcomes to achieve? The career field of occupational health and safety is self-defined by employers, professional-based organizations, and governmental agencies. Many employers are even taking a broader perspective, realizing that because they provide both workers compensation and health insurance, they should consider the entire state of a person's health and safety whether on the job or off (NSC, 2009; G. Rooney, personal correspondence, January 12, 1995).

Brauer (2006) identified 15 areas of overlap with safety professions, including the fields of Engineering, Management, Health, Behavioral, Legal, and "other…[such as] Architecture and Urban Planning" (pp. 17-18). McAdams et al. (2011) identified nine safety professions based on a history of national surveys, including: occupational safety, industrial hygiene, occupational medicine, occupational health nursing, ergonomics, health physics, occupational health epidemiology, occupational health psychology, and occupational injury prevention.

Many who are unfamiliar with the field of occupational health and safety appear to define safety in the context of their life experiences. Type "safety" into Google, and in 1/10th of a second there are 1,161,000,000 sites listed, complete with definitions, bargains, gimmicks, associations, certifications, agencies, training, education, etc. However, safety or the processes and means used to assure hazards are effectively and efficiently identified and managed, from "principles and procedures based on scientific knowledge which, comes from the experience of the researcher" (Geller, 2001, p. 10). Rather, humans take risks every day, frequently resulting in positive or desired outcomes, which according to environmental psychologists, consciously or unconsciously reinforce one's behaviors (Bandura, 1999; Geller, 2001; Krause, 1997). Unfortunately, accidents happen and there is the unintended outcome of injury (Krause, 1997).

Defining occupational safety and health in the United States seems task or role dependent (and championed by a specialized association). Safety appears to fit a spectrum: imagine Maslow's Hierarchy of Needs (Geller, 2001) dependent upon physical safety, ranging to how the World Health Organization defines health, for example, "a state of complete physical, mental, and social well-being and not merely the absence of disease or infirmity" (http://www.who.int/about/definition/en/print.html). For the purposes of this study, a safety professional, as defined by the ASSE, is an individual concerned with the "prevention of harm to people, property and the environment," employed in any of many settings (ASSE, 2013c, p. 1).

People, property, and the environment. People, property, and the environment comprise a big net. Some employers report a shift in focus or re-definition of health and safety from traditional safety or injury prevention (McAdams et al., 2011) to health or wellness (The Health Project, 2010). For perspective, work-related unintentional deaths are a mere fraction of

the top causes of death in the United States. The NSC (2011) reported the top six causes of death (all ages) in order are:

1) Heart Disease (631,636 or 38.3%)
2) Cancer (559,888 or 34%)
3) Stroke (137,119 or 8.3%)
4) Chronic lower respiratory disease (124,583 or 7.6%)
5) Unintentional death from injuries (121,559 or 7.4%)
6) Diabetes (72,449 or 4.4%).

Note that heart disease and cancer, combined, account for 72% of all deaths. For this study, the focus is unintentional death or disabling injuries, which occur during employment, or are work related. In 2011, the NSC reported where these injuries occurred and their cost or financial impact:

- $20.5M in the home and community, costing $285.3B (80% of injuries, 41% of cost)
- $3.2M at work, costing $183B (12% of injuries, 26% of cost)
- $2.1M in motor vehicles, costing $701.9B (8% of injuries, 36% of cost)

Occupational health and safety is primarily focused on unintentional injuries and related fatalities while on the job (BLS, 2011c), and while relatively small in comparison to deaths from disease, are still significant in number. In 2009 (one year, most current data) in the United States, there were 4,551 workplace fatalities, and 3.3 million nonfatal injuries and illnesses (BLS, 2011b). Financial losses reported by the Center for Disease Control (CDC), based on 10 years (1992-2002) of data were over $53 B (NIOSH-CDC, 2011b).

Another perspective of the impact of workplace injuries in the United States emerges from the National Institute for Occupational Safety and Health (NIOSH), which reported the following data in 2007 (NIOSH-CDC, 2011c):

- 5,488 U.S. workers died from occupational injuries.
- 49,000 annual deaths are attributed to work-related diseases [illnesses] each year.
- An estimated 4.0 million private-sector workers had a non-fatal occupational injury or illness; approximately half of them were transferred, restricted, or took time away from work.
- An estimated 3.4 million workers were treated in emergency departments in 2004 [the most recent data available]…approximately 80,000 were hospitalized.
- In 2006, employers spent nearly $87.6 billion on workers' compensation, but this represents only a portion of total work-related injury and illness costs.

An additional distinction can be drawn between occupational safety (safety from injuries such as amputations), health (disease or illness prevention, e.g., asbestosis), and environmental health and safety (any combination thereof). Historically, safety professionals focused on physical injury prevention, and industrial hygienists focused on disease prevention all within the factory walls.

The passage of environmental regulations in the 1970s led to laws regulating chemicals from cradle to grave to ensure safe transportation, use, and disposal (US Environmental Protection Agency [USEPA], 2013). Property is inclusive of product, facilities, and inventory, and the goal to prevent loss or business interruption. In the 1980s additional federal regulations, including occupational, transportation-related, environmental, new technologies (like nanotechnologies and bioengineering), financial performance, the concept of wellness,

and increased value on homeland security, all added dimensions and increased overlap of functions for a safety professional (Petersen, 1989).

Today's global dimension is yet another factor likely influencing a safety professional's role. While the scope of this study is the United States, the World Health Organization-International Labour Organization (WHO-ILO) estimated, on a daily basis, that more than 2.3 million occupational deaths and 337 million injuries occur globally (Neira, 2009).

Higher education. This study holds a fundamental assumption: students graduating from a college or university in a professional preparatory program or with a "professional education" are interested in like employment (Sullivan & Rosin, 2008, p. 2). Significant here is a long-standing debate regarding the purpose of higher education. The Pew Research Center (2011) reports that slightly less than half of surveyed parents and slightly over half of college presidents believe that career preparation is the most important purpose of higher education; the balance of both groups see college as a time of intellectual growth. However, in the context of this dissertation, safety is considered a profession requiring specialized education, and accordingly begins with employer voices.

Employers. This literature review includes four perspectives that illustrate employers' expectations of emerging college graduates and those pursuing a role as a safety professional: 1) the American Association of Colleges and Universities (AAC&U); 2) the Accrediting Board of Engineering Technology-Applied Sciences Accreditation Commission (ABET-ASAC) (for purposes of this paper, ABET); 3) the ASSE, Council of Professional Affairs (ASSE-CoPA); and 4) the National Assessment of the Occupational Safety and Health Workforce (NAOSH). These organizations and their perspectives are described in detail below.

1. American Association of Colleges and Universities (AAC&U)

The AAC&U, founded in 1915, reports a membership of 1,200 "accredited public and private colleges and universities, two- and four-year undergraduate institutions, masters- and doctoral-granting colleges and universities" and "organizes its work around five broad goals 1) A guiding vision for liberal education, 2) Inclusive excellence, 3) Intentional and integrative learning, 4) Civic, Diversity, and Global engagement and 5) Authentic evidence" (http://www.aacu.org/about/index.cfm).

In 2008, the AAC&U commissioned Hart Research Associates, Inc. to determine what employers expect of recent college graduates (Hart Associates, 2010). Findings featured in Table 2.1 generally reveal that: "[employers need] higher education…to place more emphasis on liberal education learning outcomes" (Hart Associates, 2010, pp. 1-2). The AAC&U has defined employer needs as: knowledge of human cultures and the physical and natural world, intellectual and practical skills, personal and social responsibility, and integrative and applied learning (AAC&U, 2011; Kuh, 2008).

2. Accrediting Board of Engineering Technology (ABET)

"ABET as a whole accredits over 3,100 programs at more than 600 colleges and universities worldwide" and reports it is "the recognized accreditor for college and university programs in applied science, computing, engineering, and technology [and has] provided leadership and quality assurance in higher education for over 75 years" (ABET, 2010, p.1). ABET accredits applied sciences programs such as occupational safety, industrial hygiene, and environmental health. Volkwein, Lattuca, Harper, and Domingo (2007) questioned the effects of ABET's changes in the accreditation criteria in 2000, which shifted principal accreditation criteria from evidence of providing course requirements to a demonstrated process of

continuous learning designed to demonstrate that student learning meets educational outcome criteria (study findings discussed later). Interestingly, their research also fleshed out employer expectations of college graduates. Note the percent agreement between the three sources, which define employer expectations illustrated in Table 2.1(ASSE & North Star Research, 2008; Hart Associates, 2010; Volkwein et al., 2007).

Table 2.1

Employer Expectations of New College Graduates

AAC&U	**ABET**	**ASSE**	**Descriptions from AAC&U** (Supplemented from ABET and/or ASSE)
89%	98%	96%	Written and oral communication
81%	98%	87%	Critical thinking and analytic reasoning (ABET engineering problem solving; ASSE transforms data/insights into practical solutions)
79%	92%	94%	Applied knowledge in real-world settings (ABET design a system to meet needs)
75%	85%	87%	Complex problem solving (ABET design and conduct experiments; ASSE recognize hazards in systems, equipment, products, facilities and operations)
75%	94%	93%	Ethical decision making (ABET understanding professional and ethical responsibilities; ASSE takes responsibility for outcomes)
71%			Teamwork skills in diverse groups
71%	95%	91%	Intercultural competence (teamwork in diverse groups) (ASSE builds personal relationships)
70%	90%	84%	Science and technology (ABET life-long learning; ASSE current with technology, regulations, products, practices related to hazards)
70%	91%	87%	Creativity and innovation (ABET use of modern engineering tools)
68%			Information literacy
67%	70%		Global issues (ABET engineering in global and social context)
67%			Intercultural knowledge (global issues)
63%	97%	83%	Quantitative reasoning (ABET apply math, science, and engineering; ASSE assess exposure, risk and metrics)
57%	73%		The role of the United States in the world (ABET knowledge of contemporary issues)
57%			Cultural diversity in the United States and other countries
52%			Civic knowledge, participation, and engagement

3. ASSE-CoPA (Council of Professional Affairs)

In 2008, the ASSE Council of Professional Affairs (CoPA) commissioned a marketing study to evaluate opportunities for future educational products and services. The survey populations were safety professionals and company executives. The results identified future market opportunities (or competency gaps) of existing safety professionals such as being misaligned with employer business strategies, rigid, and lacking broader technical skills (ASSE, 2008; ASSE & North Star Research, 2008). The summary article in *Professional Safety* concluded, "Safety professionals are viewed as too technical, not able to look at issues from a big picture perspective or integrate programs into the organization" (ASSE, 2008, p. 24).

4. National Assessment of the Occupational Safety and Health Workforce (NAOSHW)

NIOSH (McAdams et al., 2011) recently published the results of the "National Assessment of the Occupational Safety and Health Workforce," (p. ii) a study evaluating supply and demand of nine occupational safety and health professional (OS&H) occupations by surveying some 7,600 employers across many industry types and 340 providers of new hires (principally colleges and universities). The study concludes: "the focus of the OS&H profession has shifted from being compliance-oriented to being prevention-oriented with emphasis on ensuring health and safety in the workplace" (McAdams et al., 2011, p. 1). The study draws a distinction between occupational safety as **"**Work to minimize the frequency and severity of accidents, incidents, and events that harm workers, property, or the environment" (p. 3), and occupational injury prevention as based on research, risk assessment, and organizational process (p. 4). Notice in the latter, the focus is on research, and in the former, the focus is on traditional safety.

Finally, the NAOSHW (McAdams et al., 2011) study reported that employers were "generally satisfied" (p. xviii) with college grads; however, it also listed expectations that new hires were better communicators with workers and leadership, practiced more leadership, were more capable of hazard identification, outcomes measurement focused, and cross-trained in other OSH professions (McAdams et al., 2011). NAOSH (McAdams et al., 2011) also projected the demand for Occupational Safety bachelor degree holders to be 100% short of hiring projections, in 5 years. The report also found that "employers were generally satisfied" (p. xix), however, also wanted to see more, as illustrated in Table 2.2.

Table 2.2

National Assessment of the Occupational Safety and Health Workforce Reports Employer Additional Desired Skills

Percent Employers Reporting Additional Desired Skills	
59%	Communicating with workers/training skills
48%	Leadership skills
47%	Investigating accidents
43%	Job safety analysis
40%	Technical writing
33%	Industrial hygiene
30%	Measuring safety program outcomes (e.g., on health status, injury rates)
30%	Local, state, or general regulations
30%	Measurement of risk factors for occupational injury
29%	Communicating with upper management

Source: (McAdams et al., 2011, Tables 3-33a, 3-33b, p. 66; 3-39a, 3-39b, p. 75 – 76.).

Professional Organizations

The two largest individual membership-based health and safety associations that encourage college student participation through scholarships, student chapters, and with affiliations to personnel certifying boards are the ASSE and American Industrial Hygiene Association (AIHA), at 34,000 and 10,000 respective members (AIHA, 2012; ASSE, n.d.). Additionally, there are three other important organizations that have shaped the safety

profession and require mention: American National Standards Institute (ANSI), American Board of Industrial Hygiene (ABIH), and Board of Certified Safety Professionals (BCSP).

1. American Society of Safety Professionals (ASSE)

The ASSE indirectly originated from the New York City Triangle Shirtwaist fire in 1911. The fire claimed 146 lives (mostly women and children migrant workers) due to carelessness, disregard for workers, absence of fire alarms, locked fire exits, insufficient escape routes, inoperable firefighting equipment, and ignorant handling methods of highly combustible cotton fabrics (ASSE, 2011b; Von Drehle, 2003). Today, the ASSE's motto is, "protecting people, property and the environment." Their mission statement reads, "ASSE is a global association of safety, health, and environmental professionals dedicated to the advancement of its members and the profession through education and advocacy, [and holds a] vision [of being] a global advocate and premier leader for the safety, health, and environmental professional and the profession" (http://www.asse.org/about/). The ASSE charges a safety professional with the responsibility to "anticipate, identify, and evaluate hazardous conditions and practices; develop hazard control designs, methods, procedures and programs; implement, administer, and advise others on hazard control programs; [and] measure, audit and evaluate the effectiveness of hazard control programs" (http://www.asse.org/about/scope_function.php).

The ASSE has notable ties to higher education, including a foundation providing annual scholarships that totaled $170,000 (ASSE, 2011h) in 2011. Student member services on their website include local ASSE chapter activities, discounted membership fees, a student leadership conference, and annual conference round tables (ASSE, n.d.). The website links directly to higher education sites, including the Academic Practice Specialty (APS), which focuses on higher education collaboration and networking to leverage higher education's

"collective influence on educational strategies and research, accreditation and professional certification as well as on national and international academic associations" (http://www.asse.org/practicespecialties/academics/).

The ASSE's Educational Standards Committee (ESC) focuses on defining higher education requirements to ensure minimum preparation of OSH program graduates. ESC curriculum guidelines, first published in 2004, were accepted by ABET-ASAC in 2006 as the primary criteria to define and then measure OSH program competence (ASSE, 2004, 2011f).

The ASSE provides a college and university directory on its website and lists 194 programs (as of July 11, 2012) that offer Safety, Health, and Environmental (SH&E) and industrial hygiene programs, discounted student membership, student member chapters and conferences, and a career guide (ASSE, 2011b, 2011c). As of March 2012, there were 193 colleges and universities listed on the website offering 410 degrees (18 certificates, 66 associate degrees, 184 baccalaureate degrees, 105 master's degrees and 37 doctoral degrees). The directory allows individuals to search by state, region, and degree. Notice that the ability to sort by institutional or program accreditation is not offered.

Another area likely to impact higher education is the ASSE Body of Knowledge (BoK) Task Force, which was established to provide: "The sum of knowledge within the safety, health and environmental (SH&E) profession…proven and accepted traditional practices, emerging innovative practices…published and unpublished material. It is a living body of information that requires updating and maintenance to remain current" (ASSE, 2011a, About section, para. 1). Created in 1998, the BoK remains a goal for the ASSE as evidenced by comments made by ASSE's former President Dr. Darryl Hill: "It is an effort that strongly supports ASSE's strategic goals to define an accessible body of knowledge; reach out to the

SH&E community on a global level; and improve the value of the safety profession" (Hill, 2010a, para. 2).

The ASSE created an Employer's Guide to Hiring a Safety Professional, which provides an outline for employers, identifying competencies such as entry level, safety practitioner/technician or technologist, manager/senior technical specialist, director/senior level, senior or executive vice president. For each level, there are recommendations regarding education, experience, and certification(s). For example, it is recommended that an entry level hire possess a "4-year degree or 2-year degree from an accredited college or university" with relevant degree options such as environmental and/or occupational health and safety. The ASSE also established a new Center for Safety and Health Sustainability with the AIHA, and IOSH (International Occupational Safety and Health). The ASSE reports its purpose is to "provide new insights into the measurement, management, and impact of safety and health sustainability, with the goal of being a recognized thought leader for sustainability and corporate social responsibility" (ASSE, 2011i).

2. American Industrial Hygiene Association (AIHA)

The AIHA with 10,077 members of "highly educated professionals; 80% college graduates, 42% master's degrees, and 12% doctoral degrees," was established in 1939 by a group "of non-physicians of the American Association of Industrial Physicians and Surgeons, now American College of Occupational and Environmental Medicine (ACOEM)" (http://sp4m.aiha.org/aboutaiha/Pages/default.aspx). Historically, the AIHA has focused on occupational disease prevention (AIHA, 2011a) and the

association's 2020 mission statement sets as a higher goal for the irradication of work related disease (AIHA, 2011b).

The AIHA and ASSE have several memorandums of understanding to encourage cooperation and collaborate between organizations "in agreement that for the organizations to succeed and make positive contributions to worker health and safety…[they will] do whatever is necessary to ensure the membership of both organizations have a positive view of the relationship between ASSE and AIHA" (AIHA/ASSE, 2006, p. 1).

Areas of focus described in the memorandums of understanding between the ASSE and AIHA are government relations, both federal and state; public relations; promotion of publications and products; education; foundations; and emergency preparedness and response (AIHA, 2007). Of particular note, both the AIHA and ASSE work with American National Standards Institute (ANSI) to develop and publish safety- and health-related consensus standards.

3. American National Standards Institute (ANSI)

ANSI, a nonprofit organization, was created 90 years ago by a consortium of three government agencies and five engineering societies. ANSI describes its purpose as one that "empowers its members and constituents to strengthen the U.S. marketplace position in the global economy while helping to assure the safety and health of consumers and the protection of the environment" (ANSI, 2011a, Overview section, para. 1) ANSI reports that by the end of 2006 "there were about 200…standards accreditors [certifying some 5.2 million professionals]…and more than 10,000 standards" (ANSI, 2011b, National standardization section, para. 3), ANSI also accredits credentialing organizations in the United States, including safety and industrial hygiene bodies.

At the initiation of the ASSE, ANSI developed a consensus standard, published in 2003, entitled: "Criteria for Establishing the Scope and Function of the Professional Safety Position Z590.2." An earlier standard, Z590.1, published in 1998, "Criteria for Establishing Levels of Competence in the Safety Profession," was used to develop the later standard (ANSI, 2003). The preamble to the standard provides guidance by describing fundamental knowledge areas as typically having education, training, and experience. Course areas are listed as if they were taken from a page of the pre-1996 ABET requirements by listing: "physics, biology, physiology, statistics, mathematics, computer science, engineering, mechanics, industrial processes, business, communication, and psychology" (ANSI, 2003, p. 2). The ANSI (2003) criteria also include preferred general knowledge areas such as:

> Industrial hygiene and toxicology, design of engineering hazard controls, fire protection, ergonomics, system and process safety, safety and health program management, accident investigation and analysis, product safety, construction safety, educational and training methods, measurement of safety performance, human behavior, environmental safety and health, and safety, health and environmental laws, regulations and standards. (p. 2)

ANSI reports reaching consensus of the "preferred general knowledge area" (ANSI, 2003, p. 2) was with 70 participants, including businesses, germane federal agencies (OSHA, MSHA, NIOSH, USEPA), safety and health organizations (AIHA, NSC, NSMS, HFES, AOHN, BCPE, ABET, BCSP, BCHCM, ABOHN, APIH), and five colleges/universities (ANSI, 2003). The BCSP was specifically identified as a contributor, having completed a "comprehensive job analysis study that involved about 1,500 safety professionals…to ensure that the examinations leading to the Certified Safety Professional (CSP)…accurately reflect what safety professionals do in practice" (ANSI, 2003, p. 3). The BCSP and American Board of Industrial Hygienist (ABIH), certifying industrial hygienists, are accredited by ANSI as personnel accrediting bodies (ABIH, 2011a; ANSI, 2011c; BCSP, 2011a).

Similar to ANSI, the Council of Engineering & Scientific Specialty Boards (CESB) is another credentialing organization, which, for example, has recognized the ABIH to certify industrial hygienist (CESB, 2011a). "The purpose of CESB is to instill some uniformity in engineering and technical certification programs and to accredit those credible programs on which the public can rely" (CESB, 2011b, Regulation of certification in engineering section, para. 3).

The ANSI (2003) standard for the "functions of the professional safety position" was initiated by the ASSE and identifies four categories of roles:

i. Anticipate, identify, and evaluate hazardous conditions and practices.
ii. Develop hazard control designs, methods, procedures, and programs.
iii. Implement, administer, and advise others on hazard controls and hazard control programs.
iv. Measure, audit, and evaluate the effectiveness of hazard controls and hazard control programs. (ANSI, 2003, pp 6-7)

4. Board of Certified Safety Professionals (BCSP)

The BCSP began in 1969 "as a peer certification board…its sole purpose is to certify practitioners in the safety profession" (BCSP, 2011b, About section, para. 1). The BCSP identifies the following as safety professional functions:

- Identify hazards and evaluate them for the potential to cause injury or illness to people or harm of property and the environment.
- Recommend administrative and engineering controls that eliminate or minimize the risk and danger posed by hazards.
- Work with professionals in other disciplines in many different job settings.
- Apply hazard recognition, evaluation, and control knowledge and skills for equipment, systems, facilities and processes, or in operations, manufacturing,

transportation, construction, insurance services, and other enterprises (BCSP, 2011b).

The BCSP offers four levels of certifications differentiated by experience, education, and examination. Most rigorous is the Certified Safety Professional (CSP), followed by the Occupational Health and Safety Technician/Certified Loss Control Specialist (OHST/CLCS), Construction Health and Safety Technologist (CHST), and the Safety Trained Supervisor (STS).

The BCSP (2011a) defines the CSP as the highest level of most highly trained, educated, and experienced professionals in the safety field who are statistically more likely to be hired, paid higher salaries, and promoted and assigned to leadership positions than colleagues without the certification. The CSP requires a 4-year college degree in any field or a 2-year degree from an accredited OSH program, 3 years of relevant experience, and satisfactory completion of the terminal comprehensive exam proceeded by either successful completion of a fundamentals exam, or student registration as a Graduate of Safety Program (GSP). Students are eligible to register as a GSP if their college's safety degree program is accredited by ABET-ASAC or the Aviation Accreditation Board International (AABI). The BCSP defines 13 colleges and universities with ABET-ASAC as QAP's (Quality Academic Programs) (BCSP, 2011c). The ASP or GSP plus an additional 2 years of relevant experience qualifies one to take the comprehensive practice exam (to become a CSP). Table 2.3 summarizes functions and knowledge areas for the ASP and CSP exams (BCSP, 2008a, 2008b).

Table 2.3

Associate vs. Certified Safety Professional

ASP Safety Fundamentals Examination "entry-level" Percent role by knowledge example	CSP Comprehensive Practice Examination "effective full-performance professional safety" Percent role by knowledge example
35.4%: Recognizing Safety, Health, and Environmental Hazards (e.g., chemical, biological, physical, radiation, natural, fire, hazards, and human factors)	28.6%: Collecting Safety, Health, Environmental, and Security Risk Information (e.g., Identify and characterize hazards…to evaluate, design and use data management systems, study culture, management style, business climate, financial conditions…to evaluate risk, research laws, regulations, consensus standards, best practices, and published literature)
30.9%: Measuring, Evaluating, and Controlling Safety, Health, and Environmental Hazards (e.g., sampling and analysis, engineering and administrative controls)	36.6%: Assessing Safety, Health, Environmental, and Security Risk (e.g., Evaluate the risk of injury, illness, environmental harm, and property damage to which the public, audit safety, health, environmental, and security management systems, analyze trends in leading and lagging performance indicators)
20.6%: Safety, Health, and Environmental Training and Management (e.g. ,adult education, management processes, group dynamics, project & risk management, continuous improvement)	34.8%: Managing Safety, Health, Environmental, and Security Risk (e.g., design effective risk management methods, educate and influence decision makers, lead projects, promote a positive organizational culture that is conscious of its safety, health, environmental, and security responsibilities)

Certification exams are administered via computer through Pearson VUE at hundreds of test centers in global locations. Upon completion, the examinee learns of his or her results, followed by a letter. The BCSP exams are created following a three-phase role delineation study, a process facilitated by third party psychometricians. The purpose of the process is to ensure the knowledge and skills practiced by a selected pool or sample of professionals are accurately captured and subsequently represented by the number and type of corresponding exam questions. The BCSP makes all certification delineation studies and related research available on its website (BCSP, 2011a).

The BCSP (2011d) provides a list of reasons employers should hire a CSP, including (in summary):

- Identifies individual as a source of expertise by lengthy examination.
- Associates company name with globally recognized certification.
- Enhances reputation of company.
- Improves relations of company within [SHE] community.
- Exemplifies enhanced professional credibility.
- Demonstrates… certificate holders…met nationally accepted criteria.
- Provides an examination basis to assess employee competency.
- Encourages certifcants to stay updated…
- Recognizes the highest level of professionalism in certified safety, health, and environmental executives.

The BCSP is accredited by the NCCA (National Commission for Certifying Agencies), of the Institute for Credentialing Excellence (ICE), a "non-profit, organization dedicated to providing educational, networking and advocacy resources for the credentialing community (BCSP, 2011e; ICE, 2011). According to the BCSP (2011e) international accreditation is a recognized on a global level as a certification reflecting the highest professional standards. The CSP is accredited by ANSI, and "was the first certification in safety, health, environment, and ergonomics accredited by ICE…[and] is recognized by National Skill Standards Board" (BCSP, 2011e, accreditation and recognition section, para. 1). The BCSP Technical Report 2008-1, titled "Content delineation study for the safety fundamentals examination," outlines a process that "validates the content…of entry-level professional safety practice, or professional safety practice at the ASP level" (BCSP, 2008a, p. 1).

Consistent with Conley's (2012) assertion that "we live in certificate society…[and] employment and careers in almost all areas requires some sort of certification" (p. 28), the

BCSP reports in its role delineation studies that CSP's hold 109 other types of certifications, the five most common being: 13% Associate in Risk Management (ARM), 12% CIH, 7% Associate in Loss Control Management (ALCM), 7% Professional Engineer (PE), and 6% Certified Hazardous Materials Manager (CCHM). The BCSP also reports a range of CSP tasks as 88% Safety, 77% Environmental, 66% IH, 51% Fire Protection, 50% Safety Engineering, 59% Ergonomics, 53% Risk Management, 41% Hazardous Materials Management, 44% Occupational Health, 21% Security, 17% Product Safety, 23% System Safety, 11% Engineering, 10% Public Health, and 12% Medical (BCSP, 2008b).

5. American Board of Industrial Hygiene (ABIH)

The American Board of Industrial Hygiene (ABIH) provides a certification process similar to the BCSP, by credentialing industrial hygienist (IH) traditionally focused on occupational disease prevention, but is also experiencing role creep, for example, including environmental issues and safety. The ABIH reports being "become the world's largest, premier certification scheme for Industrial Hygienists" (ABIH, 2011a, IH defined section, para. 4). Regarding scope (and title protection) the ABIH website states, "there are other terms that essentially mean the same thing as industrial hygiene, e.g., Occupational Hygiene, Occupational Health, Environment, Health & Safety (EHS)…the term Industrial Hygienist has not been restricted by law, anyone… can call themselves an "Industrial Hygienist" (ABIH, 2011a, IH defined section, para. 2 & 4) The ABIH and BCSP both meet ANSI/ISO/IEC 17024 accreditation requirements (ANSI, 2011c). Both the ABIH and BCSP use psychometric processes to identify existing functions of practicing professionals and areas of responsibility and translate those activities into knowledge domains, tasks and skills, ultimately using an exam process to certify applicants as industrial hygienists. While the BCSP appears to hold the

safety market share, it is worth comparing the CIH and CSP roles, summarized in Table 2.4 (ABIH, 2011b; BCSP, 2008b).

Table 2.4

Knowledge Domains CIH vs. CSP

CIH Domains by percent	CSP Domains by percent
1) Exposure assessment principles and practice (50%)	1) Collecting safety, health, environmental, and security risk information (29%)
2) Control selection, implementation, and validation (35%)	2) Assessing safety, health, environmental, and security risk (37%)
3) Risk Management (15%)	3) Managing safety, health, environmental, and security risk (35%)

Note: CIH-Certified Industrial Hygienist; CSP-Certified Safety Professional

Note the similarities in identification, evaluation, and control, characterized as risk management. Industrial hygiene historically has focused on occupational disease prevention, while safety has focused more on physical hazards, such as fire or fall protection. Both professions are dependent upon applying research to ensure worker health and safety (Geller, 2001).

Globally, the International Occupational Hygiene Association (IOHA) reports on its website that it is "an association of occupational hygiene organizations from around the world, all of which are dedicated to the discipline and application of the inherent principles of occupational hygiene" (IOHA, 2011, Welcome to IOHA section, para. 1). In addition, "ABIH is IOHA recognized and accredited by ANSI and CESB (Council of Engineering and Scientific Specialty Boards)" (ABIH, 2013, Certification value section, para. 3)

The ABIH 2010 Annual Report reveals a nearly 50-year history, which includes approximately 10,000 certificate holders—6,630 CIH in active practice, and reports different

specializations: chemical practice, acoustics, air pollution, engineering, radiation and toxicology, all providing a certification (ABIH, 2011c). Comparatively, the BCSP 2010 Annual Report states there are over 12,000 active CSP's and 7,500 technician or supervisory certificate holders, (BCSP, 2011f). Brauer (2008) reported 98% of Certified Safety Professionals were also members of the ASSE and AIHA (or 76% and 22%, respectively).

At a summative level, ASSE, BCSP, AIHA, ABIH, and ANSI in particular have shaped the safety professional field and overlap in many areas. Significantly, their purposes or resulting works (as in the case of ANSI), provide a broad scope of what an entry-level safety professional should hold as knowledge and skill areas. Their processes to define safety emerged differently. ANSI's qualitative approach used an open-consensus process, "Consensus must be reached by representatives from materially affected and interested parties," including the public (ANSI, 2011b, p.1). ANSI applies the "*Essential Requirements* (ANSI's emphasis) which embrace globally-accepted principles of standardization implemented by well-recognized, international standards bodies such as the International Telecommunication Union (ITU), International Organization for Standardization (ISO), and International Electrotechnical Commission (IEC)" (ANSI, 2011a, National standardization para. 8).

While ANSI's consensus process utilized the BCSP and relevant parties (including Roger L. Brauer, Ph.D., CSP, P.E., former executive director of the BCSP), the results are comparable to the BCSP role delineation studies, which use a predominantly quantitative approach (survey question formation following a facilitated workshop) to identify domains of knowledge and skills. The BCSP hires a consultant, independent of the BCSP, to conduct the delineation study. The BCSP concludes their role delineation studies (see Table 2.5) with "the

Comprehensive Practice examination blueprint is an accurate representation of the tasks, knowledge, and skills required for full-performance safety professionals at the CSP level to adequately perform their function" (BCSP, 2008b).

Table 2.5

Summary of Safety Professional Roles

American Society of Safety Professionals	American National Standards Institute	Board of Certified Safety Professionals
Anticipate, identify, and evaluate hazardous conditions and practices	Anticipate, identify, and evaluate hazardous conditions and practices	Collecting Safety, Health, Environmental, and Security Risk Information
Develop hazard control designs, methods, procedures, and programs	Develop hazard control designs, methods, procedures, and programs	Assessing Safety, Health, Environmental, and Security Risk Information
Implement, administer, administer, and advise others on hazard controls and hazard control programs	Implement, administer, administer, and advise others on hazard controls and hazard control programs	Managing Safety, Health, Environmental, and Security Risk Information
Measure, audit and evaluate the effectiveness of hazard controls and hazard control programs.	Measure, audit, and evaluate the effectiveness of hazard controls and hazard control programs	

Note. Based on ANSI (2003), ASSE (2011g), BCSP (2008a).

Is certification relevant? Certification in an area of safety is voluntary, although required by some government contracts and businesses. Brauer (2008), while serving as executive director of the BCSP, surveyed 7,000 CSP credential holders to explore their demographics and salary differences. Findings revealed the following: most respondents were close to 50 years of age, 87% male, and with 25 years of practice. Regarding education, 96% held at least a bachelor's degree and 55% held more than one degree; 58% entered the safety profession from some career path other than an OHS related bachelor's degree; and 23%

applied to and were successfully hired without any safety experience. Average CSP was salary $99,244 (median $89,000), compared to $65,000-$77,000 without CSP.

The BCSP role delineation and content analysis report (BCSP, 2008b) provides insight to certification value. The following list reveals the response percentages to this question: "How has achieving the CSP/ASP benefited you?"

72% I have received greater recognition from my supervisor and peers.

69% It has increased my self-esteem.

68% The CSP certification process increased my knowledge of the safety field.

52% I have received greater recognition from my clients and those I serve.

32% I obtained a higher pay rate because I achieved the CSP.

23% I was promoted to a higher position because I achieved the CSP.

22% I was promoted to a more responsible position because I achieved the CSP.

16% I received a one-time bonus from my employer when I achieved the CSP.

12% Nothing has changed since I achieved the CSP.

8% I received other benefits.

4% The CSP certification process caused me to pursue safety or related degree.

1% The CSP certification process caused me to pursue a degree in another field.

Lastly, 93% report being satisfied or very satisfied with "their level of satisfaction as a safety professional" (BCSP, 2008b), appreciating they have worked in the field 25 years.

Is professional preparation necessary? The organizations surveyed (ASSE, BCSP, AIHA, ABIH, and ANSI) have worked to define the functions and roles of an entry-level safety professional. The roles defined are very broad and hold many requirements for specific technical knowledge and skills. At the same time, the BCSP results reveal most indeed hold a

bachelor's degree, although the survey respondents' degree programs are not listed. The BCSP, while holding the CSP as the "gold standard," accepts any 4-year college degree, plus experience, and passing of two exams. Is the absence of specific formal education in a field that claims to be responsible for human health and safety acceptable? On a similar level, the BCSP requires a high school diploma and experience to become a safety technologist in the construction, loss control, or occupational setting, while the construction field has the most fatalities and the fourth highest rate (BLS, 2011b). Interestingly, Brauer (2008) reported 42% of Certified Safety Professionals entered the profession with a "safety-related degree" and that 23% applied with no experience.

Variations of scope encompassing safety, health, and the environment have led to specializations as evidenced by the numerous certifications available. Is this process of self-definition optimal for the public or employers? The ASSE has many opportunities with students in higher education, including directing them to colleges and universities, which may influence their college of choice. Should the ASSE be more explicit about its college/university web directory and steer students to only ABET accredited programs?

Ferguson and Ramsay (2010) call for the "professionalization" (p. 26) of the safety profession to be truly recognized as such. They recommend that there be 1) minimal OSH educational requirements, which identify learning outcomes to be satisfied before graduation, 2) an enhanced or standardized process to certify competence, such as the CSP or CIH, and 3) pursuit of regulatory licensure, similar to other professional programs such as nursing, "as a matter of protecting the public health and welfare" (p. 29).

Clearly the organizations have something at stake: "professional definitions have generally been framed and promulgated by the members of the groups themselves" (Curry &

Wergin, 1993, p. xiii). This theme is echoed by Ferguson and Ramsay (2010), who stated "since essentially all professional associations are driven by membership dollars, any process such as occupational closure that portends to reduce membership, even in the near term, would logically be viewed as bad for business" (p. 30). At the same time, all of the organizations mentioned provide technical information, networking, continuing education, peer review journal, and/or other values to the members, judging by the voluntary participation.

Organizations as stakeholders of emerging OSH graduates provide consistent competencies, which at a summative level include safeguarding workers from hazards. There are subtle areas of difference: an industrial hygienist might be more focused on specific environmental air sampling, whereas a safety professional would be more engaged in physical safety. Missing, though, is a consistent and agreed upon list of OSH baccalaureate educational outcomes, ensuring that graduates entering the field are indeed minimally qualified in their charge to protect people, property, and the environment.

Safety Professional Roles and Opportunities

This portion of the literature search focuses on defining safety roles, examining what works to reduce injuries, and shifting safety paradigms.

Defining safety roles. Can Krause in his book, *Leading with Safety* (2005), be correct in stating that a safety leader is "any person who influences others in the organization regarding safety" (p. 8). Petersen (1989) posited that "the job of the safety specialist is very much a self-defined one, [with] duties…depending on the…organization" (p. 85). Petersen, in detailing the staff safety role, referenced the ASSE's "functions of a safety professional" and offered a list of activities that should be performed (see Table 2.6).

Table 2.6

ASSE Functions vs. Petersen's Activities

ASSE functions of a safety professional major areas are:	Petersen: Major activities the safety manager will engage in:
Anticipate, identify, and evaluate hazardous conditions and practices.	Measure safety performance, using - Results measures - Activity measures - Records - Statistics - Inspections - Sampling
Develop hazard control designs, methods, procedures, and programs.	Safety program development, including - Orientation - Training - Supervisory department - Motivation - Gimmicks - The selection process - Medical controls
Implement, administer, and advise others on hazard control programs.	Being a technical resource - In investigation - On standards and regulations - On consumer products - On new equipment purchases
Measure, audit, and evaluate the effectiveness of hazard control programs.	Being a systems analyst

Note. Based on ASSE (2011g) and Petersen (1989).

Petersen (1989) also discussed the function of safety within the context of management systems, and presented 10 principles (summarized below), which should be used to guide the safety function:

1. An incident is a "symptom of something wrong in the management system."
2. "Certain sets of circumstances will produce severe injuries [and] can be…controlled."
3. "Safety should be managed like any other company function…[with] goals… planning, organizing and control."

4. "The key to effective…safety performance [are] procedures that fix accountability."
5. "The function of safety is to locate and define the operational [system] errors."
6. "The causes of unsafe behavior can be identified and classified…[and] controlled."
7. "Management's job is to change the environment that leads to the unsafe behavior."
8. "An effective safety system [includes] physical, managerial and behavioral."
9. "The safety system should fit the culture of the organization."
10. "There is no one right way to achieve safety in an organization." (pp. 31-39)

In addition to describing what the safety specialist should do, Petersen addressed the "how" in several sources. In an interview published by the ASSE he is particularly clear in stating that safety professionals "should listen more than they talk…[so they] know what's going on…Good safety is about what people think about and how they work with other people on a regular basis to build excellence" (ASSE, 2007).

The safety function has expanded over time. For example, George and Flynn (2000) reported on survey results from the 1997 AIHA Membership Survey:

- "67% spend 10-50% of their time on safety functions"
- "51% spend some time on environmental issues"
- "82% said that in five years the profession as a whole would be an integration of environment, safety and occupational health"
- "62.4% anticipated that their jobs would combine safety, industrial hygiene, and environmental functions" (p. 2358).

The AIHA has considered changing its name a few times, "to the Occupational Health, Safety, and Environment Association," and in 2009, to the "American Industrial and Environmental Health Association" (AIHA, n.d.).

For 27 years, ISHN (Industrial Safety and Hygiene News)—while not peer reviewed—has surveyed subscribers. In 2011 they published a white paper titled, "State of the EHS [Environmental Health and Safety] Nation," in which they listed survey responses identifying these activities (ISHN, 2011):

80% Engaging leadership is the primary focus of EHS work.

79% I'm given added non-safety duties that impede my effectiveness.

76% In 2011, we will engage employees more in safety activities.

69% Behavior-based safety is still worth pursuing.

67% Without OSHA, I would be much less effective.

68% Human error and mechanical failures are inadequate "catch-all"…for incidents.

57% We spend much more time on OSHA compliance than safety advocacy.

54% In 2011, we will get leadership more involved in safety activities.

53% In 2011, we will develop/improve EHS metrics.

52% We lack the courage to risk careers to speak out about safety programs.

(p. 2)

The majority of responses were from men (84%), above the age of 40 (91%). The results were prophetic: 52% reported "lacking the courage to risk careers to speak out about safety programs," while recalling the ASSE value perception survey, safety professionals are perceived as not having necessary skills, strategic thinking or seeing the larger perspective, and seeing management as the barrier to safety (ASSE, 2008). Interestingly, the ISHN survey results indicate at least 6 of the 10 topics involving leadership and change practices (of self and

others). Two results referring to OSHA reflect a paradox: requiring OSHA regulations to be effective and spending too much on compliance (ASSE, 2008; ISHN, 2011).

Bureau of Labor Statistics, U.S. Department of Labor (BLS). The Bureau of Labor Statistics' (BLS) online Occupational Outlook Handbook (2010-2011) provides some distinction regarding roles and, incidentally, a positive employment outlook for both safety specialist and technicians (BLS, 2011c, 2011d). Table 2.7 offers a summary of key aspects.

Table 2.7

Technician or Specialist

Occupational Health and Safety Technicians	Occupational Health and Safety Specialist
Assist OHS Specialist "to help prevent harm to workers, property, the environment, and the general public"	"also known as safety and health professionals or occupational health and safety inspectors, help prevent harm to workers, property, the environment, and the general public"
About 22% work in government agencies that enforce rules	About 41% work in federal, state, and local government agencies that enforce rules
Post-secondary school or experience and training.	Bachelor's degree in occupational health, safety, or a related field; some require advanced degrees.
2008-2018 Employment Projection +14%	2008-2018 Employment Projection +11 %
Median wages - $45,360, May 2008.	Median wages - $62,250, May 2008.
Certifications recommended, work under direction of OSH Specialist, collect and analyze data.	Certifications such as CSP and CIH recommended. Make recommendations to control hazards, work with management
Primary focus: "to help prevent harm to workers, property, the environment, and the general public…"	

American National Standards Institute/American Industrial Hygiene Association Occupational Safety and Health Management System (ANSI/AIHA Z10 OSHMS). Returning to ANSI momentarily, in 1999, a very diverse committee "with broadly representative members from industry, labor, government, professional organizations" was

established with the AIHA serving as secretariat **(**ANSI/AIHA, 2005, p. iii). Published in (2005), Z10 OSHMS "is a voluntary consensus standard on occupational health and safety management systems…compatible with quality and environmental management" (ANSI/AIHA, (2005, p. iii).

While ANSI Z10 does not define safety professional roles, it does provide an appendix outlining the roles and responsibilities of an organization to ensure effectiveness in reducing and preventing injuries and illnesses. All management roles are defined, president through employees, and those of the health and safety department include the following:

- Advise management and employees about responsibilities regarding OSHMS
- Develop documentation process…to ensure compliance
- Recommend programs and actions for compliance
- Develop effective programs for occupational health, hazardous materials management, radiation safety, general safety, accident and fire protection, biological safety, and disaster preparedness and emergency response
- Provide technical guidance
- Provide training
- Conduct analyses of occupational incidence and injuries
- Analyze injury and illness and monitoring data for trends
- Monitor compliance
- Note instances of non-compliance. (ANSI/AIHA, 2005, pp. 27-28)

Worker's Compensation

The field of occupational injury prevention began to intensify with the passage of the Workers' Compensation Law in 1911. As a no fault system, this law prevented workers from

suing their employers; consequently, employers compensated workers for their injuries, raising some employers' attention to injury prevention efforts (when the laws were followed) (Petersen, 1989). Heinrich published *Industrial Accident Prevention* in 1931, "which had a monumental impact on industrial safety…actually the foundation for most…safety programs" (as cited in Manuele, 2011, p. 3); however, two "myths" from Heinrich's work are perpetuated to this day: 1) the vast majority of time, workers cause accidents, and 2) accident severity will be reduced by focusing on injury frequency. Both hypotheses are simply false based on numerous later studies (Manuele, 2011).

Evolving injury prevention strategies leveraging research seems slow. Guarnieri (1992) reported that accidents "in the history of the country have always been an issue, however, were not considered relevant until there was economic impact"(p.152). During the 1850s, industrialists believed alcohol was the primary cause of injury, which led to "an idea that had deep roots in Western thinking: people were responsible for their own safety and the victim shared the guilt for his or her injury" (Guarnieri, 1992, p. 152), a belief perpetuated by the religious temperance movement and the military (Guarnieri, 1992).

The military's chain-of-command principle, assigned blame because "people caused accidents…[when] they failed to carry out an order" (command was never wrong) (Guarnieri, 1992, p. 152). Victim fault was further supported by Heinrich's industrial accident reviews "proving" more than 90% of the time, the employee was at fault; and the remaining causes were unpreventable *acts of God*" (p. 152).

Injury Prevention Strategies

Many researchers (Blair & Geller, 2000; Geller, 2001; Gielen & Sleet, 2006; Krause, 1997, 2005; Krause et al., 2008; Manuele, 2008; McSween, 1993; Petersen, 1989) describe

traditional safety as being regulatory, event focused, and reactive, instead of seeking to understand the organizational systems that lead to injury, and changing those systems in a proactive and constructive manner.

Gielen and Sleet (2006) posited that "injury prevention opportunities have historically been conceptualized… in the three E's (education, engineering and enforcement)" (p. 6). Heinrich's 1931 book claimed research findings that employees are the source of accidents, and the frequency and severity rates are correlated, zero in on the employee (Manuele, 2011; Petersen, 2003). Early education efforts "that focused on preaching safety…fear and blaming…were largely ineffective" (Gielen & Sleet, 2006, p. 7). Engineering controls reduced injuries, but many times still require human interface and governmental enforcement which "works but is often opposed because it interferes with individual freedoms [and commerce]" (Gielen & Sleet, 2006, p. 7).

Levine and Redinger (2000) emphasized, "OHS [occupational health and safety] literature has been dedicated to the stated general principles of anticipation, recognition, evaluation, and control of occupational hazards…the primary focus of this effort has been to establish … occupational standards…driven by OSHA regulations which are command-and-control"(as cited in George & Flynn, 2000, p. 2251). Blair and Geller (2000) raised a similar point, suggesting that OSHA's approach has not changed in "30 years" (p. 27); however, industrial management theory has significantly changed in the last 30 years, in some cases having a positive impact on safety. Notable examples referenced in the literature include Deming's (1986) "Principles for Transformation" (p. 18), which led to Total Quality Management processes, Social Cognitive Theory (or behavioral safety) (Simmons-Morton &

Nansel, 2006), and Cultural Transformation via Safety Leadership (Krause, 2005; Krause et al., 2008) . However, safety started by focusing on physical energy.

Controlling physical energy to prevent injuries. Allegrante, Marks, and Hanson (2006) referred to William Haddon

> as the father of modern injury prevention…[he] argued that by preventing or dissipating the adverse release of energy, it was possible to minimize the chance of injury without necessarily preventing the accident…[which] precipitated a major paradigm shift from accident causation to injury prevention. (p. 106)

The authors continued, this led "health promotion to embrace an ecological perspective" (p. 106). From an energy control standpoint, Haddon, the first appointed director of the National Highway Traffic Safety Administration, forced auto manufacturers to embrace safety features (such as seat belts and air bags) via legislation, saving thousands of lives (Gielen & Sleet, 2006).

Haddon is also credited for shifting focus from energy control to injury prevention, and then to health promotion. Haddon, realizing that requiring vehicles to have safety belts would not guarantee their use, began the exploration of "psychology and the science of public health, with the purpose to focus attention on the environmental causes of behavior and to identify environmental interventions" (Allegrante et al., 2006). Notice Haddon's shift from uncontrolled energy to environmental or social factors. In a similar proactive and root-cause manner, Deming, reported to be the father of the quality movement, focused on management systems as a way to produce the desired high quality results.

Total quality management and injury prevention. Following World War II, Deming was integral in assisting Japan's efforts to rejuvenate its manufacturing enterprise system, which led to Japan's reputation for quality. Salazar (1989) appears to be the first to transform Deming's 14 Quality Points to the field of safety. In the journal *Professional Safety*, there are

17 articles featuring themes of quality and related analysis techniques. Consistent is a theme of measurement, analysis, evaluation, process modification, re-evaluation, and involvement of key people, such as leaders, employees, or customers.

While Heinrich cited the fact that, "88 percent of all accidents were caused by unsafe acts" (Petersen, 1989, p. 6), Deming focused on management system flaws attributing 94% of unwanted outcomes (Salazar, 1989). In *Out of Crisis*, Deming (1982) suggested, "quality begins with the intent, which is fixed by management" (p. 5), and by studying the production cycle for improvement in effectiveness and efficiency, without fixing blame, there is opportunity for increased "quality…production…capacity… profit… customer and everybody happier" (p. 8).

Several studies examined the hypothesis that an organization's focus on quality is correlated to safety performance. Smith and DeJoy (2012), in a large-scale mixed method (predominantly qualitative) study posited, "Well-organized and effective organizations not only enhance productivity, but also result in safer workplaces. This beneficial by-product has long been an implicit assumption of many safety practitioners" (p. 72).

One of the most recent systems approach to improving organizational health and safety performance is the *American National Standard for Occupational Health and Safety Management Systems* ANSI/AIHA (2005). This consensus standard was constructed from "Quality, environmental, and occupational health and safety…management systems…used around the world" (p. iii). While called a standard, utilization is voluntary and focuses on continuous improvement "aligned with the traditional Plan – Do – Check – Act [a cyclical] approach for improving the workplace" (p. 1). The system of preventing injury is based on risk management concepts, where in a fault-free atmosphere, hazards and hazardous operations

are identified, evaluated, prioritized (from most likely and severe to least), and controlled, then re-evaluated to determine if the control process was effective (ANSI/AIHA, 2005).

The voluntary standard "defines *what* [author emphasis] has to be accomplished in generic performance terms, but leaves the how to each organization" permitting variation between industry types and respective hazards (ANSI/AIHA, 2005, p. 1). Also interesting is the standard's recommendation that hazard controls, thus injury prevention, are approached from an order of most effective to least. The order, or "Hierarchy of Controls [are] elimination or substitution of less hazardous materials, processes, operations or equipment; Engineering controls; Warnings; Administrative controls; and Personal protective equipment," all in consideration of the type of risk and potential consequence, the acceptable level of manageable risk, applicable regulations and codes, industry best practices, best available technology, cost benefit, and organizational standards (ANSI/AIHA, 2005, p. 11).

In *Safety and Health for Engineers,* Brauer (2006) offered, "Achieving safety requires that safety be an integral part of the management process and a component of leadership provided by managers" (p. 633). Brauer used Motorola, who received the first Malcolm Baldrige Award for quality (and safety by inclusion), as an example of a continuous improvement process centered on meaningful employee participation, continuous improvement, and "emphasis on participation in improving the management process…[to ensure] workers and leaders in understanding the process, including hazards and controls" (p. 18).

In *Advanced Safety Management,* Manuele (2008) highlighted and explained how the Occupational Health and Safety Management system (OHSMS) developed by ANSI and the AIHA is a process of continuous improvement. ANSI/AIHA Z10 "is a state-of-the-art, best

practices…[and, if applied] will revolutionize the practice of safety" (Manuele, 2008, p. x). Manuele continues that in his consulting and research he has noted that "very few organizations have safety and health management systems [including for example:] risk assessment and prioritization, applying a prescribed hierarchy of controls to achieve acceptable risk levels, safety design reviews…[and] Management of change systems" (p. x).

Social cognitive theory and injury prevention. In *Injury and Violence Prevention, Behavioral Science Theories, Methods, and Applications,* Gielen and Sleet (2006) posited "for injury control to be effective, behavior must change among some groups, such as children, parents, legislators, manufacturers, and educators…[to focus on] motivation, perception, learning…thought by many to be the key determinants of injury-related behaviors" (p. 1). To that end, Geller (2001) recommended a change in thinking. One example is to apply three new E's: evaluation, ergonomics, and empowerment; therefore, one must "maintain focus on engineering, education and enforcement…[and] to get beyond current plateaus and reach new heights in safety effectiveness, we must attend more competently to the psychology of injury prevention" (p. 34). In another example, Geller (2001) contrasted traditional safety mental models and corollaries:

	From:	To:
-	government regulation	corporate responsibility
-	failure oriented	achievement oriented
-	outcome focused	behavior focused
-	top-down control	bottom-up involvement
-	rugged individualism	interdependent teamwork
-	piecemeal	system approach

- fault finding — fact finding
- accident investigation — incident analysis
- reactive — proactive
- quick fix — continuous improvement
- safety first (priority) — value (safe productivity) (pp.36-46)

Petersen (1989), in *Techniques of Safety Management: A Systems Approach,* concluded with a strong, almost condemning statement, that the safety profession has not advanced because of the misplaced belief that "that accidents are caused by people," thereby expending too much energy on "physical surroundings, and conditions….[it's time to] concentrate on the systems approach to safety, which includes the physical and the managerial, the whole thrust is that all systems must be constructed with behavioral soundness" (p. 46).

On the one hand, there is an unrecognized truth that workers' at-risk behaviors may result in injury or loss. In *Value-based Safety Process: Improving Your Safety Culture with Behavior-based Safety,* McSween (1993) stated, "research by DuPont and others suggest 80% to 90% [reported but unsubstantiated as high as 96% at DuPont] of today's incidents are the result of unsafe acts [at-risk behaviors] rather than unsafe conditions." (p. 6).

What is finally shifting, however, is the appreciation that an individual's behavior (including learning) does not occur in a vacuum, and that while understanding all sources of human behavior is complex, the web of relationship and interdependency between the individual, their social environment, and the very behavior, act in concert and tension; each causing effects on the other (or any combination thereof) resulting in conscious or unconscious behavior. Bandura (1999) identified this as triadic social determinism. Geller (2001) continued the theme with his "safety triad," and Krause (2005) called this the "worker-interface."

Again, Petersen (1989) provided the transition from person to culture and its role in injury causation or prevention, noting, "over the years we tended to become confused concerning… unsafe acts and conditions [as] causes of accidents [incidents]… [however, to] effect permanent improvement, we must deal with the root causes of accidents...weaknesses in the management system" (pp. 28-29). Petersen (1989) addressed the effect of management: "culture is key…[and] management through its vision, honest real values, systems of measurement, and reward and daily decisions creates the organizational culture…that drives actions" (pp. 83-84.). Johnson (2007) referred to "organizational constructs (e.g., culture, safety climate, and organizational commitment)…as the third age of safety" (p. 511).

Geller (2001), who is a psychology professor at Virginia Tech and a senior partner of Safety Performance Solutions, in *Psychology of Safety* summarized research on the effectiveness of injury reduction methods, ranking behavioral-based safety, ergonomics, engineering controls, and group problem solving at 59.6%, 51.6%, 29%, and 20%, respectively. Geller summarized each of the approaches, noting key aspects. Both the behavioral-based and ergonomic studies are characterized by significant worker participation and leader involvement. Group problem solving where "operations personnel met voluntarily to discuss safety issues and problems, and to develop action plans for safety improvement" was 20% effective at reducing injuries (p. 6). Engineering controls, reflecting a 29% reduction, included "introduction of robots or the comprehensive redesign of facilities to eliminate at-risk behaviors" (p. 6).

Of particular importance, Geller (2001) framed the behavioral safety process as one that strives for a "total safety culture…[where] people actively care for one another, going beyond the call of duty" (p. 25). As mentioned, Geller uses a triangle, which he referred to the safety

triad, to illustrate the interdependence of "three domains: person, environment and behavior" (p. 25) and to examine how these domains influence behavior. Geller defined environment to address physical aspects such as hot vs. cold, vibration, and noise (p. 25), somewhat differently from Bandura's reciprocal determinism triangle; where "environment (external social and physical milieu), behavior (actions), and person (individual cognitive, affective, and biological self), are understood to be dynamically interrelated" (Simmons-Morton & Nansel, 2006, p. 43). Sulzer-Azaroff and Austin (2000) completed a meta-analysis that explored the effectiveness of behavioral safety: "the data gathered support the conclusion that BBS [behavioral based safety] systems appear to have helped reduce injuries on many occasions….Most essential to those gains are the training, organizational, managerial, follow-through" (pp. 19-24).

Petersen (1989) reported that following 10 years of study behavioral reinforcement led to injury reductions of 8% to 100% or an average of 65%**.** Petersen also summarized research completed by Thomas Planek and associates for the National Safety Council in 1967 and in 1992: "among industrial organizations that are highly successful in the reduction of health and injury hazards, there are variations in safety organization and practice" (p. 41). The study used Spearman rank order correlation, establishing safety program areas in 1967 and 1992 , which were "not associated," ultimately identifying most to least effective practices to ensure worker health and safety. Senior management supporting employee participation is ranked most important, serving as a segue to organizational change or transformation.

Cultural transformation and injury prevention. In an article entitled, "The culture of safety," Williamsen (2007) interviewed pioneer Dan Petersen, asking him to comment on OSHA. Petersen stated, "when you spend all of your effort on OSHA compliance, the focus ends up with the condition of stuff…The culture approach ensures what you will have…high

performing safety is derived from good relationships and a strong culture among…people" (p. 18).

Krause et al. (2008) provided testimony to the U.S. Senate Employment and Workplace Safety Subcommittee, reporting their success is attributable to the "identification of systems issues that predispose at-risk behavior in addition to creating a culture in which at-risk behavior is minimized and the effectiveness of safety systems is maximized" (Krause et al., 2008).

Krause (2005), in his book, *Leading with Safety*, explains safety or "*an injury-free culture is one that doesn't tolerate exposure to hazards*" (p. 13). Krause explained that a hazard and exposure are related and as the precursor to some unwanted (unintentional) event, at the "Working Interface…[and] *the same number of exposure events in a given time period will lead to a different number of incidents in the same time period*…a statistical fact stemming from random variability" (p. 14). Krause (2005) presented a five-hoop Venn diagram to illustrate how an organization's leadership influences the interconnected relationships of "safety enabling systems," (such as hazard recognition and controls), "organizational sustaining systems" (such as accountability and management systems), "worker interface" and "organizational culture" (p. 9).

Interestingly, and leading by example, Krause (2005) described how his organization's thinking progressed:

> Traditionally "safely programs" dealt with the physical environment. Later we looked at management and attempted to build management principles into our safety programs. Today we recognize the need to also look at the behavioral environment - the climate and culture in which the safety system must live. (p. 38)

Krause clearly applied Bandura's reciprocal determinism model to interrupt at-risk behaviors, which result from the organizational culture.

Federal regulations and worker safety. Historically, the United States has applied federal regulation to ensure public and worker safety. Lonero, Clinton, and Sleet (2006) reported that "Laws have two main influence functions: the declarative function of law communicates expected standards of behavior, and the deterrent function of law imposes sanctions for those whose behavior violates the standards" (p. 219). Many federal agencies are charged to ensure the health and safety of people; for example: the Federal Aviation Agency (FAA), National Highway Traffic Administration (NHTSA), Consumer Product Safety Commission (CPSC), Center for Disease Control (CDC), Environmental Protection Agency (USEPA), and Federal Emergency Management Administration (FEMA). Of particular note are two worker safety agencies: OSHA and NIOSH (National Institute for Occupational Safety and Health).

Most important to this study are OSHA and NIOSH, which were both enacted into law in 1970, when it was estimated there were 38 workplace fatalities per day, or roughly 14,000 per year (vs. 4,600 in 2010) (Michaels, 2011). OSHA is a division of the U.S. Department of Labor, which is home to some 20 offices and departments, including others with significant roles related to worker health and safety, such as the MSHA (Mine Safety Health Administration) and the BLS (Bureau of Labor Statistics), while NIOSH is a division of the CDC, within the Department of Health and Human Services.

OSHA's charge is seemingly straight forward: "to ensure safe and healthful working conditions for working men and women by setting and enforcing standards and by providing training, outreach, education and assistance" (OSHA, 2011d). To accomplish this mission,

OSHA requires employers by federal law to comply with applicable standards such as the Right to Know law, which is intended to inform employees of the hazardous properties with which they are working; record injuries and illnesses; conduct applicable environmental monitoring; and report fatalities to OSHA within 8 hours (OSHA, 2011a).

OSHA initially focused on regulation development and enforcement, whereas now it also works to expand training and educational opportunities. Enforcement efforts are continually focused on occupations with the highest injury rates (OSHA, 2010). Depending on one's counting methods, there are thousands of OSHA regulations. Oddly, compliance with the OSHA standards does not always lead to fewer injuries.

Petersen (1989) drew early attention to the dissonance between regulatory compliance and controlling (or preventing losses). Blair and Geller (2000), citing Petersen, noted,

> The more-competent safety professionals…found they had two separate and distinct duties, complying with the law and controlling losses…. In some cases…related and in some cases… not. There was no question, however, as to the priorities: complying came first termed by OSHA. (p. 28)

At the same time, the Office of Management Budget ([OMB], 2008) reported OSHA as reducing workplace fatalities from the all-time high in the 1970s of "18 deaths per 100,000 workers [38 per day]…to 4 per 100,000…15 every day or 5,703 in 2006."

OSHA's enforcement and attention on controlling physical hazards likely played some role in reducing the fatality rate, and shaping the function of safety specialist. Transitioning from the survey of at-risk behaviors and controlling specific hazards, the literature reveals other influences of OSHA and NIOSH on higher education.

OSHA, National Institute for Occupational Safety and Health (NIOSH) and higher education. These organizations affect higher education and the role of a safety specialist. Specifically, ASSE, ANSI, and BCSP each identified regulatory knowledge as a competency

for entry-level safety specialist. Traditional safety or the "old three E's" are embodied in many of the OSHA regulations, which have influenced safety professional roles since their creation (Blair & Geller, 2000; Petersen, 1989). A question bantered around since the 1970s is how effective is OSHA at preventing injuries?

OSHA's purpose is "to ensure safe and healthful working conditions for working men and women by setting and enforcing standards and by providing training, outreach, education and assistance" (OSHA, 2011d). Of course, there is a range of opinions (and some research) addressing this question. On the one hand, Sparrow (2000) reported, "as many as 90 percent" of occupational incidents and injuries "had nothing to do with noncompliance" (p. 41). On the other hand, Haviland, Burns, Gray, Ruder, and Mendeloff (2010) found in an ex post facto design, a "dual impact" of those places inspected by OSHA achieved by raising awareness and resulting attention to issues noted by compliance officers, and improving injury prevention performance.

Regrettably, on account of the fact that the Congressional Budget Office (CBO) "projects a $1.3 trillion deficit for 2011, the third-largest shortfall in the past 65 years" (CBO, 2011), "consumer and occupational health and safety…is slated to be funded at 10 percent below the FY1997 level (National Science Foundation, 2011). Furthermore, NIOSH, the research and educational support function to OSHA, is also experiencing immense budget pressure.

Johnson (2011), in *Industrial Safety and Health News* (ISHN), reported "NIOSH is the one in trouble…In the grand scheme of things, you could make the argument that not gutting NIOSH may be more important than holding the line at OSHA…[while] OSHA may weather the cost-cutting…It is not a big enough target." The OMB (2008) reported in the years from

1980 to 2005, the rate of OSHA site visits or inspections decreased by 62% (1.77 inspections per 100,000 workers to .668), and continued predicting a bleak future: "Considering nearly three decades of budget and staffing cuts and sharp declines in the number of workplace inspections, future administrators, however well intentioned, will have difficulty jump-starting progress in improving workplace safety" (OMB, 2008).

David Michaels (2010), Assistant Secretary of Labor for OSHA, in testimony to a congressional committee provided perspective regarding the challenges facing OSHA, and, therefore, the workers in the United States, to no avail. According to Michaels (2010):

> Congress has increased monetary penalties for violations of the OSH Act only once in 40 years despite inflation during that period. As a result, unscrupulous employers often consider it more cost effective to pay the minimal OSHA penalty and continue to operate an unsafe workplace than to correct the underlying health and safety problem. Currently, serious violations - those that pose a substantial probability of death or serious physical harm to workers....Willful and repeated violations carry a maximum penalty of only $70,000. (Penalties section, para. 8)

In another paper, Choi and Ramachandran (2009), evaluating OSHA's role in the emerging and potentially hazardous field of nanotechnology, identified OSHA as having the lead role, yet noted it is functionally stopped in court.

Enforcement of health and safety regulations. Literature and opinion about the contribution of both agencies is broad, but the question here is about their impact on the profession and higher education. Employers are responsible for meeting OSHA's regulations. Although significantly limited in resources and by frozen proposed regulatory revisions, OSHA has continued to pursue its charge through enforcement of existing standards, targeted emphasis programs (not requiring legislative approval), education, and voluntary employer recognition programs for demonstrating health and safety excellence. For example, in June 2010, OSHA began a new program titled, Severe Violator Enforcement Program (SVEP), to focus on

employers that repeatedly place employees at high risk of serious injury, illness, or death (OSHA, 2010). OSHA reports its 2010 enforcement activity as: "40,993 total inspections…96,742 violations of OSHA's standards and regulations in the nation's workplaces, a 15.3% increase since FY 2006…[And] 1,177 …[whistleblower or retaliation] investigations (OSHA, 2011b).

OSHA Training Institute Education Centers (OTIEC's). Elements of most OSHA standards require employee training and education, typically before the employee engages with a job task because "many researchers conclude that those who are new on the job have a higher rate of accidents and injuries than more experienced workers" (OSHA, 1998, p. iii). Training requirements in OSHA Standards and Training Guidelines (OSHA, 1998) identify the need for employee health and safety training where the attendees earn certificates, or are deemed competent or qualified.

OSHA, as a part of its charge, established Training Institute Education Centers in 1992. This institute addresses two relevant areas: opportunities for continued learning and opportunities for collaborating with higher education as a provider. For reference, in 2009 and 2010, there were over one million students trained, and each of OSHA's 10 regions is affiliated with a college and/or university, many times as a consortium. This is summarized in Table 2.8.

Table 2.8

OSHA Training Institute Education Centers in the United States

Region I	Keene State College- Keene, NH
Region II	Atlantic OSHA Education Center - A consortium comprised of: • University of Medicine and Dentistry of New Jersey - New Brunswick, NJ (lead) • The Research Foundation of SUNY on behalf of the University at Buffalo - Toxicology Research Center - Buffalo, NY • Universidad Metropolitan - San Juan, PR • Rochester Institute of Technology - Rochester, NY
Region III	National Resource Center, Washington, DC - A consortium comprised of: • West Virginia University - Morgantown, WV (lead) • National Labor College George Meany Campus - Silver Spring, MD • Center to Protect Workers' Rights - Washington, DC Mid-Atlantic OTI Education Center - A consortium comprised of: • ECRI Institute - Plymouth Meeting, PA (lead) • Chesapeake Region Safety Council - Baltimore, MD • Mid-Atlantic Construction Safety Council - Philadelphia, PA • Johns Hopkins University and Health System - Baltimore, MD
Region IV	Eastern Kentucky University - Richmond, KY Georgia Tech Research Institute - Atlanta, GA Southeastern OTI Education Center - A consortium comprised of: • North Carolina State University - Raleigh, NC (lead) • University of Tennessee - Knoxville, TN University of Alabama - Tuscaloosa, AUniversity of South Florida - Tampa, FL
Region V	Great Lakes Regional OTI Education Center - A consortium comprised of: • University of Cincinnati - Cincinnati, OH (lead) • Eastern Michigan University - Ypsilanti, MI • United Auto Workers Health & Safety Department - Detroit, MI Heartland Safety and Health OTI Education Center - A consortium comprised of: • Indiana University - Bloomington, IN (lead) • University of Wisconsin-Whitewater - Whitewater, WI Mid-America OSHA OTI Education Center - A consortium comprised of: • Ohio Valley Construction Education Foundation - Springboro, OH (lead) • Sinclair Community College - Dayton, OH National Safety OTI Education Center - A consortium comprised of: • Northern Illinois University - DeKalb, IL (lead) • Construction Safety Council - Hillside, IL • National Safety Council - Itasca, IL
Region VI	Texas A&M Engineering Extension Service (TEEX) - Mesquite, TX The University of Texas at Arlington - Houston, TX
Region VII	Metropolitan Community Colleges Business & Technology Center - Kansas City, MO Midwest OSHA Education Centers - A consortium comprised of: • Kirkwood Community College - Cedar Rapids, IA (lead) • National Safety Council - Greater Omaha Chapter - Omaha, NE • St. Louis University - St. Louis, MO
Region VIII	Mountain West OTI Education Center - A consortium comprised of: • University of Utah - Salt Lake City, UT (lead) • Salt Lake City Community College - Salt Lake City, UT • Uintah Basin Applied Technology College - Vernal, UT Red Rocks Community College - Lakewood, CO
Region IX	University of California, San Diego - San Diego, CA College of Southern Nevada - Las Vegas, NV California State University Dominguez Hills - Carson, CA Chabot-Las Positas Community College District - Pleasanton, CA
Region X	University of Washington - Seattle, WA

Note. Table created based on information presented in OSHA, 2011c.

National Institute for Occupational Safety and Health (NIOSH). This entity describes its mission as to "generate new knowledge in the field of occupational safety and health and to transfer that knowledge into practice for the betterment of workers [through] research… recommendations, disseminates information, and responds to requests for workplace health hazard evaluations" (NIOSH-CDC, 2011c, p. 1). NIOSH reports eight locations in the U.S. and "headquarters are in Washington, D.C. and Atlanta, GA…with …a professionally diverse staff of 1,200 scientists…own laboratories, [and] serves as the major support for occupational safety and health research in academic centers in the U.S." (NIOSH-CDC, 2011c).

Education and Research Centers (ERCs) are NIOSH-supported academic graduate degree programs at selected universities "in the core areas of industrial hygiene, occupational health nursing, occupational medicine, and occupational safety, plus specialized areas relevant to the occupational safety and health field" (NIOSH-CDC, 2010). There are 17 ERCs:

- University of Alabama at Birmingham, School of Public Health
- University of California, Berkeley, School of Public Health
- Southern University of California, Los Angeles, School of Public Health
- University of Cincinnati Department of Environmental Health
- University of Colorado School of Public Health
- Harvard School of Public Health, Department of Environmental Health
- University of Illinois at Chicago, School of Public Health
- University of Iowa, College of Public Health, Department of Occupational and Environmental Health
- Johns Hopkins University, Bloomberg School of Public Health
- University of Michigan, School of Public Health

- University of Minnesota, Prevention Research Training Program, Division of Environmental Health Sciences School of Public Health
- Mount Sinai School of Medicine Department of Community and Preventive Medicine
- University of North Carolina at Chapel Hill School of Public Health
- University of South Florida, College of Public Health
- University of Texas Health Science Center at Houston, School of Public Health
- University of Utah, Rocky Mountain Center for Occupational and Environmental Health
- University of Washington, Department of Environmental Health and Occupational Health Sciences

NIOSH reports graduates from the ERCs in four major areas of study: Industrial Hygiene, Occupational Health Nursing, Occupational Medicine, Occupational Safety, and their activities after graduation, listed in Table 2.9.

Table 2.9

NIOSH ERC Post-Graduate Activity

	Industrial Hygiene (n=93)	Occupational Health Nursing (n=52)	Occupational Medicine (n=47)	Occupational Safety (n=36)	Other (n=43)	Total (n=271)
Private Industry	16	7	2	13	6	44
Federal Government	12	1	14	6	2	35
State/Local Govt.	3	2	3	0	12	10
Academic Institutions	12	8	2	4	0	38
Clinics/Hospitals	0	18	19	1	0	38
Seeking Advanced OSH Degree	8	1	0	0	11	20
To Be Determined	22	0	3	0	5	30
Total	73 (78%)	37 (71%)	43 (91%)	24 (67%)	38 (88%)	215 (79%)

Note. n = number of graduates

NIOSH funds the research and development of applicable programs, and provides research and training grants.

Global Perspective of Occupational Exposure

The World Health Organization estimates on a daily basis there are 6,300 workplace deaths—more than 2.3 million deaths per year (Neira, 2009). Globally, the World Health Organization (WHO) established by the United Nations provides resources and strategies to improve workers' health and safety. The international counterpart to the ASSE is IOSH (Institution of Occupational Safety and Health), which reports 39,000 members (roughly 6,000 more than the ASSE). It is immediately evident that both the WHO and IOSH apply a more comprehensive approach of systems management by assessing and managing risk to improve worker health and safety.

World Health Organization's model of injury prevention. The definition of health recognized in 1948 still endures: "A state of complete physical, mental and social well-being, and not merely the absence of disease" (World Health Organization [WHO], 2011). The definition of health (encompassing all activities of life) guides the organization's strategy. The World Health Assembly of WHO endorsed the *Global Plan for Action* (GPA), 2008-017 with the aim to provide new impetus for action…with five objectives (Neira, 2009):

1. To devise and implement policy instruments on workers' health
2. To protect and promote health at the workplace
3. To promote the performance of and access to occupational health services
4. To provide and communicate evidence for action and practices
5. To incorporate workers' health into other policies.

WHO defines a healthy workplace as:

> one in which workers and managers collaborate to use continual improvement process to protect and promote the health, safety and well-being of workers and the sustainability of the workplace by considering…the physical… psychosocial.…Personal health resources work environment …[and] community to improve the health of workers, their families and other members of the community. (Burton, 2010, p. 2)

The WHO healthy workplaces model is represented with a four-circle Venn diagram, overlaid in the center with values and ethics (Neira, 2009). The model identifies the four areas affecting health and safety in the workplace:

- Physical work environment…detected by human or electronic senses…such as air, machines, structure, furniture, products, chemicals…may affect physical or mental safety and well-being of workers
- Psychosocial work environment or the organization of work and culture; attitudes, values beliefs and practices
- Personal health resources…means supportive environment, health services, information, resources
- Enterprise community involvement…workers live in communities [and therefore] their health is affected by the community physical and social environment, e.g. air, land and water pollution, etc. (Neira, 2009, p. 8)

Dr. Maria Neria, Department of Public Health and Environment, WHO headquarters, Geneva, Switzerland (2009), called for shift in understanding that worker health and safety is interdependent upon the employer, community, family, and support services and/or capacity therein.

Institution of Occupational Safety and Health (IOSH). IOSH (2011a), centered in the U.K., and organized in 1945, has 39,000 individual members "in 85 countries; we're the world's biggest health and safety membership organization." Its vision is, "A world of work which is safe, healthy and sustainable" (Who we are section, para. 2). IOSH describes the purpose of its work in the following manner:

- make sure that people are at the heart of safety and health
- be the definitive voice for health and safety at work

- advance high professional standards
- champion pragmatic risk management, based on professional advice
- sponsor research and share knowledge
- support its members as leaders in safety and health in their communities and workplaces
- promote the benefits of good workplace health and safety. (IOSH, 2011b, What does IOSH do section, para. 1-3)

IOSH emphasized its work with universities is to ensure research was applied to guarantee the scientific process was applied to address risk identification and management, and also to guide higher education institutions with SHE programs toward quality assurance measures. Similar to ABET, the IOSH accreditation process is voluntary, and similar to the ASSE, IOSH provides funding for research and scholarship.

The IOSH voluntary university accreditation process is structured by identifying areas of knowledge and skills, and demonstrating learning outcomes. IOSH published: "Higher level qualification accreditation" (2011c), which not only describes their accreditation processes but also learning objectives, for undergraduate and graduate level programs. Additionally, the IOSH places emphasis on the demonstration and application of knowledge.

INSHPO (International Network of Safety and Health Practitioner Organisations). The International Network of Safety and Health Practitioner Organisations was established in 2001 by three organizations: the ASSE, the Canadian Society of Safety Engineering (CSSE), and IOSH, recognizing health and safety issues are truly global in nature, and that "practising generalists often lack the facility to influence policymakers on a global scale and establish effective, mutually supportive international networks" (INSHPO, n.d., para. 2). Ten years later,

INSHPO is comprised of 14 global OSH organizations: AIAS (Italy), ASSE (US), BCRSP (Canada), BCSP (US), CSSE (Canada), IFAP (Australia), IOSH (UK), IOSHM (Mauritius), KOSHA (South Korea), NACOT (Russia), NEBOSH (UK), NZISM (New Zealand), SIA (Australia) and SISO (Singapore) (Hill & Hudson, 2012). The ASSE has assumed a leadership role to coalesce global efforts to enhance and clarify the value a qualified safety professional brings to an organization, agree upon and clarify qualifications of voluntary standards such as ANZI Z10, enhance cross-border practice, recognize distinction of qualified practitioners in countries without certification programs, and support international corporations with making improved hiring decisions (Hill & Hudson, 2012).

Occupational injury prevention as an evolving discipline. Many researchers identify the need to move beyond minimal regulations using a proactive systems approach (Blair & Geller, 2000; Geller, 2001; Gielen & Sleet, 2006; Krause, 2005; Krause et al., 2008; Levine & Redinger, 2000; Manuele, 2008; Petersen, 2003). Geller (2001) suggested researchers "maintain a focus on engineering, education and enforcement strategies…[and] attend more competently to the psychology of injury prevention" (p. 34). Krause (2005) presented "The Organizational Safety Model," a five circle Venn systems model of: leadership, safety enabling systems, organizational sustaining systems, working interface (equipment, worker, procedures, and facilities) as they all create and sustain an organizational culture focused on proactive and effective health and safety practices. Krause (2005) is clear, "*An injury-free culture is one that doesn't tolerate exposure to hazards*" (p. 13) (emphasis added) and "leadership creates organizational culture and safety climate" (p. 16).

Krause et al. (2008), in his company's testimony presenting case studies and the accumulated results of their approach to a U.S. Senate Committee, focus very sharply on the

relationships between leadership, organizational systems (policies and procedures), safety-enabling systems (hazard recognition and mitigation—skills, knowledge, training- regulations, procedures—safety improvement mechanisms), culture, and resulting worker interface (equipment-worker-facilities-procedures) to diagnose and change leadership roles, thereby affecting all parts of the system, and resulting in reduced worker exposure to hazards and resulting losses.

Petersen (1989, 1995, 1998, 2003), Krause (1997, 2005), Krause et al. (2008), and Geller (2001), presented systems diagnosis approaches that position leadership to set a tone and expectation of continuous improvement by focusing on proactive measures and changes in a non-blaming manner.

In his review and explanation of American National Standards Institute, Occupational Safety and Health Management System, Manuele (2008) identified OSHMS as the "first national [voluntary] consensus standard…for safety and health management systems applicable to organizations of all sizes and types" (p. 7), and "is a state-of-the-art, best practices guide…that will revolutionize the practice of safety" (p. xi). Part of the issue lies in how each person assesses risk, including those in leadership positions, based on their conscious or unconscious learning, in the absence of science or accurate learning. Girasek (2006) explained how optimistic bias and heuristics prevent people from making informed risk assessments. "Numerous studies have demonstrated that people tend to erroneously judge their own risk to be less than that of others…[and] heuristics…causes people to think that an event is more likely to occur if it is easy for them to envision" (p. 92). McSween and McSween (2003) presented the following paradox, however, that "most businesses and industries today have

excellent safety records….the average employee… can expect to experience one lost-workday injury in approximately 33 years of work" (p. 1).

Krause (2005) stressed the importance of using research and leading measures to provide reliable indicators of where attention should be focused before the unintentional injury. Again, he challenged the profession by noting, "the most interesting aspect of all this is that most safety professionals [know the value of leading measures] while *safety leaders*, including executives who make important safety related decisions, frequently, don't" (p. 14). Herein reside more paradoxes. Recall these points:

- ASSE reported "The most frequently mentioned barriers [by safety professionals] is lack of upper management support, [while] Managers … say no barriers…exist at their company" (ASSE & North Star Research, 2008, p. 24).
- ISHN in 2010 reported 80% of respondents see "engaging leadership is the primary focus." While 52% said "we lack the courage to risk careers to speak out about safety programs" (ISHN, 2011, p .33).
- Volkwein et al. (2007), studied the impact of the present performance-based ABET accreditation changes initiated in 1996 and in full effect by 2000. The changes improved graduate performance as experienced by professors, and employers,
- AAC&U (Hart, 2010) employer survey, which revealed employers were dissatisfied new hire college graduates, and
- the ASSE (2008) value perception survey each identified employers' number one want as new hires with strong written and communication skills.

Returning to Petersen's (1989) 10 principles, striking are numbers seven and eight: "In most cases, unsafe [at-risk] behavior is normal behavior; it is the result of normal people

reacting to their environment" (p.33)…[and] three major subsystems that must be dealt with in building an effective safety system: (1) the physical, (2) the managerial and (3) the behavioral" (p. 33). Petersen also pointed out, "We [safety specialists] have historically reacted to the environment of the day and in many cases have not had particularly impressive results…[instead of applying] solid in-depth research which could have guided us" (p. 12).

Competing or Synergistic Interests?

Brauer (2006) reported that "the overall field of safety has changed…rapid convergence of several related areas of practice…industrial hygiene, environmental science and engineering, environmental health, ergonomics, fire protection…many individuals have responsibility for many of these areas simultaneously" (p. xii). Recall the BCSP in its role delineation study, where it identified 109 certifications related to the field of safety. The largest individual-based associations in the United States appear to be the ASSE and AIHA, with overlapping definitions: "protection of people, property and the environment," (ASSE, 2011g), and

> science and art devoted to the *anticipation, recognition, evaluation, prevention, and control* of those environmental factors or stresses arising in or from the workplace which may cause sickness, impaired health and well-being, or significant discomfort among workers or among citizens of the community. (AIHA, 2011a)

WHO defines health as encompassing worker health and safety in the context of community and family, and a continuous improvement process centered on ethics and values, leadership, and employee engagement.

The safety related literature during the last 20 years identifies the need for a systems approach modeling continuous improvement, and safety professionals with competencies which include technical and adaptive skills. Recall the NAOSH (McAdams et al., 2011) study noted that employers are requiring safety professionals with increased communication skills, leadership, and broader technical skills; however, however, from a perspective of injury

prevention research, “Scientists, administrators, and practitioners need to move out of the complacency of their comfort zone and embrace research tools, theories, methodologies, and types of evidence and safety promotion practice, that can accommodate, elucidate” (Allegrante et al., 2006). Manuele (2010) reported “[defining] acceptable risk, is frequently used in standards and guidelines throughout the world, yet a substantial percentage of those with SH&E responsibilities [in the U.S.] are reluctant to adopt or use it” (p. 30).

The literature reveals a tension and evolution of injury prevention science. The ASSE links its origins to the 1911 Triangle Shirtwaist fire, where the application of elementary physical precautions in the garment mill, such as unlocked exit doors and control of cigar smoking (fire origin) would have likely prevented the catastrophic loss of 146 women and children workers (ASSE, 2011b). In the 100 years since that disaster, the quality and quantity of injury prevention research has advanced, at times with false starts. On the bright side, research is available from peer-reviewed sources explaining how a myriad of factors contribute to hazards, thus requiring technical and additional skills to correctly identify, evaluate, prioritize, and control (McAdams et al., 2011).

Today, factory walls are permeable, health and safety issues, positive or negative, are fluid and shared within the community (Burton, 2010; CDC, n.d.). The AAC&U and ABET employer surveys revealed their common expectation: that recent college hires have global and cultural perspectives. Manuele (2008) posited, “prudent professors…will assure that core courses properly equip students to meet employer needs” including the ability to implement and facilitate OSHMS methods” (p. 12).

Higher Education's Role

What role does higher education play in this complex system? Consider there are roughly 90 baccalaureate programs in the United States and that there is functionally no method of determining what is being taught by whom (Ferguson & Ramsay, 2010). Both the ASSE and AIHA have significant ties to higher education: ANSI, and its sister or certifying boards, the BCSP and ABIH. They also share a formula to control hazards: to anticipate, recognize, evaluate, prevent, and control hazards.

Higher education programs are positioned to positively change the future of worker health and safety by increasing and ensuring the rigor of minimal learning outcomes of undergraduate degree programs that are critical to the safety of people and their environments. As the field of health and safety has incorporated more and more science, the competencies of knowledge, skills, and attitudes most certainly become more complex comparable to any other technically based profession.

While governmental regulations have been successful for some level of effectiveness in workplace injury prevention (Michaels, 2011), it seems unlikely regulatory overhaul will progress to a level of ensuring necessary improvements in worker safety (Blair & Geller, 2000; GAO, 2009; Michaels, 2010;). Hill (2002) begged the question of the ASSE, "Is it Time to Transform?" Recall, the ASSE is the largest member-based safety professional society in the U.S., and has the only higher education committee (the Educational Standards Committee) charged to develop applicable curriculum guidelines to guarantee the next generation of professionals is indeed qualified and competent.

Given the "never experienced before challenges of magnitude" facing higher education (Mehaffy, 2012, p. 2), the ASSE seems uniquely positioned to both advance the

professionalization process (Ferguson & Ramsay, 2010) and establish relevant and timely educational requirements. Stakeholder voices, especially employers, seem critical to shape and ensure graduates are meeting expectations (U.S. Department of Education [ED], 2006).

Dissertation Merit

This applied research project aims to identify how expert safety professionals describe evidence of baccalaureate competency expected from emerging safety professionals. The nature of the method focuses on expert practitioner language leading to the articulation of learning outcomes, or the types of activities graduates would be capable of performing. Ferguson and Ramsay (2010) suggested, "educational program outcomes and competencies (knowledge and skills) for entry-level professionals must be established" (p. 27) in order for the profession to advance, and provide opportunity to reduce needless injury, illness, and fatality. The results of this study, through the ASSE Educational Standards Committee, will be clarified and then used to support comparison to the existing ASSE Curriculum Guidelines, driving a revision process.

Knowledge contribution. This study is designed to capture and articulate how expert practitioners describe evidence of learning from baccalaureate safety and health program graduates. By focusing on tangible examples of graduate learning, it will be possible to create educational standards defining competencies that emerging safety professionals would be able to apply upon employment in any industry, whether as part of an established safety program department or as an individual charged with protecting people, property, or the environment.

Unique to this study, and therefore contributing to the body of knowledge, is the use of experts to focus on emergent safety professionals. As reported here, there have been several well-constructed studies detailing the roles and responsibilities of safety professionals (ANSI,

2003; ASSE, 2011g; BCSP, 2008a, 2008b). Other safety professional studies have shown significant gaps in values perception gaps (or opportunities for improvement) between leaders and safety professionals (ASSE & North Star Research, 2008), and a national survey of U.S. industries that revealed "employers are generally satisfied with their [OSH] employees' level of training;" however, they "desire new hires to have training in additional areas," including leadership, communication, and increased breadth of technical skills (McAdams et al., 2011, pp. xix-xx).

At the same time, there are studies showing employers prefer graduates with core competencies such as communication skills, critical thinking, applied knowledge, complex problem solving, ethical decision making, ability to work in teams, and cultural awareness (see Table 2.1) (ASSE & North Star Research, 2008; Hart Associates, 2010; Volkwein et al., 2007). Missing, though, is a comprehensive understanding from expert safety practitioners detailing what they would like to see as evidence of graduate readiness to effectively engage in the safety profession, upon graduation and for the future. The *National Assessment of the Occupational Safety and Health Workforce* (2011) estimates that in 5 years, there will be a 100% shortfall in the number of baccalaureate safety graduates to fill available positions. Since few OSH programs have sought voluntary accreditation, how can the profession be sure that the graduates are indeed competent?

Chapter III: Research Methodology

The safety profession is "growing up" (Petersen, 2013, p. v). Proof of this is the ASSE's efforts to initiate action by realizing the importance of applying "evidence and research" (Hill & Ramsay, 2013) to guide the profession in its mission to protect people, property, and the environment (ASSE, n.d., 2011a, 2011b). At the same time, my question remains to be answered: What competencies should be required of Safety, Health, and Environmental (SH&E) baccalaureate program graduates as emerging safety professionals?

To answer this question, I selected a Modified Nominal Group Technique (MNGT) research method. MNGT is a qualitative group meeting process, facilitated by a designated leader, to solve problems or prioritize ideas in a collaborative manner. Participant ideas are discussed to ensure understanding, permitting ranking of results, while equalizing participant voices, maximizing a group meeting process that results in consensus, participant satisfaction and valuable results (Delbecq, Van de Ven, & Gustafson, 1975). Delbecq and Andrew Van de Ven are credited with developing the method for broader use in 1968 (Delbecq et al., 1975). NGT was modified (Pokorny et al., 1988) and improved (Fox & Glaser, 1990) by providing participants with a question or problem to focus on, and the prompting data before the actual NGT process meeting.

The literature search revealed MNGT methods are dependable for generating meaningful results, while participants report the process builds consensus, is fair, and more efficient and effective than other group meetings (Delbecq et al., 1975; A. Fink, Kosecoff, Chassin, & Brook, 1984; Jones, 2004; Sink, 1983). Potential pitfalls of the MNGT process include unprepared or unwilling participants, weak NGT leader skills, and loss of participant authenticity (Delbecq et al., 1975; A. Fink et al., 1984). Finally, NGT is not a leadership guise,

but is rather a process where "group members must pool their judgments" (Delbecq et al., 1975, p. 5), leveraging independent creativity, followed by structured participation (discussion, voting, and ranking) to ensure equality and synthesis of ideas. NGT is a research-based method that should assist leaders to define resources for consensus prioritized lists of ideas.

Rationale for Research Methods

The NGT method has many unique attributes and is particularly applicable to this line of inquiry. "Nominal" as a title is a slight misnomer. Delbecq et al. (1975) explained that it is "*nominal*…in name only, or nominally…[because] earlier researchers [would] bring individuals together but… not allow the individuals to communicate verbally" (p. 7). NGT is judged appropriate when: 1) "issues [are] adjudged especially important [as in this case literally impacting the health and safety of workers]; 2) where wide and represented input is [required as in this case where so many are claiming expertise]; and 3) where difficulties in ranking…are such that traditional meeting is of relatively little use," as in this case (Delbecq et al., 1975, p. xii). These three points provide simple criteria to determine NGT's ability to develop required educational standards.

There are several examples where NGT has been applied to higher education. The NGT literature review as of February 21, 2012, resulted in approximately 200 sources, 46 of which (or 23%) involved NGT applications in higher education, and 32 (16%) were applied in the field of health care. Using a different search method, WHO (World Health Organization) website provides 52 sources to "Nominal Group Technique," describing a range of applications from developing action plans following hospital incidents to assuring patient safety (WHO, 2010, n.d.-a, n.d.-b).

The concept that altered the NGT method originated as a question from a colleague following the February 2012, pilot study. Literature supports modifying the NGT process. For example, Fox and Glaser (1990) reported "improving" the NGT method by providing participants the prompting question and relevant data before the NGT processing meeting, allowing the participants the opportunity for reflection and preparation beforehand.

Delbecq et al. (1975) noted that NGT is applied when the "central element…is the lack of agreement or incomplete state of knowledge" (p. 5). The process has been culled from many sources, including group dynamics, creativity, and brainstorming. Girotra, Terwiesch, and Ulrich (2009) cited "Osborne's (1957) book, *Applied Imagination*, which introduced the term "*brainstorming*…[authors emphasis] and research that the *number of ideas generated* (i.e., productivity) is significantly higher when individuals work by themselves" (pp.2-3). The *Harvard Business Review* blog reported, "people really do like [brainstorming, believing it]… is a tremendously beneficial process…[but] 50 years [of research] show[s] that a brainstorming team generates fewer ideas than the same number of people working solo" (O'Connell, 2010). Girotra et al. (2009) reported that brainstorming pitfalls include "*free riding*…encountered when output is measured collectively as opposed to individually; *evaluation apprehension*…inhibition to express ideas because of fear; *production blocking,*" or the loud few rule (p. 5).

Delbecq et al. (1975) described participant satisfaction, citing Van de Ven and Delbecq (1974): "NGT provides a balanced concern for task accomplishment and interpersonal social maintenance functions, appears most acceptable to participants and facilitates problem solving" (p. 22). At the same time, the in-person NGT method, using three different steps (silent idea generation, discussion or idea clarification, and anonymous voting and ranking) to arrive at a

prioritized list, might satisfy the diversity among people by providing three different means to engage, sharing knowledge, perspective and responsibility, and, hopefully, clear output.

By applying the NGT method, participants should sense equality or fairness, and the meeting should not be sidetracked by any one person's agenda. NGT process leaders face complex and dynamic issues such as ensuring adequate discussion, facilitating conflict or tension, and determining when to move the meeting on. These issues are somewhat helped by a method, however, dependent on the NGT leader's skills and judgment (Fink et al., 1984). Some issues are simply beyond the researcher's control, such as completing the pre-work and being a willing participant.

To prepare for an optimal NGT session, and meet the research requirements, a pilot session was held. Barbour (2007) posited: "it is essential…the researcher gives thought at the planning stage of the research" (p. 14). A pilot case allowed me to practice, learn and plan.

Pilot NGT

This section summarizes a pilot NGT process meeting conducted February 2012, applying the framework of Delbecq et al., (1975) and Moore (1987). Four of the five faculty members from my home academic department participated in the NGT pilot session.

In addition to having the materials to support the pilot (easel pads and stand, masking tape, 3 x 5 cards, pens, paper, and evaluation forms), process directions were also used such as, a meeting process outline, welcoming statement and printed copies of the prompting question as recommended by Delbecq et al. (1975). The NGT process relies on these steps: presenting the question or problem to address, individual idea generation, round-robin recording, serial discussion, voting supporting final ranking, and final process assessment or evaluation.

The process worked well, was reported as being fair, efficient, and effective, and was informative. A faculty colleague familiar with the method observed and provided notes. This feedback caused me to realize it was simply impossible to both participate as a member and lead the process. My department colleagues strongly recommended the meeting purpose or question be provided prior to the meeting to allow participant preparation. This suggestion led me to revisit the literature and realize the NGT method has been modified or improved by not only providing the question or problem prior to the NGT meeting, but also that there is value in providing data or information beforehand to prompt thinking (Fox & Glaser, 1990).

Research Design

Using NGT as a research method met important criteria; namely, that it would address my question with rigor and credibility, be a constructive process, be collaborative and consensus-building, especially with the ASSE Educational Standards Committee (ESC) and ASSE as an organization, and be of use to the profession. ESC represents higher education in the largest member-based professional safety organization in the United States. It consists of eight members, (seven faculty and one industry representative) and is responsible for developing, monitoring, and supporting related higher education programs in its pursuit of developing SH&E college graduates (ASSE, 2012b).

Conversations regarding this research proposal were first shared in 2010 with Dr. James Ramsay, ASSE ESC Chair. In June 2012, ESC agreed to support the research, recognizing the value to further their agenda in higher education with hopes of updating the ASSE's Curriculum Guidelines (J. Ramsay, personal communication, June 2012), to serve as an expert or peer-review panel, and lastly to prepare for and participate in a MNGT process meeting.

Following a formal presentation to the ESC November 16, 2012, the three-phased research process including: Phase 1) a pre-MNGT survey of ASSE Professional Members; Phase 2) the MNGT meeting May 2, 2013; and Phase 3) the post-process evaluation, was approved. As the project progressed, Daryl Hill, Ph.D., Chair of the ASSE FTP (Framing the Profession Task Force), proposed a joint meeting of the ESC and the FTP. In all, 15 of 16 possible participants agreed to a joint MNGT meeting on May 2, 2013, to be held at the ASSE office in Chicago, Illinois.

Research phase 1: Pre-MNGT survey or professional member survey. Central to the MNGT process is the need to provide participants with the question or problem to be addressed and prompting ideas to support adequate preparation before the MNGT process meeting (Fox & Glaser, 1990). A 13-question survey was developed to capture: competencies that expert safety professionals would expect from a baccalaureate prepared SH&E graduate; definitions of SH&E workplace excellence; participant activities defining engagement with the SH&E profession; selected demographics; and any added "comments."

Critical to the quality of the NGT process is the question and/or framing the purpose of the process (Delbecq et al., 1975). The research question originates from my experience as a new professor following 20 years as a SH&E practitioner, with a desire to understand what undergraduates studying SH&E need to know to be effective.

Literature revealed that professions such as medicine (Cooke, Irby, Sullivan, & Ludmerer, 2006), engineering (Volkwein et al., 2007) and nursing (Bamford & Warder, 2001) have used higher education program advisory boards to "work backwards" (Noonlan, 2006, p. 202) from desired and/or known workplace competencies to define curriculum and course plans.

Previous research to define nursing competencies had started strikingly close to my question. Bamford and Warder (2001) began their MNGT process by collecting data to address this question: "What do you feel are the education and training needs of occupational health nurses working in the NHS in the West Midlands for those nurses to contribute to the public health agenda?" (p. 315). Consistent with my study was the need for a reliable source of data to assist MNGT members in their preparation our meeting.

The survey and 2013 MNGT question evolved from the February 2012 pilot prompt, which read: "As you think about baccalaureate preparation for emerging safety professionals, now and in the future, list what you would like to see in a portfolio demonstrating competence." This question was fine-tuned, following cycles of review with the ASSE ESC (J. Ramsay, personal correspondence, 2012-2013) to become: "Imagine that you're looking over the portfolio of someone who is a baccalaureate-prepared safety professional. What kind of evidence would you want to see in a portfolio that would demonstrate competence (knowledge, skills and dispositions)?" The February 2013 MNGT question focused on evidence, and added knowledge, skills, and dispositions in parentheses following the word "competence," as defined by the nursing profession (Sroczynski, Gravlin, Route, Hoffart, & Creelman, 2011).

Discriminate sampling. Inherent in this research is the need *to* defin*e* what consitutes an expert safety professional. I began by developing criteria and using the ESC as a review panel. In the process, Dr. Ramsay recommended using the ASSE Professional Member criteria (see Table 3.1). ASSE Professional Members, for the purposes of this research, are experts in the SH&E field. They have at least 5 years of experience, are Certified Safety Professionals (CSP) or Certified Industrial Hygienists (CIH), "are in good standing" with respective boards, possess at least a baccalaureate degree from an accredited institution, and/or hold a certification

or licensure from 1 of 15 recognized organizations (such as a Professional Engineer) (ASSE, 2013b). By using professional members in this style of "discriminate data samples" (Rudestam & Newton, 2007, p. 108), the expectation is to capture responses from those most qualified to provide their perspective.

Table 3.1

Defining Expert

Initial definition Expert Safety Professional	Final definition Expert Safety Professional
For the purposes of this study, SH&E experts have in the last 5 years, singularly or in combination: 1) Serve(d) on an advisory committee of an ABET-ASAC accredited program, 2) Published peer reviewed OSH literature, 3) Serve(d) on a National OSH Committee or research task force, 4) Serve(d) as a terminal degreed associate or full professor faculty member, holding a current and germane board certification, 5) Work(s)ed full time as an OSH practitioner at a facility or job site with demonstrated OSH performance excellence, verified by a third party, 6) Hires and manages Bachelors of Science OSH program graduates at a facility or job site with demonstrated OSH performance excellence, verified by a third party.	The ASSE definition of a "Professional Member" which requires the ASSE member: 1. Shall be a certified safety professional (CSP) or certified industrial hygienist (CIH) in good standing with the Board of Certified Safety Professionals or American Board of Industrial Hygiene, respectively, or 2. Shall hold an accredited certification from a body recognized by the Admissions Committee, hold a baccalaureate or higher degree from an accredited college or university and shall have a minimum of 5 years in the aggregate professional safety, health and environmental experience, or 3. Shall be registered or licensed by a state agency as a professional engineer (P.E.), hold a baccalaureate or higher degree from an accredited college or university and shall have a minimum of 5 years in the aggregate professional safety, health and environmental experience, or Shall hold a doctorate level degree from an accredited college or university in a safety, health and environmental field recognized by the Admissions Committee and shall have a minimum of 5 years in the aggregate professional safety, health and environmental experience. (http://www.asse.org/membership/reclass.php)

Survey distribution. Once the ASSE ESC and dissertation committee approved the 13-question survey, my ethics and participant risk analysis was submitted to the Antioch University Institutional Review Board for review, and subsequently approved January 25, 2013. The ASSE emailed an invitation to 1,000 randomly selected *p*rofessional *m*embers, or 10 % of the

members classified as professional, to participate by following an Internet address or link to a SurveyMonkey landing page. Here, a prospective participant learned how the survey would be used, risks they may experience as a participant, and measures that would be applied to guarantee their anonymity. Consent was declared by choosing to participate in the survey.

Optimal survey participation was judged to be 50-60. One approach in determining the qualitative sample size is to determine when data analysis reaches repeatable patterns, which provide "interpretive sufficiency" (Charmaz, 2005, pp. 527-528). Rudestam and Newton caution (2007) "real saturation is never reached…more likely it is the researcher who becomes saturated" (p. 108). As a precursor for an MNGT process, the purpose of the survey is to trigger participant thinking. In one MNGT study, "10 [participants] proved highly generalizable to the whole [sample] of 206" (Dobbie, Rhodes, Tysinger, & Freeman, 2004, p. 403).

The ASSE Director of Marketing and Communications, Kelly Fanella, used the organization's membership data management software to randomly select 1,000 professional members of the roughly 10,000 professional members listed. Professional Members constitute roughly one-third of the 34,000 ASSE members (ASSE, 2013a). Each selected Professional Member received an email directly from the ASSE, with an invitation to participate in the survey, and instructions to open an internet accessible website to the SurveyMonkey survey. Between February 1-22, 2013, 58 responses were collected, consistent with the desired sample size of 50-60 (J. Wergin, personal communication, November 15, 2012).

SurveyMonkey settings included opening with a participant information and agreement of consent by participation page; one question was listed per page, question 1 required a written answer (of any length) to advance in the survey, question 1 text box was set to the

largest answer block available, 20 lines of text at 100 characters per line (one participant reached 18 lines, most were under 12 in length). The survey was titled: February 1, 2013 Expert Safety Professional Survey: Baccalaureate Competencies. It concluded with a thank you from the researcher and contact information.

There were four opportunities for participants with questions about the survey or dissertation process (outside of the survey itself). Included was contact information for Dr. Jon Wergin, Dissertation Chair, Antioch University; Dr. James Ramsay, Chair, ASSE ESC; Dr. Carolyn Kenny, Chair, Antioch University Institutional Review Board; Dr. Laurien Alexandre, Vice Chancellor University Academic Affairs, PhD Program in Leadership & Change; and the researcher. As of June 25, 2013, all listed contacts reported no formal inquires.

Survey questions and data analysis. Of the 13 questions, three were open-ended that invited participants to respond in a written format to a question or leave a written comment, and 10 included multiple answers. Multiple answer data responses were analyzed using combinations of SurveyMonkey data analysis tools and Microsoft Excel, while the short answer questions were processed with QSR NVivo 10, qualitative analysis software. NVivo 10 software is specifically designed to aid in gaining understanding of data (in this case, written responses to questions). As with any qualitative analysis, NVivo 10 relies on the interpretive data analysis of the researcher (Bazeley, 2007). NVivo software requires the researcher to attach a code, allowing comparable meanings from the same participant or others, to be coded in the same manner. NVivo supports future retrieval, tally, and meaning checking of all the coded data (QSR International, 2012). The heart of the survey was question 1, and NVivo was used to facilitate understanding of these responses.

Participant responses to question 1 were downloaded from SurveyMonkey to Microsoft Excel, and then imported directly to NVivo 10. Once imported, each of the participant responses were read as a whole, then coded into nodes. Nodes were created by using participant words ("in vivo") that were interpreted as descriptive (Saldaña, 2009, p. 70). Question 1 responses were coded four times, creating and tracking node meanings with annotations (margin notes) in NVivo (QSR International, 2012). Ultimately there were 4 family nodes, 19 parent nodes and 4 child nodes, which provided a hierarchical order (Saldaña, 2009).

Kappa coefficient. Using *K*appa scores to evaluate the degree of chance between the four coders *did* not seem relevant in this case. Thompson, McCaughan, Cullum, Sheldon, & Raynor (2004) revealed "when the distribution of decisions being measured becomes extreme then possible agreement beyond chance (which is what Kappa is measuring) becomes hard to achieve…consequently, even though agreement may be high, Kappa values are low" (p. 18). Percent coding agreement was high in this study, at 90%, attributable most likely to the SH&E experience of the coders. However, character count of coded data drives how NVivo calculates Kappa.

I used a manual method available in NVivo to examine differences in how the coders captured survey participant data and assigned it to nodes. The most common difference was in the actual capture of the number of characters surrounding each SH&E term. For example, a survey participant reported: "It would be good to see evidence of carrying out specific safety programs or protocol such as chemical hygiene, MUTCD protocol, NFPA specific guidance, and/or teamwork." Upon examination, included by one coder and not another were the words: "It would be good to see," accounting for a difference of 18 characters, not counting spaces. In

another case, the participant stated “Education tailored towards es&h. This needs to include internships, communication and writing courses as well….Advanced courses not in the 101 versions,” in this example alone each coder captured different words, ranging from one word to six, with a range of character spread of 11 to 130 (no spaces). These examples, of which there were many, highlight why Kappa values were not to be trusted.

Technology. Technology was another challenge. Three of the four coders were able to download a free version of the NVivo 10 software supporting software application in data analysis. One coders’ employer would not support the software installation, and their home computer was not able to process the installation. The coder, wanting to support the research, and bringing the only full-time practitioner voice to the survey interpretation, agreed to code participant data manually by using a Microsoft Excel spreadsheet I had provided.

On the bright side, having multi-coders “increases the likelihood of finding all the examples in text” with similar meaning (Chi-Jung Lu & Shulman, 2011, p. 112), but works only if they know what they are doing in the coding process (Bazeley, 2007).

Each coder participated with me in an individual phone training session, following available QSR Instructions (2012) to describe the NVivo 10 coding process. I walked the coders through the software process for three participant responses. I explained how I developed descriptive nodes, by using words from participants. Lastly, I asked each coder to lead me through coding until they were comfortable with the process. In the case of the manual coding, mechanics were different, while the training followed the same pattern.

During all coder preparation, I did not redirect or comment on the coder’s choices of node selection; however, an area of improvement for this research project would have been to provide a more thorough coder training process specific to this research, including a coder

training, reference or guide, and practice session all together. Additionally, for future studies, if a coder were unable to use the software, I would not allow them to proceed with the project. In this case, to calculate percent agreement, kappa coefficient, and use the analysis features of the software, it was necessary to for me to enter the manually coded data.

Specifically important to question 1 were issues of reliability and validity, important to consider because question 1 was used to prompt thinking of the MNGT participants.

Reliability. Reliability is defined as "consistency of judgment" (Boyatzis, 1998, p. 146). To achieve reliability, I applied "In Vivo" coding by using written words from the participants, that seemed to provide "a summative, salient, [and] essence-capturing" (Saldaña, 2009, p. 3) *element from which* to create nodes at the child and parent level. NVivo 10 coding is a process of "linking" participant ideas to organizing coded data into "families because they share some characteristic" (Saldaña, 2009, p. 8). Coding into nodes supports examining data linkages to build understanding. Additionally, I used NVivo coding comparisons to examine "intercoder agreement or interpretative convergence" (Saldaña, 2009, p. 27) by calculating percent agreement and the kappa coefficient between coders (QSR International, 2012, pp. 161-166). Three colleagues with different SH&E backgrounds, varying relationships to this project, and all receiving the same coding instructions, agreed to code participant responses to question 1, using nodes I created.

Table 3.2

Coders

Name	Relationship to Project	Primary Experience
Dr. James Ramsay, CSP	ASSE ESC Chair	Higher Education; Health, Occupational Safety; Home Land Security and Safety, Embry Riddle University
Ms. Paulette Lantuh, CSP	Member ASSE ESC and FTP as industry representative	Significant breadth and depth of SH&E experience in chemical and heavy manufacturing, Kodak Co.
Dr. David May, CIH, CSP	Colleague at Keene State College. Member of ASSE	Retired OSHA Area Director, now Higher Education Safety Studies Professor at Keene State College
Mr. Wayne Hartz, CSP	Member ASSE ESC, project author	Industry, now Higher Education Safety Studies Professor at Keene State College

Validity. In an effort to assure internal validity (or minimize researcher bias), NVivo 10 data, corresponding codes and nodes were projected and reviewed in a collaborative process over a one and one half day session with Dr. James Ramsay (March, 6-7, 2013). The goal was to accurately capture participant data and meaning and "not generaliz[e] beyond the specific data" (Weber, 1990, p. 18).

Professional member survey results were distributed one week before the May 2, 2013, joint meeting with instructions to review 13 pages of data and to create "their own list" of evidence each participant would like to see in a portfolio. Advance engagement with the data is reported to benefit participants to prepare for the NGT process meeting (Fox & Glaser, 1990). Additionally, to reduce my bias, and provide MNGT participants enough, but not too much, information, question 1 survey results were presented subdivided by three family or summative nodes (categories), which were further subdivided into 24 parent nodes (or subcategories). For

each parent node, a "top ten" list of participant data (words, phrases, titles, sentences) were selected as the "most vivid and/or representational" data to support meaning making by each of the MNGT participants (Saldaña, 2009, p. 186).

Research phase 2: MNGT meeting. Meeting preparation material lists and methods are readily available (Delbecq et al., 1975; Fox & Glaser, 1990). Committee Chairs Hill and Ramsay, worked with ASSE Professional Staff liaisons Hudson, Esq., and Clements, and me to create the joint meeting agenda. Ms. Clements coordinated the Wednesday through Friday schedule for all participants, including the agenda, MNGT pre-work, and hotel and meal arrangements. The ASSE also provided four flip chart stands and blank self-adhesive pads, markers, masking tape, and a large meeting space allowing "U" shaped table arrangement, which is considered optimal (Delbecq et al., 1975). I supplied blank 3" x 5" index cards, additional copies of the ASSE Professional Member survey results, and pre-printed poster-size easel pages with survey results, evaluation forms, and an MNGT meeting outline guide.

Meeting process. The NGT process meeting I led relied on the four steps presented by Delbecq et al. (1975): 1) Individual idea generation, where participants worked independently for roughly 10 minutes, revisited their pre-meeting list, and created answers to the same question professional members were asked, 2) Round-robin recording, where each participant offered one idea, which I recorded on easel paper posted at the front of the room, 3) Serial discussion, where each idea offered was discussed to assure each participant understood, and 4) *a*nonymous voting which supported final ranking. Voting (the number of votes per person was determined by using 15% of the total number of ideas (Fox & Glaser, 1990)) was accomplished by using 3" x 5" blank index cards, to each participant.

MNGT attendance. The premise of the MNGT process is for people to be present, physically, and for the meeting's duration. Of the 15 participants, one person was engaged via conference call for the meeting's duration, one person was present by conference call for part of the morning, but physically present in the afternoon, and one person was unavailable in the morning, not physically arriving until after lunch.

MNGT meeting participants need to be fully present. The inconsistency in attendance added a confounding factor that could have been controlled. At the same time, there were no participant comments objecting to the conference call connections or attendance variation (this might be common to all meetings, but inconsistent for research purposes).

Group size. According to MNGT protocol, the recommended group size is five to nine and if one's research pool is greater in size, it is recommended to split the group (Delbecq et al., 1975; Fox & Glaser, 1990). Assuming not all participants would attend, and realizing the research complexities introduced by splitting the group, I decided to move forward with the predicted group size at 15. Fifteen participants arrived and were ready to engage, with three exceptions, (two by conference phone, one only present in the afternoon). Perhaps the most noticeable issue of increasing the group size was the time required to collect ideas and manage the discussion.

Delbecq et al. (1975) reported "the number of participants is generally determined by the number of respondents required to constitute a representative pooling of judgments," and that "heterogeneous groups…produced a higher proportion of higher quality, high-acceptance solutions than homogenous groups" (pp. 26-27). While the group was heterogeneous with academicians (ESC) and practicing professionals (FTP), it was too large. At one point in the process of collecting round-robin ideas, speaking one at a time, I observed that some

participants seemed frustrated to listen and not speak. Waiting for a moment to interject, I explained that I appreciated everyone's patience and that waiting and listening was required in a larger group. My comment seemed to ease the tension in the room. There were no comments on the evaluation forms by the participants raising the issue of group size. However, one participant did comment that they "wondered how those in attendance had been selected," and perhaps this comment was tied to group size. Most respondents reported high levels of satisfaction on the written exit survey.

Research phase 3: Post process evaluation. Two anonymous surveys were used to evaluate the MNGT process meeting, one survey was distributed at the conclusion of the MNGT meeting and the second SurveyMonkey survey was sent via email within one week.

The results described in the next chapter are outlined in the chronological order they became evident and are consistent with constructivist epistemology, creating believable results to my question: what should I be expecting of and teaching these kids who think they want to be safety professionals?

Chapter IV: Results

This research has produced three categories of results in the process of determining competencies for SH&E baccalaureate graduate readiness, presented in the three phases of the project: 1) Professional Member survey results, used to prepare MNGT meeting attendees for the actual meeting, 2) MNGT process meeting results, and 3) MNGT process meeting evaluation. Table 4.1 presents the significant findings. The research was framed on a literature search, which is referenced as applicable.

Table 4.1

Results Summary

Result Categories	Participants & Methods	Results
1) Professional Member Survey- to provide the MNGT participants with ideas before the MNGT meeting Survey dates: February 1-22, 2013.	• 58 of 1,000 randomly selected professional safety members participated in a 13 question, anonymous SurveyMonkey survey. • The first question of the survey asked for portfolio examples demonstrating baccalaureate SH&E competencies. • Results were analyzed using SurveyMonkey and/or NVivo 10. • Inter-rater coding reveals vailidity of results interpretation.	• Professional member participants are committed to the profession. • The majority of participants have industry expertise (61%), followed by technical and professional (31%) and construction (28%). • Participants provide 741 portfolio examples: 62% ask for evidence of knowledge, 20% evidence of values and 16% experience. • Results emailed to MNGT participants 4/28/13, one week prior to 5/2/13 meeting. • Post MNGT anonymous survey (73% response rate) revealed 90% used the pre-survey results to prepare for the MNGT meeting, 15 minutes or more, and reported an average importance of 3.2 out of 5 (1 Lo – 5 Hi).
2) MNGT Meeting May 2, 2013 9:30 – 4:15PM	• 15 participants of ASSE ESC and FTP committees; daylong meeting. • MNGT process meeting; used easel paper-kept and later transcribed, and 3 x 5 index cards.	• 60 competency ideas are listed by participants and recorded on easel paper. • Discussion refines list to 33 competencies. • Anonymous voting reduces the list to 22 competency ideas, which

Result Categories	Participants & Methods	Results
		are ranked most to least important. • Top competencies are used to create 11 learning outcomes.
3) Post MNGT Meeting Assessment May 2, 2013, and May 6-12, 2013	• May 2, 2013. Anonymous written survey; 12 of 15 participants (80%) complete at meeting conclusion. • May 6-12, 2013. Anonymous SurveyMonkey; 11 of 15 (73%) participants complete.	• 92% MNGT participants report they expect the quality of SH&E education would improve if a portfolio process was required. • 100% MNGT participants report the quality of the ideas selected were good to excellent • 100% MNGT participants report they had a chance to provide all of their ideas. • 92% agree or strongly agree MNGT participants report the process was fair. • 92% agree or strongly agree MNGT participants report they feel satisfied with the results.

Results Phase 1: ASSE Professional Member Survey

During February 1-22, 2013, 56 participants responded in full to the 13 questions. Ten questions collected participant demographics, and three questions, numbers 1, 4 and 13, required written responses. Results are presented by explaining demographics first, followed by question 4, which explored how survey participants defined SH&E excellence, and then question 1, which is the heart of the topic, exploring how participants define their expectations of recent graduates. Question 13, was an open question, allowing participants to leave "comments."

Demographics mirrored ASSE membership. Additionally, survey participants were very familiar with recent graduates, very engaged with activities demonstrating professional expertise, were grounded in experience, held at least one germane board certification (thus

exceeding 100%), held higher education levels than those reported by Brauer (2008), and were from organizations that had developed high standards defining SH&E excellence.

Survey question 4. This question asked: "If you have hired, led, managed or supervised at a facility or job site identified as having demonstrated excellence in the SH&E field, please explain the key processes resulting in 'excellence' at the facility or job site." Sixteen participants skipped the question. The remaining participants provided 38 usable comments that were coded into seven nodes. Participants defining SH&E excellence explained the key processes (see Table 4.2).

Table 4.2

Defining SH&E Process Excellence

Terms used to define key SH&E processes	Times men-tioned	Examples Note: References refer to the participant number, assigned 1-56 in chronological order of survey completion.
Continuous Improvement Process	22	Behavioral based safety programs; Continuous improvement culture. Senior Management participation in Safety Observation Tours (SOTs); behavior based safety program, employee involvement, management and union commitment… References 2 - 5, 10, 16 An experienced workforce with adequate training and materials seems to be working. There are no fancy programs at this time just diligence and the reward of keeping our contract. Worker safety performance improvement as a result of "worker-to-Safety Professional" interaction at the field level. Reference 19, 20
Recognition such as VPP Health Insurance ISO-OHSAS	16	Safety Management Systems as identified by 6 VPP Stars in 5 years Awards in the Wellness field. We had a voluntary protection program due to supervisors doing what they were supposed to do. OSHA did not need to make regular safety inspections at our facility, as it had an overall, excellent safety record. SHARP Site. Reference 1-3, 11, 16 Sites are externally-certified to ISO 14001 / OHSAS 18001, OHSAS 18000 certification R&D site to be the first US-based ISO 14001 and OHSAS 18001 certified Reference 5, 8, 9
Accountability and or management	9	SH&E included in business risk reviews; SH&E senior-most position in organization reports to President / CEO; Front line employee engagement coupled with leadership support at all levels,

Terms used to define key SH&E processes	Times men-tioned	Examples Note: References refer to the participant number, assigned 1-56 in chronological order of survey completion.
systems.		with appropriate resources provided (in both staff and finances). Reference 1-3 Employee involvement, Employee empowerment, Excellent Hazard Analysis education/training, Not overly complicated procedures. Reference 4 – 9
Leadership; choosing best vs. good, people development.	7	The better sites will have good participation of many on site (however, politics can create a better image than is may actually exist). A leader that understands and is knowledgeable of specific risks associated with the work is imperative and separates the best from the 'good'. Reference 1 A key process was keeping focused, persistence and perseverance with continuous influencing meetings with all management levels, HSE as a value. Management leadership and commitment. Reference 2, 3, 7
Professional EHS staff development	5	5 CSPs in the last 2 years, 4 COHNs in same timeframe, 1 OHST, and 3 onsite vendors with COHN. Technical competence and professionalism of staff members. an experienced staff of OHS professionals. Adequate EHS staff. Reference 1-4
Not working in place of excellence or unsure.	5	Not working in an environment of excellence. Trying to move an organization in that direction. Reference 1 I managed SH&E function for the US operations of an international building products producer. Unfortunately, the organization measured safety using only traditional metrics....that of LTI incident rates, and injury incident rates. Reference 2. My facilities closed due to financial and I am now doing consulting on my own. Where I am working needs a lot of help, Reference 3 Unsure.; I did not; however. Reference 4-5
Mentor other companies.	2	Mentor other companies in safety management systems, occupational health and wellness Asked to speak at national conferences regularly due the breadth of programming and results. Reference 1

Question 4 was important to explore and understand participant's perspective on their role in the SH&E profession and specifically, how they define "excellence." Literature revealed a range of SH&E performance definitions. For example, there was one survey indicating a value perception gap between safety professionals reporting disinterest from their

organization's leadership, while leadership was seeing and expecting a high value of contribution of SH&E performance (ASSE, 2008). In other cases safety professionals are documented as applying outdated and debunked theories of injury prevention (Manuele, 2011), or focusing on compliance and fearing to speak up to management (ISHN, 2011).

Significantly in this survey, the majority of participant explanations of "key SH&E processes" seemed to have fleshed out continuous improvement processes, third party validation, leadership roles and accountability, and demonstration of professional competence via board certifications.

Question 4 results are important given the potential of survey participants to influence MNGT meeting participants in what the higher education SH&E programs should be focusing on.

Survey question 1. This question read: "Imagine that you're looking over the portfolio of someone who is a baccalaureate-prepared safety professional. What kind of evidence would you want to see in a portfolio that would demonstrate competence (knowledge, skills and dispositions)?"

Of the 58 participants, 56 provided usable (codeable) data (unusable data included one participant's entry of an "h," and another's entry of "test" in the question 1 text box, presumably to advance the survey to the next question). I, the researcher, did not complete or enter data into the survey either as a participant or as the SurveyMonkey administrator. At the summative or family level node, 63% of participants said when they look at a portfolio of a SH&E baccalaureate graduate they want to see evidence of knowledge, followed by evidence of values or attributes (20%), and experience (16%) (See Table 4.3).

Table 4.3

Node Categories

Node Hierarchy: Family Nodes	Number of times referenced	Percentage of times referenced
Evidence of knowledge	465	63%
Evidence of values or attributes	148	20%
Experience	122	16%
A resume vs. portfolio	6	1%

Table 4.4 provides a full inventory of node data presented from most to least in occurrence.

Table 4.4

Categories and Subcategories

Node Hierarchy: Family (Categories) and Parent (Subcategories) Nodes	No. references coded
Family node: Evidence or examples of knowledge	465
• EHS topics or courses described as basic or core	124
• Communicator written and verbal	121
• Other preparation and examples (e.g., certifications)	48
• Practical application of knowledge	47
• EHS topics or courses described as advanced	42
• Topics or courses described as related area (e.g., HR or accounting)	28
• Topics or courses are qualified by hi grades or accredited or transcript	20
• Project manager	11
• Capstone	3
• Global or international knowledge	2
Family node: Evidence of values or attitudes	148
• Team player collaborator	30
• Leader	25
• Problem solver or critical thinker	23
• Learner	19
• Systems and change perspective	11
• Professionalism	10
• Motivated initiator	9
• Referrals or recommendations	8
• Facilitator	7
• Customer and or quality focused	6

Node Hierarchy: Family (Categories) and Parent (Subcategories) Nodes	No. references coded
Family node: Experience	122
• Internship or CO OP	81
• Volunteer extracurricular	39
• Resume required not portfolio	6

Responses to question 1 provide many rich examples of competencies (knowledge, skills, and dispositions) that could be useful to evaluate graduate readiness to enter the SH&E profession. Almost two-thirds of the coded data were interpreted as demonstrating knowledge. Knowledge expectations varied from what seems like a strategic level, such as "Safety professionals should not only understand how to do their job but why their position exists within their company"(5), to very tactical technical matters such as "workers comp/business law" (1), and "Employers are looking for people who understand their business and how to incorporate their specific role into the greater good of the company" (14), to a more basic level where courses imply competence of knowledge: "I am looking for a balanced course of study that spans Science, Engineering, Technology and Math as well as Psychology (behavioral, organizational)/Sociology, Business Management and Communications" (18). These findings are generally consistent with work by the ASSE and BCSP defining safety professional knowledge competencies or domains (ASSE, n.d., 2011a; BCSP, 2008b).

High grades were mentioned by some as being important while others listed additional certificates as evidence of knowledge. Many listed very specific technical courses such as "Toxicology & epidemiology…physiology and anthropometrics," while others listed "systems safety [such as fault tree analysis]" and "worker behavior audits" (42-49). Oddly and inconsistent with general employer surveys where knowledge of different cultures and global issues are rated as important for new college graduates (Hart Associates, 2010), there was very

little mention of international or global issues by professional members, a paradox ripe for exploration.

Many professional members asked for a variety of examples of communication knowledge, including written samples: “email correspondence” or “Technical correspondence” (2-9), while others wanted to see “risk assessments, training programs, policies, correspondence demonstrating written communication skills” (22-23) and even “publications,” by the applicant (73-74). There were a cluster of comments asking to see project management skills, including “Strong organizational and time management skills” (6-7).

The balance of responses (coded data) to question 1 were predominantly focused on evidence of values or attributes (148 data points or 20%), or data coded referring to actual experience (122 data points or 16%). Regarding values or attributes, there were suggestions the *portfolio* demonstrate ethical conduct. Many were interested in the ability of a person to demonstrate “collaboration” (1-2) and “achieving goals when on a team” (28-30). Professionalism was used to define “dress and demeanor” (2-3) and “predilection toward accuracy and thoroughness” (9). Values and attitude captured “continuous improvement process skills” (1), and “I would look for evidence of problem solving ability related to the safety profession utilizing state-of-the-art concepts and theory” (1-3). There were 23 nodes that captured a desire for “problem solving” (20-22) or “critical thinking” (15-19) and desire for evidence thereof, in a range of levels from “papers, presentations, projects” (13-14), to seemingly more involved and experienced based, such as “ability to see challenges/opportunities and choose the best options to address” (23).

Additional values provided as evidence included “strong work ethic” (1), “Self-motivated” (5-6), “self-starter,” (5-6), “builds relationships” (3) and “continuous improvement

process skills" (2). Additionally, there were suggestions the candidate would have evidence of leadership such as leading a fundraiser, an officer in a club" (22-24), or "demonstration of leadership, communications, customer service" (2).

Data coded as asking for evidence of experience captured mostly SH&E internship experience, such as "field experience" (2), or "It is important that some experience is brought to the table. Gaining a degree is not enough. Internships, cooperative education, volunteerism should be a part of their development" (6-8). In particular this response addressed wanting to see evidence of knowledge, skills and dispositions; "Successful completion of an internship or Co-op program where the candidate can demonstrate that they were able to do the following: Identify hazards - Quantify risk - Create a business case for change and sell an idea to leadership" (41-43). Additionally "volunteerism" (16-18) was also identified as a desirable in "other activities – clubs, organizations – leadership positions, initiative taking" (10-11).

There were a couple of participants who questioned the value of portfolio approach: "I don't have time to look over a portfolio. I want a short resume and I will determine knowledge, skill and disposition if I choose to interview a candidate" (2-4). As well, a few questioned the value of higher education: "Let me start by stating the fact that they have a BS doesn't mean they are 'prepare'" Safety Professional--nor would it demonstrate competence unless there were some pertinent employment experience" (5-6).

For the MNGT meeting, question 1 provided 13 pages of ideas, sorted by their respective nodes. As discussed in the methods chapter, a "top ten" approach was applied to the responses for the MNGT participants in an effort to strike the balance between data overload and to minimize researcher bias by providing too little data.

Question 13 comments. The survey did not include a question prompting comments, however, 23 (50%) participants offered closing thoughts in the open response box: "Comments." I used NVivo to collect common meanings:

Table 4.5

Question 13 Comments

Terms used	No. times	Examples Note: References refer to the participant number assigned 1-56 in chronological order of survey completion.
Employers	4	"Employers are satisfied with SH&E graduates" (1), and there should be an increase in internships to deepen learning (2, 3). "SH&E students need to get their hands dirty" (4).
Higher Education	3	One participant said it would be important to distinguish undergraduate portfolio work from graduate level work (1). One noted having served on a SH&E program advisory board and providing internship experiences, and concluded by stating, "The new interns and graduates have a lot more knowledge, drive, and enthusiasm than when I graduated" (2).
ASSE's role	3	"The Framing the [Safety] Profession Task Force, Educational Standards Committee, Council on Professional Affairs and ASSE Board of Directors must be key 'drivers' to promote and advance the SH&E profession" (1). "We need to expand the programs and increase internship plus going to schools to spark interest in the youth" (2).

At the same time there were a few comments expressing concerns about higher education SH&E programs keeping pace with "today's workplace challenge" (3) and offered, "Connection with real world instruction and moving into more subjects to link safety and risk within the working business model is paramount to keep pace with international competition and the exporting of American jobs overseas" (3). Another commented that "EHS

professionals must know a wide range of topics to be beneficial" (4) and that higher education is positioned to provide such preparation. A couple of comments addressed the inability of some students to communicate effectively (5, 6).

There were a few closing questions posed in the comments section. One participant wanted to know if a model curriculum would be developed and another offered the quintessential question "I do wonder at times how one's own predispositions bear on professional success in the safety profession" (8). Lastly, there were general niceties offered; six participants expressed well wishes or appreciation being asked (1-6). Four participants reported they had no further comments at this time (1-4).

Results Phase 2: MNGT Process Meeting Results

The May 2, 2013, ASSE ESC & FPT Joint Meeting opened at a few minutes after 8 a.m., at the ASSE Office, 1800 E Oakton St, Des Plaines (Chicago), IL. The boardroom was arranged in a U shape as illustrated in the below photo.

Figure 4.1. Joint meeting.

There were 15 participants in the MNGT process meeting, 12 for the full session, three by phone before noon, one by phone and two arriving after noon, see Table 4.6.

Table 4.6

Joint Meeting Attendance

Attendee:	ESC	FTP	ASSE	Participation
Tom Bresnahan		X		Full day
Tom Cecich		O		Unable to attend
Laura Clements			X	Full day
Lon Ferguson	X			Full day by conference phone
Hamid Fonooni	X			Full day
Stephanie Helgerman		X		Partial AM by conference phone, in person PM
Darryl Hill, Chair, FTP		X		Full day
Dennis Hudson			X	Full day
Paulette Lantuh	X	X		Full day (member of both ESC and FTP)
Todd Loushine	X			Full day
Charles McGlothlin	O			Unable to attend
Jim Ramsay, Chair ESC	X	X		Full day (member of both ESC and FTP)
Elbert Sorrell, ESC	X			Noon arrival
Michael F. O'Toole	X			Full day
Jim Thornton		X		Full day
Teresa M. Turnbeaugh		X		Full day
Ken Wengert		X		Noon arrival
Total attending	7	8	2	

Results are presented in the sequence from the MNGT meeting; A) Idea generation, B) Discussion, C) Voting and ranking, D) Learning outcome creation.

Idea generation. There were 60 baccalaureate SH&E competency ideas generated from the participants of the joint meeting. Following 10 minutes of individual work in silence, cipants were asked to answer the same question previously emailed to professional members and which they received one week in advance of this session. Participants were asked to report out their ideas, one at a time, with no side conversations or judgmental remarks. Participant

ideas were written on easel paper and posted on the walls or white boards in the ASSE Board Room. Brackets [ ] have been added to clarify abbreviations used on the easel paper, see Table 4.7.

Table 4.7

Joint Meeting Participant Answers

1) Technical skills- noise, fire, IH [industrial hygiene], human factors, stds [standards], ergonomics, environmental (air, H2O [water], waste stds) epidemiology, toxicology, system safety, computer skills, controls, SMS [safety management systems], PTD [Prevention Through Design], accident investigation, metrics, auditing
2) Risk assessment
3) Business acumen, economic analysis, project mgmt [management],
4) Technical skills, competency with computer
5) Health sciences
6) Internship experience
7) Internship experience and written summary of internship learnings and activities
8) Epidemiology principles and methods
9) Evidence of ability to sell idea
10) Sample written reports with examples of SH&E issues and recommendations
11) Fundamental course work—math, chemistry, physics, psychology, business
12) Evidence of marketing
13) Recommendation from advisor and from internship and character, duties of performance
14) Evidence to develop training and present it
15) Evidence of regulatory requirements; OSHA [occupational safety and health] administration], DOT [department of transportation], and legal [legal issues]
16) Understanding of ergonomics and understand process cradle to grave
17) If people management, people development
18) Multi-tasking-time mgmt [management]
19) Well-organized and professional portfolio and resume
20) Technical skills such as noise, fire
21) Understanding of law and policy
22) Understanding of global/international trends and development
23) Understanding of how to use social media
24) Understanding of professional ethics
25) Original thoughts expanded in projects
26) Ethics—evidence of professionalism and ethics
27) Experience
28) Passion and commitment

29) Different safety issues per industry
30) Review of resume and transcript
31) GPA [grade point average] of 3.0 or greater
32) Computer skills
33) Outside interests [such as clubs] looking for evidence of teamwork and leadership
34) Z 590.2 [ANSI/ASSE Z590.2-2003 Criteria for Establishing the Scope and Functions of the Professional Safety Position]: ID [identification], eval [evaluation], control measures [of hazards]
35) Professional org [organization] participation, involvement
36) Objective statement on their philosophy of practice and recognition of limitations
37) Evidence of scientific process: critical thinking, problem solving
38) Humility, service, attitude
39) Interpersonal skills, team building
40) Risk Mgmt [management] W/C [workers' compensation] including claims Mgmt
41) Provide evidence of how to resolve conflict
42) Change management
43) Understand strategic planning process
44) Understanding of adult behavior change and psychology principles
45) Creative thinking
46) Commitment to grow in profession and pursue certification
47) Leadership
48) Human factors
49) Impressions from interview
50) Industry or job specific knowledge
51) Environmental sciences knowledge and responsibility as professional
52) Application of real world knowledge in hazard identification, evaluation, control haz [hazards]
53) Risk analysis system safety–product
54) Communication skills
55) Risk Mgmt [management] process
56) Technical skills-electrical
57) Creative thinking
58) Communication skills
59) Review of resume and transcript
60) Different safety issues per industry

The next phase of the MNGT process was to gain understanding of ideas listed in Table 4.7 Joint Meeting Participant

Group discussion. The purpose of discussion was to gain understanding of the ideas presented by each participant. The process resulted in combining, re-wording, and eliminating

ideas. Following a couple of hours of discussion, the original list of 60 ideas was refined to 31 core competencies (See Table 4.8).

Table 4.8

Distilled Core Competencies

1	Technical skills- noise, fire, IH [industrial hygiene], human factors, stds [standards], ergonomics, environmental (air, H2O [water], waste stds) epidemiology, toxicology, system safety, computer skills, controls, SMS [safety management systems], PTD [Prevention Through Design], accident investigation, metrics, auditing [added: application HazID (hazard identification)]
2	Risk assessment, risk mgmt (management) [added: evaluation of [hazards] , ID [identification of hazards] , eval [evaluation of hazards]]
3	Business acumen, economic analysis, project mgmt [management], [added: budget mgmt]
4	Health sciences [added: status and meaning- manage human health]
6	Internship experience [added: written summary of internship learnings and activities]
7	Evidence of ability to sell idea [added: marketing and influence]
8	Sample written reports with examples of SH&E issues and recommendations
9	Modified to: Foundations: sciences, social sciences, economics/business, physical and biological sciences, sustainability
10	Recommendation from advisor and from internship and character, duties of performance
11	Evidence to develop training and present it
13	Modified to: understand process, systems life cycles, cradle to grave, sustainability [then removed sustainability]
14	If people management, people development [added: HR [human resources] organizational development]
15	Multi-tasking, time mgmt
16	Well-organized and professional portfolio and resume [added: transcript]
17	Understanding of global/international trends and development
18	Ethics-evidence of professionalism and ethics
19	Passion and commitment
20	GPA of 3.0 or greater
21	Outside interests [such as clubs] looking for evidence of teamwork and leadership
22	Objective statement on their philosophy of practice and recognition of limitations
23	Evidence of scientific process-critical [added: & creativity] thinking-problem solving
24	Humility, service, attitude
25	Interpersonal skills-team building

26	Risk Mgmt [management], [added: Prevention Through Design] W/C [workers/compensation], case mgmt [management], RTWork [return To work]
27	Claims mgmt [management], W/C [workers' compensation], case mgmt, RTWork [return to work]
28	Provide evidence of how to resolve conflict
29	Change management
30	Understand strategic planning process
31	Understanding of adult behavior change and psychology principles
32	Commitment to grow in profession and pursue certification
33	Impressions from interview

Note. While the table numbering ends with 33, the true number of ideas was 31. Following discussion it was realized ideas 5 and 6, should be combined into 6. Additionally, there was a numbering error, one easel page ended with the number 11, and the next page began with 13, mistakenly dropping numeral 12 (importantly, not losing an idea). These two situations result in a total idea list of 31.

The next phase of the MNGT process was anonymous voting.

Group voting. White, blank 3" x 5" index cards were used to record anonymous votes. Each participant was provided with five blank cards (representing the number of votes), instructed to select five different ideas that would best define baccalaureate SH&E competencies, record their ideas (one per card), and rank order their idea cards from five to one, with five being the most important. Participants made three notations on each card: the idea number, the idea title, and the rank order number (1-5). At the time of voting there were 14 participants for total of 210 votes (Lon Ferguson on the conference phone, communicated with Laura Clements via email, where she transferred his votes to blank cards). There were three voting rounds (see Table 4.9) with somewhat different purposes and outcomes. Votes were tabulated by Dr. James Ramsay, CSP, ESC Chair, and Dr. Teresa Turnbeaugh, CSP, FTP member. Results were transferred to an easel page and shared with the MNGT participants following each vote.

Table 4.9

Vote Results

Idea No.	Idea	1st Vote	2nd Vote	3rd Vote
1	Technical skills- noise, fire, IH [industrial hygiene], human factors, stds [standards], ergonomics, environmental (air, H2O [water], waste stds) epidemiology, toxicology, system safety, computer skills, controls, SMS [safety management systems], PTD [Prevention Through Design], accident investigation, metrics, auditing [added: application HazID (hazard identification)]	67	61	
2	Risk assessment, risk Mgmt (management) [added: evaluation of [hazards] , ID [identification of hazards] , Eval [evaluation of hazards]]	16	27	29
3	Business acumen, economic analysis, project Mgmt [management], [added: budget mgmt]	18	16	31
4	Health sciences [added: status and meaning- manage human health]	4	4	5
6	Internship experience [added: written summary of internship learnings and activities]	10	9	23
7	Evidence of ability to sell idea [added: marketing and influence]	1		10
8	Sample written reports with examples of SH&E issues and recommendations	11	9	13
9	Modified to: Foundations: sciences, social sciences, Economics/Business, physical and biological sciences, sustainability	19	19	
10	Recommendation from advisor and from internship and character, duties of performance			5
11	Evidence to develop training and present it	7	4	6
13	Modified to: Understand process, systems life cycles, cradle to grave, sustainability [then removed sustainability]	5	4	9
14	If people management, people development [added: HR [human resources] organizational development]	2	2	1
15	Multi-tasking-time mgmt			1
16	Well-organized and professional portfolio and resume [added: transcript]	3	5	8
17	Understanding of global/international trends and development			
18	Ethics- evidence of professionalism and ethics	6	5	11
19	Passion and commitment			
20	GPA of 3.0 or greater			
21	Outside interests [such as clubs] looking for evidence of teamwork and leadership			
22	Objective statement on their philosophy of practice and recognition of limitations			
23	Evidence of scientific process-critical [added: & creativity] thinking - problem solving	15	17	27
24	Humility, service, attitude			
25	Interpersonal skills- team building	20	24	31

Idea No.	Idea	1st Vote	2nd Vote	3rd Vote
26	Risk Mgmt [management], [added: Prevention Through Design] W/C [workers' compensation], case Mgmt [management], RTWork [return to work]	5	3	8
27	Claims mgmt [management], claims mgmt W/C, case mgmt, RTWork [return to work]			
28	Provide evidence of how to resolve conflict			
29	Change management			
30	Understand strategic planning process	1	3	
31	Understanding of adult behavior change and psychology principles	2		5
32	Commitment to grow in profession and pursue certification			
33	Impressions from interview			
	Vote Totals	212	212	223

Voting discussion. Following the first round of voting, it was realized "Risk Mgmt [Management]" was presented twice (idea numbers 2 and 26), potentially impacting voting. Accordingly, "Risk Mgmt" was removed from idea 2, before the second round of voting. After making changes on the easel papers to reflect the change of ideas 2 and 26, the second round of voting was performed. Upon group review of all results, it was agreed round 2 voting was most representative of the MNGT process results and would be used to create learning outcomes, the next phase of the meeting (see Table 4.10).

Table 4.10

Ideas Ranked by Round 2 Vote Results

Idea No.	Idea		2nd vote	
1	Technical skills- noise, fire, IH [industrial hygiene], human factors, Stds [standards], ergonomics, environmental (air, H2O [water], waste stds) epidemiology, toxicology, system safety, computer skills, controls, SMS [safety management systems], PTD [Prevention Through Design], accident investigation, metrics, auditing [added: application HazID (hazard identification)]	67	61	
2	Risk assessment, risk Mgmt (management) [added: evaluation of [hazards] , ID [identification of hazards] , Eval [evaluation of hazards]]	16	27	29
25	Interpersonal skills- team building	20	24	31

Idea No.	Idea		2nd vote	
9	Modified to: Foundations: sciences, social sciences, economics/business, physical and biological sciences, sustainability	19	19	
23	Evidence of scientific process - critical [added: & creativity] thinking - problem solving	15	17	27
3	Business acumen, economic analysis, project Mgmt [management], [added: budget Mgmt]	18	16	31
6	Internship experience [added: written summary of internship learnings and activities]	10	9	23
8	Sample written reports with examples of SH&E issues and recommendations	11	9	13
16	Well organized and professional portfolio and resume [added: transcript]	3	5	8
18	Ethics- evidence of professionalism and ethics	6	5	11
4	Health sciences [added: status and meaning- manage human health]	4	4	5
11	Evidence to develop training and present it	7	4	6
13	Modified to: Understand process, systems life cycles, cradle to grave, sustainability [then removed sustainability]	5	4	9
26	Risk Mgmt [management], [added: prevention through design] W/C [workers' compensation], case Mgmt [management], RTWork [return to work]	5	3	8
30	Understand strategic planning process	1	3	
14	If people management, people development [added: HR [human resources] organizational development]	2	2	1
7	Evidence of ability to sell idea [added: marketing and influence]	1		10
10	Recommendation from advisor and from internship and character, duties of performance			5
15	Multi-tasking - time mgmt			1
17	Understanding of global/international trends and development			
19	Passion and commitment			
20	GPA of 3.0 or greater			
21	Outside interests [such as clubs] looking for evidence of teamwork and leadership			
22	Objective statement on their philosophy of practice and recognition of limitations			
24	Humility, service, attitude			
27	Claims mgmt [management], W/C [workers' compensation], case Mgmt, RTWork [return to work]			

Idea No.	Idea		2nd vote	
28	Provide evidence of how to resolve conflict			
29	Change management			
31	Understanding of adult behavior change and psychology principles	2		5
32	Commitment to grow in profession and pursue certification			
33	Impressions from interview			
	Vote Totals	212	212	223

Voting results discussion. A third voting round was pursued after a participant suggested both Technical Skills (idea 1) and Foundation Science Courses (idea 9) be removed from the list, to see how that might affect the outcome. While interesting, I led the group back to the next phase of the meeting, and that was to transfer MNGT participant work into learning outcomes. It is interesting to note there were 11 ideas of the 31 not receiving any votes, and therefore eliminated from the process (see Table 4.11).

Table 4.11

Eliminated Ideas

Idea No.	Ideas that received zero votes over three rounds
17	Understanding of global/international trends and development
19	Passion and commitment
20	GPA of 3.0 or greater
21	Outside interests [such as clubs] looking for evidence of teamwork and leadership
22	Objective statement on their philosophy of practice and recognition of limitations
24	Humility, service, attitude
27	Claims mgmt [management], W/C [workers' compensation], case Mgmt, RTWork [return to work]
28	Provide evidence of how to resolve conflict
29	Change management
32	Commitment to grow in profession and pursue certification
33	Impressions from interview

There are two noteworthy findings in the post-process analysis. First, the total vote count between rounds 1 and 2 was consistent at 212, which is also the calculated sum of votes. The tally for vote 3 was 235, or 23 votes greater than the calculated sum. Second, percent change was calculated between voting rounds one and two to explore the relative amount of vote shift (See Table 4.12). Percent change reveals the largest changes in voting were a 69% increase (16 to 27 votes) for "Risk Assessment;" decrease of 43 % (7 to 4 votes) for "evidence to develop and present training;" and an increase of 20% (20 to 24 votes) for "interpersonal skills." Of note, "technical skills" remained the top choice.

Table 4.12

Percent Change from Vote 1 to 2

Ideas	Vote 1	Vote 2	Percent change
Technical skills- noise, fire, IH [industrial hygiene], human factors, Stds [standards], ergonomics, environmental (air, H2O [water], waste stds) epidemiology, toxicology, system safety, computer skills, controls, SMS [safety management systems], PTD [Prevention Through Design], accident investigation, metrics, auditing [added: application HazID (hazard identification)]	67	61	**-9**
Interpersonal skills-team building	20	24	**20**
Modified to: Foundations: sciences, social sciences, economics/business, physical and biological sciences, sustainability	19	19	0
Business acumen, economic analysis, project Mgmt [management], [added: budget Mgmt]	18	16	**-11**
Risk assessment, risk Mgmt [management] [added: evaluation of [hazards] , ID [identification of hazards] , Eval [evaluation of hazards]]	16	27	**69**
Evidence of scientific process - critical [added: & creativity] thinking - problem solving	15	17	**13**
Sample written reports with examples of SH&E issues and recommendations	11	9	**-18**
Internship experience [added: written summary of internship learnings and activities]	10	9	**-10**
Evidence to develop training and present it	7	4	**-43**
Ethics- Evidence of professionalism and ethics	6	5	**-17**

Learning outcomes. A primer was provided to the group explaining that the next step was to create learning outcomes, from competencies or "Knowledge, Skills and Attitudes [or dispositions]" (Massachusetts Department of Higher Education [MADOHE], 2013) identified from round 2 voting. Learning outcomes are defined as what a student should be able to demonstrate by thinking and doing at the conclusion of a course and or a professional preparation program (AACN, 2008). Competencies are thought of as knowledge, skills, and attitudes, and are transferable to learning outcomes. A simple model was illustrated on easel paper (see Figure 4.2).

The MNGT group was organized into pairs, one each from ESC and FTP committees, to create learning outcomes based on the MNGT top ten baccalaureate competencies. I assigned competencies to each pair and provided a learning outcome template, framing what a student should be able to demonstrate at the completion of a teaching module. Learning outcomes use an action verb (describing what they will do), a topic, and a second action verb (describing the activity to demonstrate the "what"), resulting in an outcome (Rooney, 2011; NILOA, 2011).

There were two 15 minute rounds where pairs worked together followed by a report back to the whole group via written outcomes on easel paper. Results are provided in Table 4.13.

Table 4.13

Core Competencies to Learning Outcomes

Idea	Ranked in order of 2nd vote -high to low	Learning Outcomes
1	Technical skills- noise, fire, IH [industrial hygiene], human factors, Stds [standards], ergonomics, environmental (air, H2O [water], waste stds) epidemiology, toxicology, system safety, computer skills, controls, SMS [safety management systems], PTD [Prevention Through Design], accident investigation, metrics, auditing [added: application HazID (hazard identification)]	1. Students who complete a BS in SH&E will be able to; a. Comprehend & describe epidemiology & toxicology principles and methods, b. demonstrate and apply environmental sampling, c. Comprehend & apply system safety tools and techniques such as PTD [Prevention Through Design], process safety, etc. d. Comprehend and apply human factor principles and ergonomic methods, and e. Comprehend the SH&E policy and regulatory environment including standards, permits, etc.
2	Risk assessment, risk Mgmt (management) [added: evaluation of [hazards] , ID [identification of hazards] , Eval [evaluation of hazards]]	2. Students who complete a B.S. in SH&E will be able to a. Identify, collect, compile, prioritize and analyze data associated with SH&E risks b. Evaluate and implement appropriate control measures to mitigate risk to acceptable level
25	Interpersonal skills- team building	3. Students who complete a B.S. in SH&E will be able to a. Create PPT [PowerPoint] slide presentations to convey ideas/concepts, b. Produce reports meeting expectations from rubrics c. Participate in group/team projects and be able to produce written reports and/or oral presentations d. participate in team projects that will identify, describe, & explain SH & E Risks & appropriate control measures
9	Modified to: Foundations: sciences, social sciences, Economics/Business, Physical and Biological sciences, Sustainability	Unassigned

Idea	Ranked in order of 2nd vote -high to low	Learning Outcomes
23	Evidence of scientific process-critical [added: & creativity] thinking-problem solving	4. Students who complete a B.S. in SH&E will be able to a. define/describe/identify the problem, b. collect relevant facts/data, c. Systematically analyze facts/data, d. Interpret data & develop recommendations, e. Explain recommendations to stakeholders, f. Incorporate stakeholders input, and g. Solve [problem effectively].
3	Business acumen, economic analysis, project Mgmt [management], [added: budget Mgmt]	5. Students who complete a B.S. in SH&E will be able to a. Explain the integration of safety into the integral parts of the business process. 6. Students who complete a B.S. in SH&E will be able to a. demonstrate the cost effectiveness of safety activities in financial terms, such as ROI [return on investment]
6	Internship experience [added: written summary of internship learnings and activities]	7. Students who complete a B.S. in SH&E will be able to a. recall and apply classroom learnings to identify and assess hazards and recommend solutions b. document the hazard analysis process c. develop written safety programs d. provide training e. concisely summarize and communicate key aspects of internship (e.g. duties, learnings)
8	Sample written reports with examples of SH&E issues and recommendations	8. Students who complete a B.S. in SH&E will be able to a. prepare technical reports, which are accurate, [and] organized with correct grammatical structure
16	Well organized and professional portfolio and resume [added: transcript]	Unassigned
18	Ethics- Evidence of professionalism and ethics	9. Students who complete a B.S. in SH&E will be able to a. comprehend and apply professional ethics by illustrating appropriate ethical responses in contrived scenarios of ethical dilemmas
4	Health sciences [added: status and meaning- manage human health]	Unassigned

Idea	Ranked in order of 2nd vote -high to low	Learning Outcomes
11	Evidence to develop training and present it	10. Students who complete a B.S. in SH&E will be able to a. Integrate adult learning principles into training strategies for effective knowledge transfer, b. Demonstrate the efficacy of SH&E training via post training evaluations.
13	Modified to: Understand process, systems life cycles, cradle to grave	Unassigned
26	Risk Mgmt [management]	Unassigned
30	Understand strategic planning process	Unassigned
14	If people management, people development [added: HR {human resources] organizational development]	Unassigned
31	Understanding of adult behavior change and psychology principles	Unassigned

Learning outcome table rows listing "Unassigned," literally means corresponding competencies were not assigned to pairs to be converted to learning outcomes due to time constraints.

Results Phase 3: MNGT Process Meeting Participant Evaluations

There were two anonymous surveys used to evaluate the efficiency and effectiveness of the MNGT process: a written survey was distributed at the conclusion of the meeting and a SurveyMonkey survey was distributed one week after the joint meeting.

Written survey. Twelve of 15 participants (80% response rate) completed written evaluation forms at the conclusion of the meeting. Results are presented in Table 4.14.

Table 4.14

Post Meeting Written Survey Results

Survey Question	Results
You had a chance to provide all of your ideas.	100% Agree or strongly agree
You would say the process was fair.	92 % Agree or strongly agree
You would say the process changed your thinking.	36 % Agree or strongly agree
You feel satisfied with the results.	92% Agree or strongly agree
The facilitator influenced the results.	58% Somewhat disagree or strongly disagree
Did the facilitator, influence you in your rating process?	92% Somewhat disagree or strongly disagree

There was an opportunity for written comments on the evaluation form in response to this prompt: "Please offer insights explaining strengths or weaknesses with this process." Responses included:

- Great job!
- Efficiently run/conducted; Lots of ground covered, using systematic and inclusive methods; Strengths: efficient, inclusive, fun; Weaknesses: Hard to know when enough "voting" had occurred and when to move on to next phase
- Great participation by all.
- This is a large complex concept and it's difficult to try and capture/define in one day.
- My only concern is related to how participants were selected to be part of this process.

Another question probed the efficacy of the process by comparing the MNGT process to other group process meetings. The results showed:

- 82% reported there more ideas generated compared to previous group work.
- 100% reported ideas were good to excellent quality.

- 67% reported the MNGT process was somewhat more to much more efficient.
- 92% reported somewhat more to much more participation than other experiences.
- 92% predicted quality improvement of baccalaureate education by using a portfolio process
- Four additional comments were positive and supportive.

SurveyMonkey survey. The second survey was conducted May 6-12, 2013. Eleven of the 15 participants responded for a 73% response rate (67% (6) from ESC, 44% (4) from FPT and 11% (1) independent). The survey was not originally planned, however, as the results of the written survey were reviewed, I realized there was no assessment of the pre-MNGT process. Following an IRB approval a brief anonymous SurveyMonkey survey was sent to each participant. Results showed:

Ninety-one percent reported they prepared for the May 2 joint meeting by reading the results of the professional survey. Seventy percent reported spending 15 to 60 minutes, and 30% spent one to four hours to review the survey results. Fifty-six percent (5) created a list per the instructions and 33% (3) made annotations in a printed copy of the results. Thirty-three percent (3) read the results and discussed the survey with colleagues. Ninety percent (8) said they would recommend using the MNGT meeting process in the future. Sixty-seven percent (6) reported meeting preparation was important, while 33% (3) reported it was somewhat important.

Elements of the full process were listed, and participants were asked to rate the importance of each element on a scale of 1 (low) to 5 (high). The overall importance average was 3.3 (see Figure 4.2. Post meeting survey Two topics receiving high importance scores were connected to the voting process. The third highest importance item was writing and

posting portfolio competencies and fourth was the value of working in educator and practitioner pairs.

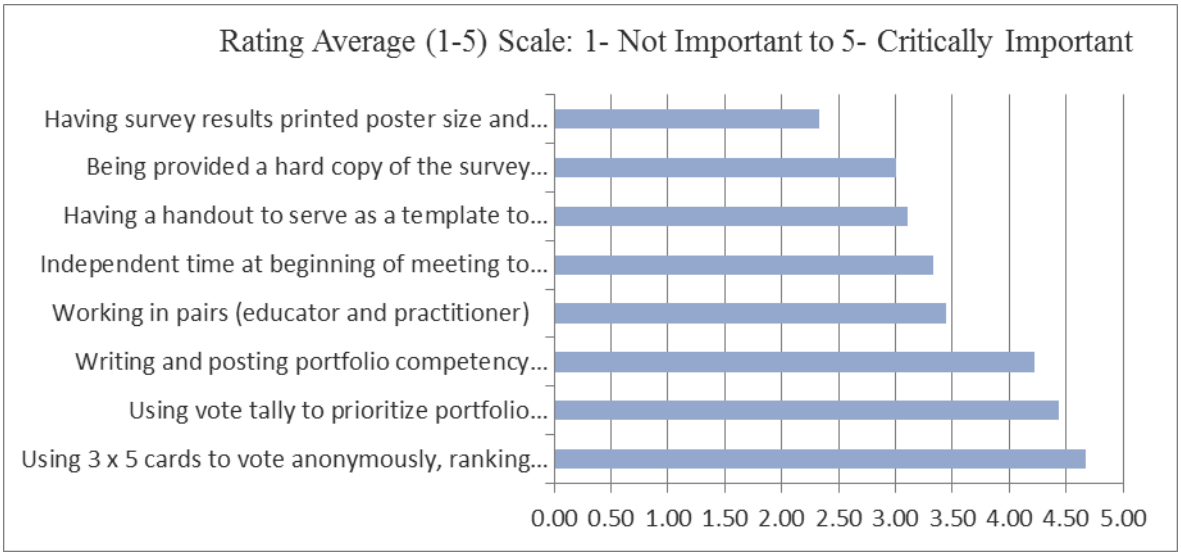

Figure 4.2. Post meeting survey.

Assessment discussion. Consistent with MNGT and NGT literature (Allen, Dyas, & Jones, 2004; Andersen & Fagerhaug, 2000; Delbecq et al., 1975; Fox & Glaser, 1990), participants in this MNGT process reported being very satisfied with their work, the quality of their ideas created, and their efficiency. Ninety percent of the survey respondents engaged with the Professional Member Survey results prior to the meeting. In addition to feeling good about the work, 92% also reported they would "expect the quality of baccalaureate education to be [positively] impacted by a portfolio process" (written survey question 5).

Summary

A three-phased approach was necessary to answer the question: what competencies should be expected of SH&E baccalaureate program graduates. For phase one, a 13-question survey was created, in concert with the ASSE Education Standards Committee (ESC). This survey was distributed to a randomized selection of 1000 ASSE Professional Members, yielding 56 respondents.

Data analysis included a review of survey participant demographics, which demonstrated participants were comparable to the ASSE organization as a whole, and were well positioned to comment on SH&E program graduates. Textual analysis of questions 1 and 4 provided rich data. Analysis of question 4 revealed survey participants defined SH&E excellence as characterized by continuous improvement, third party validation, and leadership roles and accountabilities. Themes from question 1 revealed survey participants expected baccalaureate SH&E graduates to be competent in general education and core SH&E sciences, be able to demonstrate professional and ethical conduct, and have had SH&E applied experience. Summarized survey results were then sent to the MNGT process participants prior to the meeting to serve as idea prompts.

Phase two was the MNGT process joint meeting of the ASSE's ESC and Framing the Profession task force (FTP) members, held May 2, 2013, at the ASSE corporate office. I facilitated this MNGT process to identify portfolio examples that would demonstrate SH&E baccalaureate competence. Sixty ideas were identified, then distilled to 33, and finally prioritized to 10 core competencies. The 10 competencies were then translated into 29 learning outcomes.

Phase three focused on an evaluation of the MNGT process meeting and results. The majority of participants reported high levels of fairness, efficiency, and effectiveness, comparable to research of the MNGT process. All in, the research method worked and has set the stage for application within the profession.

Chapter V: Discussion

Purpose

This was a research project designed to answer a seemingly simple question: what core competencies should be required of baccalaureate SH&E program graduates to ensure their effectiveness as emerging SH&E professionals? The question arose in the midst of personal, profession-wide, and higher education transitions, and in the midst of the highest stakes. Each year there are roughly 2,000 baccalaureate SH&E graduates entering the job market (McAdams et al., 2011), while worker health and safety lies in the balance: in 2011, on average in the U.S., there were 13 worker deaths per day and 8,200 injuries that required more than first aid (http://www.bls.gov/iif/). At the same time, as a new professor in a baccalaureate safety program, I experienced first-hand the wide range of baccalaureate safety graduates (incompetent to highly competent) hired into all types of industries with numerous job titles and levels of responsibilities, yet consistently charged to protect people, property, and the environment.

Safety profession transition. The safety profession has been in a state of professionalization for 50 years or more (ASSE, 2011j; Ferguson & Ramsay, 2011). The core of any profession is rooted in its like members. Sullivan (2005) reported "becoming a professional is a matter of learning how to appropriate a complex body of knowledge, skill and…culture that distinguishes each field" (p. 26). In defining its complicated core competencies, the safety profession is a relative fledgling. The ASSE continues to champion the professionalization of occupational health and safety, to solidify its "identity and territory" (ASSE, 2011j, p. 3). Sullivan (2005) described such a process, not unique to this profession, as a "long competition between practice-controlled and school-based forms of professional education" (p. 27).

Some literature in occupational health and safety supports the fledgling nature of the professionalization, revealing tension between practice and professional education preparation. For example, the route of entry into the profession is a mix between higher education and certificate-based programs. Brauer (2008) noted in a salary survey of CSP's that 42% entered the occupational health and safety field with a SH&E degree and hold 100 different certifications related to SH&E. Researchers in the field such as Manuele (2008), Petersen (2009), and Geller (2001) have called the profession to task for holding onto past paradigms and myths of injury prevention, now debunked with research, and for not applying research-based methods demonstrated to be more effective (at improving worker health and safety) and efficient (results of health and safety improvement are reflected in an organization's productivity and reduced losses).

OSHA, the federal agency charged to "ensure every worker's health and safety," has been unable to gain legislative support to update existing or pass proposed regulations—even when supported by numerous and well-constructed studies to reduce injuries, illnesses, and financial loss (Michaels, 2010). While there has been a steady decline in workplace injuries and illnesses since somewhat reliable recording keeping began, the average number of work-related fatalities hovers around 12 per day with estimated financial losses of $1 billion per week (Michaels, 2012). At the same time, many safety professionals have aligned their roles with compliance requirements, while not focusing on integrating employee health and safety into business operations or adding value to the organization for which they work (ASSE, 2008; Manuele, 2008; Petersen, 2009).

Companies and/or organizations that have embraced employee health and safety have recognized that meeting regulatory requirements is a minimum level of performance, and have

achieved the highest levels of success by integrating employee health and safety into their organizational performance expectations (Krause, 2005; Krause et al., 2008; O'Toole, 2002; Petersen & American Society of Safety Engineers, 2005).

Higher education transition. The variety of higher education SH&E programs, absence of agreed on core competencies, and lack of program accreditation, adds further confusion for stakeholders. As of March 2012, the ASSE listed on their college and university directory 410 SH&E higher education degree options, including 18 Certificates, 66 AS/AAS, 184 BA/BS, 105 MS/MA/MPH/MSPH/MSIE, 37 PhD, 1 DrPH. Of the 184 baccalaureate degree programs, there are 55 different degree names, producing graduates with unknown SH&E competencies. In response to this, the ASSE created an Employers' Hiring Guide (2011) providing prospective employers with a list describing typical safety and health job titles and tasks, and new hire selection criteria.

How can the SH&E profession, literally charged with the people's health and safety, lay in such sharp contrast to other baccalaureate professional preparation programs such as engineering, teaching, athletic training, dietetics, and nursing? These comparable baccalaureate preparation programs have established higher education standards and corresponding program accreditation processes, setting minimum preparation standards, evidence of graduate learning outcomes, continuous improvement processes based on stakeholder feedback, along with graduate licensure or certification exams.

While voluntary program accreditation is available to SH&E programs, of the 184 baccalaureate programs listed by the ASSE, I counted only 15 or 8% had sought ABET accreditation as recommended by the ASSE for all SH&E programs (ASSE, 2012a). When college and university SH&E programs were surveyed to determine why they have not pursued

voluntary accreditation, McAdams et al. (2011) reported accreditation was viewed as "too expensive" (31%), "required too much work" (24%), "offered too little value" (31%), "did not believe there was accreditation for the field" (9%), or had "other reasons" (47%) (p. 118). Interestingly, similar reasons for not pursuing accreditation have been cited within my own program. Nevertheless, SH&E programs are potential areas of stability and growth; the need for baccalaureate safety graduates is forecast to outpace production by 100% in the next five years (McAdams et al., 2011).

Confounding the perceived value of program accreditation is confusion between national and program accreditation. National or regional accreditation is institution focused, while program accreditation is specific, and most common to professional preparation programs such as engineering, nursing and teaching (Council for Higher Education Accreditation [CHEA], 2011). Research has not established a correlation between national accreditation and program quality (National Research Council (U.S), 2010; U.S. Department of Education, 2006), while program accreditation research has demonstrated significant improvements in students' learning and meeting stakeholder expectations (U.S. Department of Education, 2006; Volkwein et al., 2007). Program faculty collaboration, whether initiated by program accreditation (summative assessment) or by course (formative) assessment, has been shown to improve student learning and achievement of agreed upon program outcomes (Sheppard et al., 2009).

Finally, underlying all of this is the fact that the value proposition of higher education is under scrutiny as never before, driven by disproportionate tuition costs (Berger, 2013; Dan, 2013; McArdle, 2012) and growing evidence that student learning during college is minimal (Arum, Roksa, & Cho, 2011; Finley, 2012; U.S. Department of Education, 2006).

Research value. The potential value of this research was recognized by two forward thinking groups within the ASSE, the largest member-based professional safety organization in the United States: the ESC (Educational Standards Committee) and the Framing the Profession (FTP) Task Force. ESC agreed to serve as an expert panel providing invaluable peer review of this research proposal and development, followed by the FTP seeing potential value in a joint meeting using a MNGT process meeting as an action research method. The research worked the very space of professional members, in the field with those in higher education as the ASSE FTP works to clarify the organization's "identity and territory" (ASSE, 2011j, p. 3), and the ESC to update their curriculum guidelines.

In 2006, the ABET incorporated into their accreditation criteria the ASSE ESC curriculum guidelines revised in 2004 (ASSE, 2012b). These were later incorporated by the ABET-ASAC accreditation criteria; however, aside from the small number (15 out of 184) of ABET accredited SH&E programs, there is little information available regarding application in other higher education programs. The state of graduate competencies in the SH&E program area remain limited to each specific program. The FTP, upon review of the state of higher education program graduate preparation, reported in their scope of work: "The incoherent structure and lack of defined consensus in OSH educational outcomes means that there is no universal way for an employer to be reassured that he or she is hiring a fully qualified and competent OSH professional" (ASSE, 2011j, p. 5).

Knowing what core competencies to expect at completion of any education program should be inherent to any teaching endeavor. Competencies define knowledge, skill, and dispositions the learner should be able to demonstrate at the conclusion of the session, course, program, year, or curriculum. Defining baccalaureate core competencies holds relevance for

many stakeholders, such as prospective employers, students, parents, and colleagues. From a higher education perspective, competencies and learning outcomes are synonymous. The AAC&U recommends faculty assessment of learning outcomes or competencies to determine what level of learning has occurred and what program or course changes are necessary to enhance in order to assure learning outcomes are met, a process also known as continuous improvement (Miller & Association of American Colleges and Universities [AAC&U], 2007; National Council for Accreditation of Teacher Education [NCATE], 2008).

Regardless of SH&E employment, baccalaureate graduates entering a profession that, directly or by inference, holds these persons responsible for ensuring worker health and safety, must be ready for a variety of workplaces and people interactions with adequate competence (Hill, 2010b; Norris, 2011).

The ASSE is confronting the complexity of professionalization by purposefully engaging in this research with the FPT and ESC, albeit at some risk. On the one hand, the ASSE is dependent upon its membership base to maintain its organizational size and therefore position significance. The ASSE provides a lot of support to students, recognizing they "are the pathway to the profession's future" (Hill & Hudson, 2012, p. 3) and that membership numbers are important. On the other hand, how can the organization, committed to the protection of people, property, and the environment, maintain its credibility with the increasing expectations of employers (ASSE, 2008, ISHN, 2011) if those recent SH&E program graduates do not meet minimal core education standards?

This research occurred in the midst of what Vaill (1996) called "permanent whitewater…complex, turbulent, changing environment" (p. 4). The discussion will focus first on how the research process worked, in the midst of whitewater, where the ESC representing a

higher education perspective of professional development is in useful tension with the FTP, principally a practitioner based perspective, in a joint meeting.

Bridges (2004) offered that during transitions there is a process of moving "into something, not just a transition from something" (p. 43). The discussion will progress with this transition, to how the results might be used to move the profession forward, by comparing and contrasting the research outcomes with the existing ASSE curriculum guidelines and subsequent pedagogical implications.

Research limitations.

> Everyone says something true about the nature of things, and while individually we contribute little or nothing to the truth, by the union of all a considerable amount is amassed.
>
> - Aristotle, *Metaphysics,* 384-322 BC

The MNGT research method was successful at building consensus in a joint meeting of academicians and practitioners, and accomplished the goal of developing education standards or a set of core competencies, which were then transformed into learning outcomes. Indicators of success included ESC project approval and consultation, professional member survey participation, joint meeting participation, and favorable participant evaluations.

The research process exceeded expectations, by FTP working with the ESC in the joint meeting. While the ESC played the critical role of readying and ultimately approving the research proposal to move forward, it was a windfall for the FTP to engage in the process by providing a practitioner perspective. Chairs of both the FTP and ESC played significant roles in leading their colleagues in accepting and participating in the research. At the same time, organizationally, the ASSE played a subtle role by supporting logistics recommended by the ESC and FTP. The research occurred in the context of the professionalization of safety, increasing scrutiny of higher education, increasing employment needs of emerging safety

professionals, and continued needless worker suffering. In many ways there was an appetite and readiness for this work.

A deeper analysis of the three-phased research process—ESC Participation, Survey, and Joint Meeting—provides insight into defining a method effectiveness.

ESC participation. Two axioms of organization development are apparent in the first phase: "an intervention always begins with the a question" (S.Cox, personal correspondence, January 4, 2001) and the other posited by Lewin, "people believe in what they create" (as cited in Freedman, 2006, p. 84). The first axiom was my question to Dr. Ramsay, namely, would the ESC be interested in supporting my research to explore SH&E core competencies? Logically, if I were interested in learning what competencies are required of students gaining employment across the United States, why not try to engage the leading organization in the United States? My question to Dr. Ramsay revealed we shared the belief that safety was a profession and higher education should play a critical role, which led to his support of the research.

The second axiom of engaging people in the process reflects my style of learning, pedagogy, leadership, and values: that by engaging others with the material, topic, or problem, in a socially safe and respectful way, people usually become comfortable and open to both presenting their thinking and seeing different perspectives. I quickly realized that the members of both the ESC and FTP appeared to value safety as a profession, and as reflected in the results of this research, that higher education should have a more consistent and defined role.

While there were likely shared values between the ESC and FTP members, the MNGT process, by design, nulled the threat of groupthink and/or an individual with an overbearing point of view or voice. As evidence, the group as a whole identified over 60 ideas that would constitute evidence of learning, later distilled to 10 core competencies. Shared values in the

midst of context and readiness with a reliable research method and effective process led to results.

Survey. The professional member survey provided appropriate prompting data for the MNGT meeting participants. There is an important distinction to be made regarding the qualitative survey method. While the survey worked well to collect data for the MNGT process meeting, it fell short in meeting the rigor required to serve as a stand-alone qualitative survey. In general, qualitative research (study of interviews, surveys, video, text) is used to develop an understanding of a case or phenomenon and therefore would have required additional steps to ensure the collected data was interpreted accurately, such as member checking, and triangulation (Stake, 1995) Additionally, systematic coding would have required a coding manual and enhanced coder training. However, as applied in this case, the purpose of the anonymous survey was to reliably collect ideas for the meeting participants, and these ideas were coded into nodes (categories) based on terms originating from the data. The survey response met the needs of the research, revealed consistency to the ASSE membership demographics, and was found to have very high percent of agreement between coders (most likely the result of a shared language common to SH&E profession).

Because qualitative research is not transferable or generalizable to other situations, the MNGT process was necessary given the desired output of educational standards applicable to any SH&E program. Of note, the results of the anonymous survey did not reveal a tension between higher education and practitioners, but rather a clear statement that knowledge-based competencies in higher education are important. Also significant was a recurring theme in the answers to question 4. Many respondents defined excellence at one's facility as having a third-

party performance verification processes, such as OSHA-VPP, LEAN, and ISO Certifications (14001/OSHAS 18001), which feature standards and continuous improvement processes.

It is also noteworthy that the professional member survey reported very little on international or global importance, nor were there comments made questioning whether or not the profession includes the environment or security, or comments that pitted one organization against another. Survey participants' responses did not reveal concerns about professionalization or reflect tension between practitioners and/or higher education.

Joint meeting. The second phase of the project was the actual MNGT process meeting and by all reports, the meeting process was effective at arriving at core competencies and learning outcomes. Given the roles and responsibilities of the ESC and FTP, as charged by the ASSE organization, the meeting outcomes should be transferable to higher education preparation for the SH&E profession.

The joint meeting process, where members of the ESC and FTP task force worked together, modeled an important example. There were no signs of tension between ESC or FTP, or between individuals. That said, during a break in the meeting I was told that in the past, when there were conversations within the organization regarding the establishment of minimum education criteria or a CSP exam for national licensure process, there were very strong member objections raised.

Because the research process was constructivist by nature, not all participants shared the same perspective. Participant comments provided on the MNGT meeting evaluation forms provided clues that while some participants were more skeptical, the process was a positive learning experience for others,. One participant, during preparation for the meeting, shared that the professional survey data had "a lot of rich information to get through and ponder, and I

spent more time than was required." Three participants said that "they had discussed the professional survey results with their colleagues," which I had not anticipated would happen.

The meeting evaluation forms were very positive; all (100%) reported they had had a chance to provide all their ideas (written survey questions 1, 2, and 4), and 92% agreed or strongly agreed that: the process was fair, they were satisfied with the results, the facilitator did not influence the rating process, and this process fostered more group discussion than other situations had in the past. One of the 13 written evaluation forms reported that the participant strongly disagreed that the process was fair and strongly believed that the "facilitator influenced the results and his or her rating process." He or she also offered this comment: "My only concern is related to how participants were select[ed] to be part of the process." Another development was learning the FTP group wanted to join the MGNT meeting, thereby increasing the group size to 15, or five over the more typically recommended 10. It was a calculated risk to exceed the typical NGT group size, which added a variable.

While one participant experienced the MNGT process meeting as unfair, another one of the evaluations (collected at the same time) reported "a great synergy resulted, critical to the development, vetting and application of the created outcomes." Lastly, one participant said to me at the conclusion of the meeting, "I learned a lot, we should be holding more of these sessions, it was really a good use of time." In reflection, the evaluation by the majority of ESC and FPT participants add a level of credibility. The evaluation process did not reflect tension between academics or practitioners, instead, each validated the process and results.

In general the research seemed to work in a synergistic process with the right people, at the right place and time, with the right question, yielding solid results. Research expectations were exceeded.

Meaning. At the conclusion of the joint meeting, with the list of ten core competencies and 29 learning outcomes still posted on easel paper, Dr. Ramsay suggested projecting the existing ASSE curriculum guidelines for a quick comparison. In a hurried review, as the meeting was breaking apart, someone made a comment that "these [learning outcomes] are not that different [than the ASSE curriculum guidelines]." Candidly, when I heard his comment, I recall thinking "no-way." Six weeks later, after experimenting with different visuals to illustrate both the ASSE curriculum guidelines and joint meeting core competencies, it occurred to me that indeed there is similarity and significance. The core competencies resulting from the joint meeting essentially encompassed and surpassed the 2006 ASSE curriculum guidelines, as illustrated Figure 5.1 below.

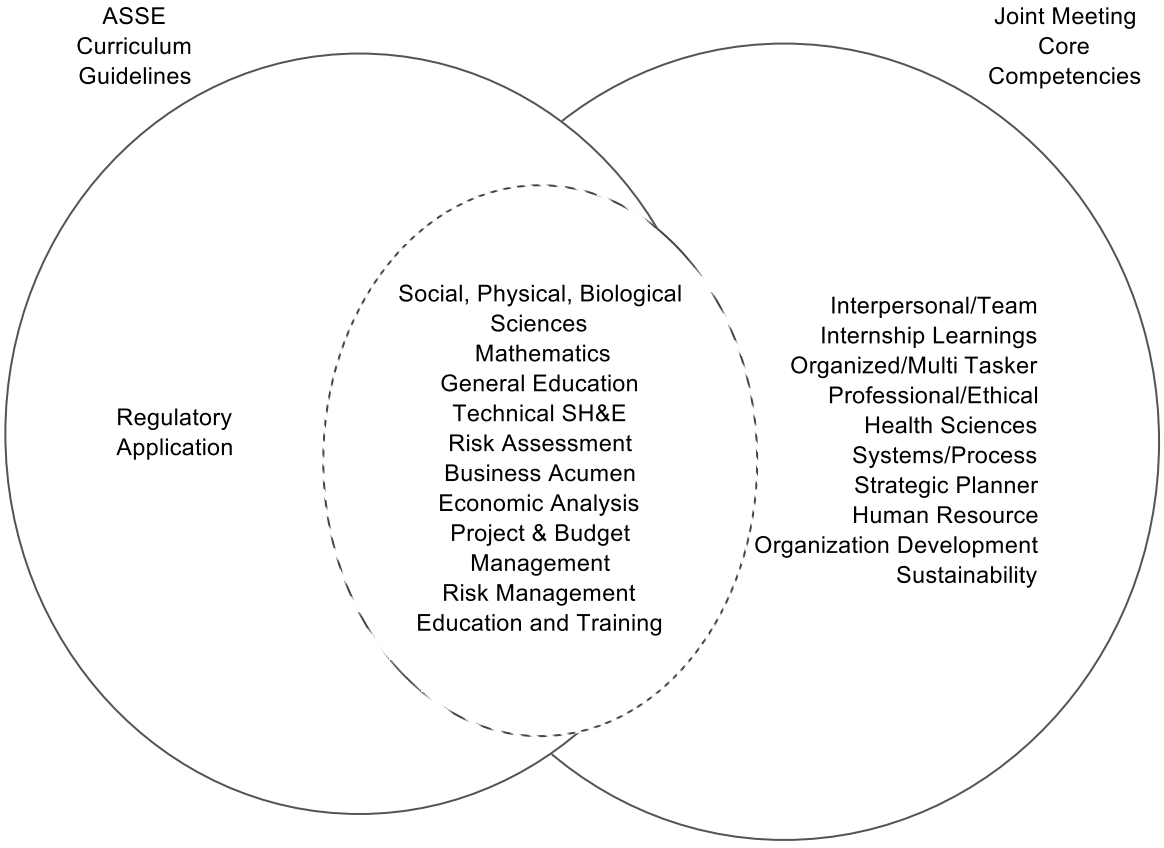

Figure 5.1. ASSE curriculum and core competencies.

The research data verified the relevancy of the ABET-ASAC *Criteria for Accrediting Applied Science Programs for Safety* (2012-2013) and created an opportunity to revisit the intention of the ASSE curriculum guideline with a new set of core standards and corresponding learning outcomes.

This research project derived learning outcomes from two groups of professional members within the ASSE, while at the same time; there are literally over 100 safety organizations in the United States alone. On the one hand, the participants of the joint meeting are leaders and representatives of the ASSE charged with framing the profession and guiding higher education via the Educational Standards Committee. On the other hand, a limitation, noting this study's dependence on the ASSE. For reference, the ANSI *Criteria for Establishing the Scope and Functions of the Professional Safety Position* included 70 participants, with the ASSE serving as secretariat (ANSI, 2003).

The external pressures facing colleges and universities will continue to increase as stakeholders grapple with the value proposition question (Mehaffy, 2012). If the Spellings Report is any indicator (Basken, 2007), and value add, as other programs such as nursing, teaching, and engineering have experienced. Further, program accreditation will become more relevant to universities and colleges as they compete for decreasing student enrollment and explore new avenues of course and degree delivery, such as MOOCs (Massive Open Online Courses), perceived to be a magic bullet of revenue in some cases, albeit of varying levels quality (Pappano, 2012).

I assume the field of occupational health and safety will continue to expand and change as the economy continues to morph, while safety professionals as defined by the ASSE (2011g), will strive to protect people, property, and environment. An assumption of this project is that the

best preparation for baccalaureate graduates in the all-encompassing safety field is achievement of the defined core competencies, in conjunction with other higher education learning outcomes such as "The Essential Learning Outcomes" (http://www.aacu.org/leap/vision.cfm), which require student "engagement with big questions, both contemporary and enduring" that develop "intellectual and practical skills," prepare students for "personal and social responsibility," and the habit of learning to learn by being "integrative" (p. 3).

This research led to consensus of the importance of learning outcomes, articulating what baccalaureate graduates should be capable of doing and thinking. Learning outcomes require formative and summative assessment by course and program faculty to ensure the learning that occurs is what is desired. In "AAC&U's 2008 survey, employers dismissed multiple-choice tests in favor of assessments that evaluate students…learning" (Finley, 2012, p. 4). Learning outcomes are comparable to employer performance expectations and subsequent evaluation processes. As proponents of higher education we would serve our students and stakeholders well by sharpening our assessment practices and increasing collaboration with colleagues, in the spirit of continuous improvement of student learning.

Next Steps

> To change is to substitute one thing for another….But to transform cuts much more profoundly. It is to cause a metamorphosis. (Burns, 2003, p. 24)

This research set out to define core competencies for baccalaureate SH&E programs with the ESC, representing the ASSE's interest in higher education, as reflected in their words and actions (ASSE, 2010; Hill, 2002). The credibility and potential value of the core competencies were increased by active engagement of the FTP, a task force of forward thinking practitioners determined to clarify and advance the profession. Since the establishment of the ESC committee in 2004, their focus has been to define a process to ensure

graduates of SH&E programs were competent by defining and then meeting voluntary accreditation standards through ABET. An unanticipated outcome of this research was that the joint meeting process corroborated the content of the ABET standards, and provided additional opportunities.

In general, professional program accreditation organizations have shifted their focus from specifying courses, to establishing minimal standards, or, as in the case of baccalaureate nursing programs, "essential criteria" (AACN, 2008). Additionally, professional program accreditation organizations require evidence of continuous improvement, where program faculty work together to assess their teaching, course, and program effectiveness in a spirit of discovery, where changes in pedagogy are applied, and tested.

As the value proposition question of higher education has increased, so has the corresponding focus on results (Mehaffy, 2012). Shifting focus to see that desired learning outcomes are met reflects a higher education paradigm shift to "the quality of student learning," from an assumption that "content-centered" equals content knowledge (L. Fink, 2003, p. 27). Assuming the purpose of higher education is learning, whether or not one is interested in employment or intellectual growth, the result or outcome of learning should be measurable (AAC&U, n.d.; Finley, 2012; Kuh, 2008). This shift toward outcomes-based evidence is one already experienced by professional programs structured on baccalaureate preparation, including, for example, engineering programs. In a nation-wide study of baccalaureate engineering programs, it was recognized that the majority were based on an outdated "curricular model," a holdover of higher education beliefs not incorporating the last 20 years of research on learning or changes in engineering (Sheppard et al., 2009, pp. 10-14). Pedagogy focused on learning means to assist students to change; "No change, no learning.

And significant learning requires that there be some kind of lasting change that is important in terms of the learner's life" (L. Fink, 2003, p. 30). Students need to frame their learning in reference to the desired profession, with purposeful experiential learning, with time and safe space to practice, and where key principles are revisited in increasing depth as their knowledge builds (Sheppard et al., 2009, pp. 191-206).

This research has established 10 core requirements with corresponding learning outcomes, creating the possibility to reframe what the ASSE expects of institutions preparing students for employment as emerging safety professionals. Allowing the 184 baccalaureate programs, with 55 different degree titles, the flexibility to create their own curricula or titles becomes moot, provided there is evidence students are capable of meeting the core outcomes.

Unfortunately, at a summative level, when examining learning changes between freshman and graduates, higher education is not doing very well. In a recent study by the AAC&U titled *Making a Difference* (Finley, 2012), using several types of indirect measures to determine the degree of change in a student's learning over their time at college, the results of this five-year study are shocking. The study reported "little or no growth on [learning] outcomes" (p. 8), and "the majority of students, first-years and seniors, are not proficient in mathematics, critical thinking, writing, or reading" (p. 13). Notably, the joint meeting identified the importance of these same knowledge areas.

The present practice of graduating students as emerging safety professionals without a means to establish graduate competency is irresponsible. In my own college where 94% of the budget is derived from tuition (Kahn, 2013), there is tremendous pressure to accept and graduate students, while trying to uphold quality standards; for example, while there are many factors at play, for the last seven years my college's safety studies program has graduated an

average of 85 students per year, of whom only 7-10% successfully passed an occupational health and safety technician exam, which has been demonstrated to align with domain knowledge areas of employed safety technicians. (The exam requires a high school education and one year of experience.)

Recommendations. These recommendations are offered in the spirit of continuous improvement requiring a big picture perspective or whole system approach. There are many stakeholders requiring new learning to facilitate change. These recommendations are meant to be constructive, not punitive. Intrinsic motivation is optimal, requiring flexibility, collaboration, and desire to build the mold for the next era of professionals (Fullan, 2010). My recommendations are as follows:

a. Higher education's role is critical and foundational as the source of competent emerging safety professionals. Recognizing it will be the employers that hire graduates, it is in higher education's interest to at least meet if not exceed their expectations.
b. ASSE appears to be best positioned to build necessary capacity and facilitate change. This includes:

i. Develop a new era strategy of ensuring safety baccalaureate competence in collaboration with representatives from as many higher education baccalaureate programs as possible.
ii. Create new vision of minimally competent baccalaureate SH&E graduates that are able to demonstrate with evidence they are ready to emerge as safety professionals, responsible for protecting people, property, and the environment.

iii. Determine the need to build capacity of SH&E college programs by first researching the status of baccalaureate safety programs, their use of learning outcomes, how they use formative and summative assessment, how they determine employer satisfaction, and their processes of program improvement. Form partnerships for improvement.

iv. Consider transferring other professional baccalaureate preparation program processes. For example, the AACN (American Association of Colleges of Nursing) reports it is "the national voice for baccalaureate and graduate *nursing* education" (AACN, 2013). I suggest looking into establishing the AACSHEE (American Association of Colleges of Safety, Health and Environmental Education) and perhaps a self-reporting process which higher education safety programs can report against a predetermined list of criteria, comparable to the VSA (Voluntary System of Accountability) (http://www.voluntarysystem.org/).

v. Request The Carnegie Foundation for the Advancement of Teaching to study the education preparation of emerging baccalaureate safety professionals (http://www.carnegiefoundation.org/).

c. The ASSE ESC and perhaps FTP revisit the results of this research and consider:

i. Shift focus from required curriculum guidelines to core competencies and corresponding learning outcomes.

ii. Revise ABET criteria to incorporate the identified additional core competencies, over a phased-in time period.

iii. Change the ASSE University/College Directory to clearly report which programs are accredited and report why that is critical.

iv. Consider alternatives to full ABET accreditation. This could include ideas discussed in the past whereby programs could voluntarily report their degree of agreement with the core competencies, and perhaps establish a process of verification (trust and verify), but hold ABET accreditation as the ultimate or highest measure of quality.

v. Study the requirements of both the BCSP (Board of Certified Safety Professionals) and ABIH (American Board of Industrial Hygienist) certification continuance specifically for SH&E faculty members, and require evidence of service or scholarship for advancement.

vi. Explore options of how the ASSE could support faculty and students by encouraging and rewarding scholarship that would benefit the quality of the educational process.

In Reflection

There were several points in my research where I potentially had little control over variables and, in some cases, where unanticipated developments occurred. Defining the research method came together once I became clearer on my question. I was advised early in the research idea phase that the ASSE receives numerous requests for research and subsequently found that my research proposal would be evaluated for its potential value by the ESC. Unanticipated, my process of inquiry with the ASSE ESC committee resulted in being invited first as a nonvoting member, then full member (as long-time and founding member Dr. Paul Specht, a member of my dissertation committee and founder of the Keene State College safety baccalaureate program in the 1970s, discontinued his member role, creating a spot I was nominated for). I did not anticipate the level of interest from the ASSE, ESC, or FTP. Once the ESC committee decided the research was worth supporting, they then agreed to serve as a peer review expert panel and engage in the process. ESC approval led to support by the ASSE and

their offer to facilitate a direct email survey to a randomly selected population of professional members.

A modified NGT process requires in-depth preparation to maximize FTF (face-to-face) participation. There was a risk that even with the best laid plans, results of the professional member survey may or may not be useful, presented accurately, or even used by the MNGT participants. While there was a pilot process to learn from and use to plan the actual MNGT meeting, its process and outcomes were unpredictable, and would require the patience and willingness of several professionals, all leaders, to be participants.

I am not the first to imagine a time when all baccalaureate students interested in pursuing SH&E are products of accredited programs. The 170 unaccredited higher education programs need more than encouragement and reliance on a few people to make this future possible. A close friend and colleague once said to me, "the consequences of a mistake [in safety] are too high: if you can't take it, move to accounting where mistakes are always fixable. Health and Safety doesn't have that luxury" (A. Ellis, personal communication, August 23, 1990).

Clearly there are some challenging hurdles ahead. This research has developed a set of core competencies, universally applicable to any baccalaureate SH&E higher education program, regardless of program or degree name, curricular plans or course titles. If safety is to fully become a profession, it is time to meaningfully establish educational core competencies as a crucial step in the process.

During my literature review, I was struck by the thoroughness and clarity of The Carnegie Foundation Preparation for the Professionals series, and especially their report on *Educating Engineers, Designing for the Future of the Field* (Sheppard et al., 2009). Provided

were summative concepts that I think are directly transferable to the state of professional safety. Consider these points, and note I have I substituted "engineering" with safety:

- Safety "work is inherently interactive and complex."
- "Formulating problems and solving problems are interdependent work."
- Safety "has many publics."
- Safety "incorporates many domains beyond the technical."
- Safety Professionals "affect the world" (pp. 175-176)

While the above bullets may frame a comparable reality, the safety profession has much further to go. It is old news that there are many types of human intelligences (Gardner, 1983), making me wonder if SH&E higher education programs are focused appropriately on stakeholder needs. Perhaps all faculty of SH&E programs should spend six months in a practicum of some type every five years, to fully understand the expectations placed on emerging safety professionals, and update not only content, but pedagogy as well. The research on learning is pretty clear, that to ensure change (learning), it is necessary to engage (Doyle, 2008; L. Fink, 2003; Kuh, 2008) in order to reach deep understanding of what is at stake and discern what action to take.

Appendix

Appendix A: Project Proposal Letter

Wayne Hartz, Doctoral Student,
Ph.D. Leadership and Change
Antioch University

June 15, 2012
Dr. James Ramsay, CSP
Chair, Educational Standards Committee
American Society of Safety Engineers

Re: Proposal to Study the American Society of Safety Engineers Education Standards

Dear Dr. Ramsay,

Thank you for encouraging me to submit a proposal to study our Association's Education Standards. The following content frames a qualitative research method that is comprehensive and timely, using a consensus process that requires engaging the Educational Standards Committee (ESC). Additionally, this project will serve as my dissertation study, completing my Ph.D. in Leadership and Change. I look forward to the distinct possibility of working with you and the ESC. Moving this study forward is contingent on you, the ESC, and my dissertation committee agreeing to the project (following incorporation of revisions).

Although ASSE's Education Standards (ASSE, 2004) provide a benchmark, recent literature leads me to conclude now is an opportune time to re-evaluate ASSE's Education Standards and consider the value of revisions. Notably, you and Dr. Ferguson (2010) have identified that the application of existing American Society of Safety Engineers (ASSE) Education Standards, followed by program accreditation serve as the recognized benchmark for Occupational Safety and Health (OSH) higher education programs. At this year's 2012 ASSE Professional Development Conference, Dr. Hill and Esquire Hudson, presented about the numerous global efforts underway to define safety as a profession, and the subsequent required components, including: the Body of Knowledge (BOK), formal Educational Standards, Occupational Closure, Ethical Code, and Certification. Also made clear in their presentation, is the leadership role which the ASSE is taking to establish a meaningful, consistent, and globally acceptable safety professional criteria (2012).

This research design leverages the foundation of the existing education standards and seeks to access our association's safety network, by using: a social science sampling technique, the flexibility of the internet and data collection via a Wiki survey instrument, and the ESC as an expert panel, to participate in a consensus process meeting, and lastly to compare, contrast and evaluate the need for our associations standards revision.

Method Summary

Following approval by ESC and my dissertation committee, ESC members are asked to identify subject matter experts[1] (SMEs), such as their respective program advisory committees, themselves are then invited to complete an online Wiki survey. A Wiki is an online collaboration process accessible from any computer type device used to access the Internet, allowing SME flexibility (West & West, 2009). The Wiki survey will ask respondents for basic demographic information, and to answer this question, as fully as they see fit: "As you think about baccalaureate preparation for emerging safety professionals now and in the future, list what you would like to see in a portfolio demonstrating competence."

While simple demographic information is required, all names or program identifiers will be removed, thereby supporting anonymity. Following survey completion, SMEs are asked to forward a survey to a colleague, initiating chain or snowball sampling. The Wiki accumulates all demographic data and written responses. As the data from the survey is collected, it will be analyzed with qualitative software to identify and generate common themes.

The survey is continued until a point of diminishing returns,[2] or point where themes become repetitive. Lastly, the themed results are then forwarded to ESC, who then participate in a Nominal Group Technique[3] (NGT) process meeting, which I facilitate. The NGT process assists in building consensus and prioritization of the collected data. Further method details are described in Appendix 1 and 2 [not included in the dissertation], providing a flow chart with explanation of steps, and description of ESC and researcher roles.

Results

The results of this study will support comparison(s) to the existing ASSE Educational Standards. Unique to this process is the open-ended nature of the starting question, snowball sampling, and qualitative analysis concluding with a consensus process meeting.

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[1] For the purposes of this study, OSH SMEs have in the last five years, singularly or in combination: 1) Serve(d) on an advisory committee of an ABET-ASAC accredited program, 2) Published peer reviewed OSH literature, 3) Serve(d) on a National OSH Committee or research task force, 4) Serve(d) as a terminal degreed associate or full professor faculty member, holding a current and germane board certification, 5) Work(s)ed full time as an OSH practitioner at a facility or job site with demonstrated OSH performance excellence, verified by a third party, 6) Hires and manages Bachelors of Science OSH program graduates at a facility or job site with demonstrated OSH performance excellence, verified by a third party.

[2] The point of diminishing returns is a moving target. Delbecque et al. (1975) offer a practical perspective explaining NGT participants offer ideas in a "round-robin " sequence until "there are no further ideas to share" (p. 8). From a qualitative research perspective, the concept from grounded theory is to collect data beyond "saturation," getting to "interpretive sufficiency, which takes into account cultural complexity and multiple interpretations of life" (Charmaz citing Christians (2000) and Denzin (1989)) (Charmaz, 2005, pp. 527–528).

[3] NGT is a facilitated group process meeting which assures all participants have equal opportunity to offer ideas on a stated problem or issue. In this case, Wiki survey results will be distributed prior to the meeting. The NGT process will include listing Wiki themed results, clarifying themes, anonymous multivoting, and subsequent ranking of themes and if necessary further discussion and voting, generating results or in this case education standards (Delbecq et al., 1975; Dobbie et al., 2004).

Specifically, the study should:

1. Provide comparison to the 2004 Education Standards, supporting possible revisions.
2. Validate our association's Education Standards, clarifying expectations of OSH graduate performance.
3. Support the creation of learning objectives, vs. specific course requirements.
4. Contribute to the Safety Profession Body of Knowledge.
5. Contribute to the definition of generalist competencies.
6. Contribute to future OSH program accreditation efforts.
7. Support comparison to global initiatives.

Estimated Resources

1. ASSE Costs $200- 1,379.
2. Project duration, March – July 2012.
3. Principals' time commitment, 10 – 20 hours.

In closing, this proposal originates from my desire to apply my required doctoral dissertation to a question that I have been struggling to define since joining higher education: What do I teach to best prepare a competent emerging safety professional, able to take a leadership role, to protect people, property, and the environment?

I look forward to your questions. Thank you in advance for your consideration of this proposal and its potential value.

Sincerely,
Wayne Hartz
Doctoral Student
Ph.D. Leadership and Change Program
Antioch University
Yellow Springs, OH

1. Method Summary

Step 1.This proposal is critiqued by the ESC, my dissertation chair, and modified as required.

Step 2. ESC agrees to the criteria defining SME's, proposed for this study as: OSH SMEs have in the last five years, singularly or in combination:

a. Served on an advisory committee of an ABET-ASAC accredited program,
b. Published peer-reviewed OSH literature
c. Served on a National OSH Committee or research task force
d. Served as a terminal degreed associate or full professor faculty member, holding a current and germane board certification
e. Worked full time as an OSH practitioner at a facility or job site with demonstrated OSH performance excellence, verified by a third party such as OSHA VPP or SHARP, Koop Award, Malcolm Baldrige Award or peer-reviewed published consultant case study
f. Hires and manages bachelor of science OSH program graduates at a facility or job site with demonstrated OSH performance excellence, verified by a third party such as OSHA VPP or SHARP, Koop Award, Malcolm Baldrige Award or peer-reviewed published consultant case study
g. Other suggestions to define OSH SME's

Step 3. SME's complete online Wiki survey. In addition to collecting a minimum of demographic data (type of industry, brief bio), SMEs are asked to answer this question: "As you think about baccalaureate preparation for emerging safety professionals now and in the future, list what you would like to see in a portfolio demonstrating competence?"

The Wiki is hosted at no cost on Google Sites. Access and control of the Wiki is password protected and limited to the designer (Wayne Hartz). The actual survey can only be completed via invitation. The Wiki requires minimal training and is very simple to complete. Data access is limited to the Wiki designer.

Snowball sampling begins with those on the ESC committee. Corresponding SMEs forward the questionnaire to others who will have an important perspective to add (and meet the SME attributes). Snowball sampling is common in social sciences sampling to reach a population that is connected around a topic on interest of which there is a wide and even conflicting points of view (Cohen & Arieli, 2011).

Step 4. The Wiki data is collected until qualitative data analysis reveals no new themes, indicating the point of diminishing returns.

Step 5. Themed survey results are sent to the ESC committee members, allowing pre-meeting review. ESC participate in a half-day facilitated meeting using a Nominal Group Technique (NGT) process. The method to revise educational standards is based on the consensus building process of NGT has been shown to be superior to conventional meetings or brainstorming processes, fair—providing all contributors equal idea consideration and voice—and result in a prioritized list of distilled ideas (Delbecq et al., 1975). Outcomes of using NGT include; a greater number and quality of ideas, high participant satisfaction, time efficiency, and the achievement of relevant results (Fox & Glaser, 1990).

The NGT process results in a prioritized list of educational standards, allowing comparison to the existing standards.

Step 6. ESC results are provided to the ASSE.

2. Roles

Researcher Roles:

Procedures:

To submit this proposal to ESC Chair and dissertation committee via email or in person. Incorporate and/or answer questions, ultimately revising the study method and process as require to gain approval.

Develop an internet based Wiki to engage the SMEs.

Confidentiality and permissions

i. Meeting Antioch University's Institutional Review Board (IRB) requirements: Explain to participants their risk of participating in the study. Secure ESC written permission to collect and use for research purposes only; all project and communication data, including but not limited to: personal and written correspondence such as e-mail, field and/or meeting notes, group or individual conversations, Wiki entries, and evaluation forms.

ii. SMEs and those participating via snowball sampling will be provided an explanation of the risk of participating. Wiki completion will indicate agreement to use information provided, following the removal of personal identifiers.

iii. Public documents (including my dissertation) will not reveal names or personal identifiers in association with comments or inferences, made by participants.

iv. Participants agree to their names, affiliations and project roles, such as SMEs or Task Force Member etc., being listed in public documents (such as my dissertation).

Participant instructions

v. Create a one-two minute YouTube video clip to provide Wiki survey completion directions. Additionally, contact information will be provided to answer specific survey completion questions.

vi. Use commercially available Nvivo software[4] process to analyze the survey replies.

vii. Track survey reply frequency and theme identification, monitoring for point of diminishing returns to stop the survey process.

viii. Provide the Task Force with a written summary of the Wiki generated themes.

ix. Facilitate ESC in NGT process meeting to agree on and prioritize themed results.

x. With ESC, analyze differences between existing and study findings, considering opportunities for standards revision as appropriate.

Results

xi. Provide the ESC with a written summary of the process, Wiki results, data analysis, and NGT meeting outcomes.

Doctoral Research

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[4]Nvivo software is specifically designed to analyze qualitative data such as written or spoken communications resulting from interviews, surveys, questionnaires, etc. It is produced by QSR (Qualitative research developer) which claims to the largest of its type in the world. The cost of Nvivo 10 is $179. http://www.qsrinternational.com/products_nvivo.aspx

1. This study will also be used to meet the dissertation requirements of Antioch University Ph.D. in Leadership and Change Program.
2. Dr. Jon Wergin, my dissertation chair, is very supportive of this research and methodology, last discussed May 23, 2012
3. Secure full (formal) dissertation committee approval, from Dr.'s Jon Wergin, Chair, and Elizabeth Holloway, Antioch University; and Paul Specht, Millersville University.

A. ESC Roles

The Task Force has three major roles, as client, expert panel, and invested partner. These duties would include:

1. Review this proposal, and in particular the method of data collection and analysis, offering candid feedback, and eventual approval of the revised process.
2. Maintain the scope of this study as designed.
3. Evaluate budget, and recommend funding sources.
4. Identify, invite and gain commitment from SMEs to complete the Wiki survey. If necessary, prompt SMEs to participate.
5. Recognize SMEs for their contribution.
6. Engage in-person in a final NGT meeting, requiring an estimated six hours (with lunch and breaks).
7. Complete post evaluation surveys.
8. Agree to timely return of phone calls or e-mails.

Project costs.

Table 1. ASSE Direct Cost Estimate

• Wiki website host- Google Sites – no cost	0
• If agreeable utilize existing budget for the ESC Fall meeting in Chicago. If agreeable to ESC Chair, apply Fall meeting budget and time allocation to NGT Process Meeting (appreciating other agenda items may require additional time). ▪ Flip chart paper, markers, pens, 3 x 5 cards, masking tape	$200
Estimated sub total	$200

Table 2. Assumptions

1. Email correspondence as necessary
2. ASSE Staff do not charge time against project
3. Task Force and SMEs volunteer time
4. Hartz time volunteered
5. Estimated sub total $0

Table 3. Optional Additional Costs

1. Hartz- Purchase of Nvivo 10 Software	$ 179
2. Qualitative software training	$ 1,000
3. Estimated sub total	$0 – 1,179

Table 4. Total Project Cost Estimate

Table 1 – ASSE Direct costs	$ 200
Table 2 – Assumptions	$ 0
Table 3 – Optional Additional Costs	$ 0 – 1,179
Total Project Cost Estimate	$ 200 – 1,379

Estimated Time Requirements

Project duration: June – November 2012

Table 5. Tentative Project Gantt Chart

Step		June	July	July	August	Sept	Oct	Nov	Dec	Jan 2013
1	Project review, comment, agreement and approval.	X	X							
2	SMEs are identified by ESC and invited to complete survey, additionally initiates snowball sampling			X						
3	Snowball sampling continues			X	X	X	?			
4	Snowball sampling continues, Wiki data analysis begins			X	X	X	X			
5	Sampling stops. Themed results sent to ESC before Fall Mtg						X			
6	ESC participates in NGT meeting process							X		
	Written process and results summary to ESC							X	X	
	Hartz completes dissertation							X	X	X

Table 6. Estimated Principal Time.

Who	Task	Estimated Hours
ESC	1. Reviews, edits, accepts proposal	1-3
	2. Identifies SMEs and invites SMEs to participate	1 - 3
	4. Participates in NGT process	6
	5. Completes evaluation	1
	6. Other e.g. communication	2 - 4
	Total	10 - 17
SMEs	Watches YouTube video to complete Wiki survey	.1
	Answers demographic questions	.2 - .5
	Answers open ended question	1 - 3
	Total	1.5 - 3.6

Appendix B: Survey Invitation Letter

Dear ASSE member,

ASSE is asking you to help a fellow safety professional and ASSE member with a research project that will help identify ways to improve existing Safety Curriculum Guidelines specifically; what type of curriculum safety professionals would expect to see in Bachelor of Science graduates applying for employment in the SH&E field. The data from this survey will be used by the ASSE Educational Standards Committee to help develop current and relevant set of educational standards for the profession.

This short survey is confidential and should only take about 10-15 minutes to complete. To participate in this exciting project please complete the survey at: https://www.surveymonkey.com/s/ExpertSafetyProfessionalSurveyBaccalaureateCompetencies
- by Monday, February 25, 2013

If you have any questions regarding the **survey** please contact:
Professor Wayne Hartz, CSP, CIH, CSHM whartz@antioch.edu or 603-358-8025.

If you have any questions regarding the ASSE Education Standards or Committee, please contact: Dr. James Ramsay, PhD., MA, CSP
james.ramsay@erau.edu

Appendix C: Professional Member Survey

Thank you for participating in this survey.

I am required to provide the following disclosure:

a) The purpose of the anonymous and confidential survey is to collect opinions from Expert Safety Professional's such as you, to identify in your words, what you would like to see as evidence in a portfolio indicating that a bachelor degree graduate is ready to enter the safety profession or perhaps even be hired by you.

b) There are two types of information you will be asked for; 1) to explain what you would like to see in a portfolio demonstrating competence of baccalaureate graduates, and 2) some simple demographics.

c) By participating in the anonymous survey, your data will be used by Wayne Hartz, as a Doctoral Student, Ph.D. Leadership and Change Program, Antioch University. Once the survey data is collected, cleansed of personal identifiers and used in the aggregate, it will be shared with the ASSE Educational Standards Committee. Final results will become public, but not include personal identifiers.

d) The survey is hosted on this Google Wiki Site. Wayne Hartz, as the survey administrator, will take every reasonable measure to keep your responses anonymous. This includes separating your name and personal identifiers from your data once collected from the Google Wiki site.

e) Because the survey is hosted by Google, Google's privacy policy applies. Google reports that it tracks all user information to refine user experiences. Privacy assurances for this survey are no different than any Google service, and as such will not guarantee user privacy. Further information is available from Google's website http://www.google.com/intl/en/policies/

f) By completing and submitting the on-line survey you are providing implied consent to participate in this study.

g) You can exit the survey at any time with no consequence.

h) Incomplete responses will not be considered.

i) By participating in the survey as an expert safety professional, your responses will help inform the Educational Standards Committee in defining bachelor degree competencies necessary for success today and in the future.

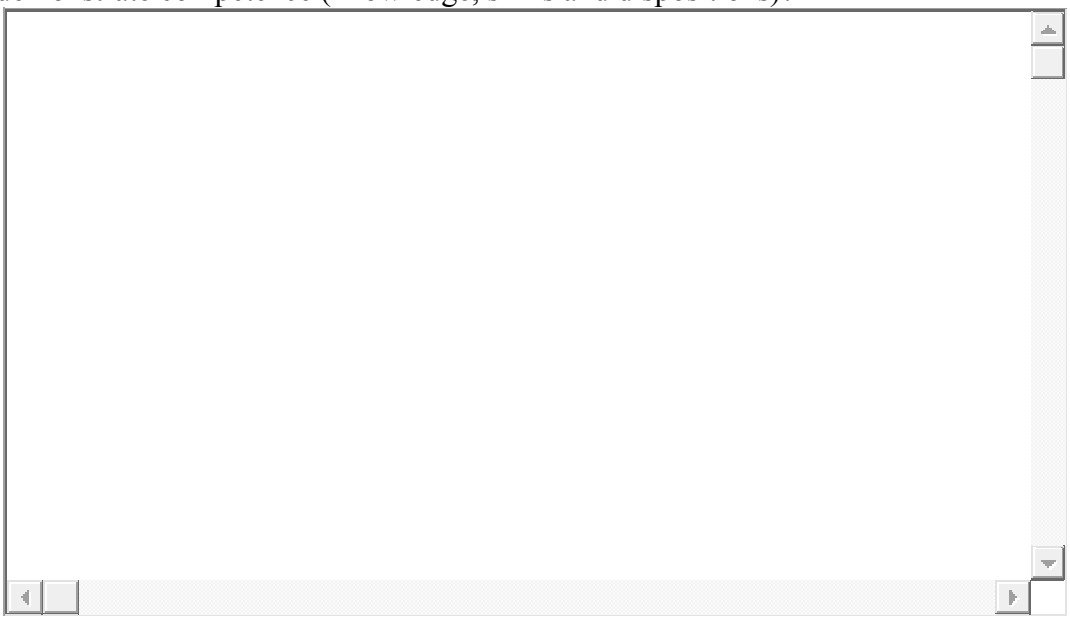
j) As a participant, risk to you seems negligible. In the worst case scenario or, if all measures to protect your identity fail, your opinions regarding graduate competencies could be known.

k) If you have any questions about the study, you may contact Wayne Hartz at (603-358-2943) or via email at whartz@antioch.edu

l) If you have any questions about your rights as a research participant, you may contact Dr. Carolyn Kenny Chair of the Antioch University Institutional Review Board, ckenny@antioch.edu or Tel: 805-618-1903 (w) 805-680-1584 (mobile) or Dr. **Laurien Alexandre**, Vice Chancellor University Academic Affairs, PhD Program in Leadership & Change Lalexandre@antioch.edu Tel: 323-666-8181 (w).

m) If you would be interested in a continued role with this research, such subject, please provide your contact information to Dr. James Ramsay, Chair, ASSE Educational Standards Committee james.ramsay@erau.edu. Your name and Email will not be attached to your survey responses.

1. Imagine that you're looking over the portfolio of someone who is a baccalaureate-prepared safety professional. What kind of evidence would you want to see in a portfolio that would demonstrate competence (knowledge, skills and dispositions)?



2. Please check each box that describes your professional safety, health and environmental activities in the last 5 years:

☐ Please check each box that describes your professional safety, health and environmental activities in the last 5 years: You have continued your Professional

Membership with the ASSE.

☐ The facility or job site in which you were employed was identified as having demonstrated excellence in the SH&E (Safety, Health and Environmental) field.

☐ You have hired, led, managed or supervised at a facility or job site identified as having demonstrated excellence in the SH&E field.

☐ You have served as an advisory committee member of an ABET or ATMAE accredited baccalaureate degree program.

☐ You have served on a germane national committee, task force, board or council.

☐ You have authored in two field applicable, peer reviewed journals or other literature (e.g., text books, chapters, white papers, policy papers, etc.).

☐ You have served as full-time faculty.

☐ You have served as adjunct faculty.

You have participated in other professional activities (please explain):

3. If you have hired, led, managed or supervised at a facility or job site identified as having demonstrated excellence in the SH&E field, please explain the key processes resulting in “excellence” at the facility or job site:

4. Within the last 5 years, in your SH&E employment, have you worked with new Baccalaureate grads of SH&E Programs?

☐ Within the last 5 years, in your SH&E employment, have you worked with new Baccalaureate grads of SH&E Programs? Yes

☐ No

5. With which industry types are you most experienced? (check all that apply)

- [ ] With which industry types are you most experienced? (check all that apply) Agriculture, Forestry
- [ ] Mining
- [ ] Utilities
- [ ] Construction
- [ ] Manufacturing
- [ ] Wholesale and Retail
- [ ] Transportation
- [ ] Information, Insurance and Finance
- [ ] Real Estate
- [ ] Professional, Scientific & Tech Services
- [ ] Waste Management
- [ ] Education Services
- [ ] Health Care
- [ ] Public Administration & Government

Other (please specify):

6. What is your age?

- ○ What is your age? < 25 Years
- ○ 26 - 29 Years
- ○ 30 - 34 Years
- ○ 35 - 39 Years
- ○ 40 - 44 Years
- ○ 45 - 49 Years
- ○ 50 - 54 Years
- ○ 55 - 59 Years
- ○ 60 - 64 Years
- ○ 65+ Years

7. What is your gender?

- Female
- Male

8. What is your ethnicity?

- Caucasian
- Hispanic/Latino
- Asian/Pacific
- African American
- Native American

Other (please specify):

9. What is your highest level of education?

- High School
- Some College
- Associate Degree
- Bachelor Degree
- Master Degree
- Juris Doctorate
- Doctorate

Other (please specify):

10. Please indicate all professional board certifications you have held in the last five years (check all that apply):

- Please indicate all professional board certifications you have held in the last five years (check all that apply): CSP
- CIH

- ☐ PE
- ☐ ARM
- ☐ CHMM
- ☐ CHSM

Other (please specify):

11. How many years of professional experience do you have?

- ○ How many years of professional experience do you have? 1-4
- ○ 5-9
- ○ 10-14
- ○ 15-20
- ○ 20+

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12. How did you receive an invitation to participate in this survey?

- ☐ From a colleague
- ☐ From the ASSE
- ☐ Other (please specify):

13. Comments:

End.

Appendix D: Pre-work for Joint Meeting

Education Standards Committee (ESC)
&
Framing the Profession Task Force (FPTF)

Joint Meeting Supplement

May 2, 2013 ASSE Office, Chicago

Wayne Hartz[1]

April 25, 2013

PRE-Joint Meeting work you will need to do:

- Estimated required time: 1 hour
- Read through survey question one results pages 7 – 20.
- As you read the survey results, make your own list of *evidence* that would demonstrate to you that a baccalaureate graduate is qualified to be employed as a safety professional. This list is for your eyes only and may be electronic, or whatever form you prefer.

Make sure to bring your list to the meeting!

Thank you all in advance for your cooperation and trust in me as we work toward developing learning-outcome based baccalaureate education standards. I am truly looking forward to our joint meeting on May 2nd and 3rd.

Do you have Questions??

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[1] Wayne Hartz, MSP, CSP, CSHM; Interim Dean Professional and Graduate Studies, Keene State College; Doctoral student, Ph.D. Leadership and Change Program, Antioch University. Contact information: 603-358-2943 whartz@keene.edu or whartz@antioch.edu Dissertation Chair: Dr. Jon Wergin, Professor, Antioch University, Leadership and Change Program. Contact information: jwergin@antioch.edu

I appreciate this is a lot of data and a unique research method. If you have questions you would like answered before the joint meeting, please let me know.

whartz@keene.edu or 603-358-2943

Question 1 was:

Imagine that you're looking over the portfolio of someone who is a baccalaureate-prepared safety professional. What kind of evidence would you want to see in a portfolio that would demonstrate competence (knowledge, skills and dispositions)?

Joint Meeting Goal

The purpose of this document is to provide you with what you need to prepare for the May 2nd portion of the joint meeting. The goal of the May 2nd meeting is twofold:

1) Identify by consensus a set of core academic areas (i.e., ergonomics, industrial hygiene, safety law and policy, etc.) that comprise a baccalaureate Safety Health and Environmental (SHE) degree.
2) Develop and agree on competencies (i.e., student learning outcomes) for each core academic area.

Critical to our work on May 2nd, is focusing on evidence (observable action or data) of student learning outcomes (what graduates should be able to think and do upon graduation).

Background

The goal of my doctoral research is to develop outcome based baccalaureate education standards for Safety, Health and Environmental (SHE) program graduates applicable to any college or university program. My research method uses a modified nominal group technique[2] or carefully orchestrated meeting proceeded by a survey of expert safety professionals (provided here) to serve as a prompt for preparation to our joint meeting, which I lead on May 2nd.

Survey of Expert Safety Professionals

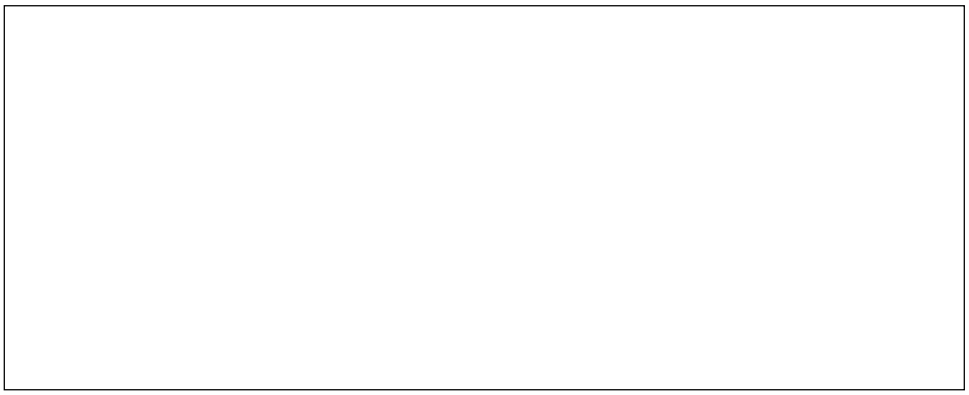
[2] Nominal Group Technique (NGT) "is an evaluation method that provides semi-quantitative, rank ordered feedback [from] a group of [participants contrary to] a focus group, [where] one or two vocal members who hold strong opinions can influence the group discussion to the exclusion of [others]… [with NGT] every participant has equal say in generating and rank ordering evaluation items" (Dobbie et al., 2004, p. 402).

During February 2013, the ASSE distributed a 13 question survey by email to a randomly selected set of 1,000 of the roughly 10,000 ASSE Professional Members. 58 completed the survey, satisfying the data requirements for this type of research method.[3]

The focus of the survey was to have experts flesh out competencies which they would expect to see in a portfolio of recent baccalaureate prepared SHE graduates. In addition, experts were asked for their definitions SHE workplace excellence, their activities defining engagement with the SHE profession as experts, select demographics, and an opportunity to add "comments." (A PDF of the blank survey is attached). Appendices 2.0 and 3.0 provide survey information.

Survey Question 1 results:

Results: 56 of 58 participants provided usable data.[4] This resulted in five pages (single spaced) of representative data which was imported into qualitative analysis software (NVivo 10) software which facilitated reading each participant's response and classifying the data which resulted in four primary categories and 30 secondary categories.



[3] 58 qualified survey participants meets qualitative research criteria to serve as a prompt to the modified or improved nominal group technique method. William M. Fox, (1989) "The Improved Nominal Group Technique (INGT)", Journal of Management Development, Vol. 8 Iss: 1, pp.20 – 27. Sage on-line, "The Method Chapter in a Qualitative Dissertation" (2008?). Dissertation Committee (Oct. 2012).

[4] SurveyMonkey settings were set to require a written answer to proceed with the survey. One participant entered an "h" and a second entered the word "test".

Table 2. Primary and Secondary[5] Categories. Secondary categories are words or phrases used by survey participants and provide greater detail.	**No. responses coded**
Evidence or examples of knowledge	465
• Practical application of knowledge	47
• Topics or courses described as related area e.g. HR or accounting	28
• Topics or courses are qualified by hi grades or accredited or transcript	20
• EHS topics or courses described as basic or core	124
• EHS topics or courses described as advanced	42
• Global or international knowledge	2
• Capstone	3
• Other preparation and examples (e.g. certifications)	48
• Communicator written and verbal	121
• Project manager	11
Evidence of values or attitudes	148
• Team player collaborator	30
• Professionalism	10
• Systems and change perspective	11
• Problem solver or critical thinker	23
• Motivated initiator	9
• Customer and or quality focused	6
• Facilitator	7
• Referrals or recommendations	8
• Leader	25
• Learner	19
Experience	122
• Volunteer extracurricular	39
• Internship or CO OP	81
Resume required not portfolio	6

Notes:

No. Responses: The number of times participant responses were counted in a particular node.

Name (Nodes): Terms or descriptions from participants serving as category titles for similar meaning responses.

Read survey question 1 results, pages 7 – 20, make your own list of *evidence* that would demonstrate to you that a baccalaureate graduate is qualified to be employed as a safety professional. This list is for your eyes only and may be electronic, or whatever form you prefer.

[5] Secondary category labels reflect words used by survey participants.

Optional: The balance of the survey is provided in Appendix A [in this document]. You may want to read through it to understand survey participant demographics in comparison to ASSE members.

Evidence or examples of knowledge; 465 (73%) mentioned the importance of:

Practical application of knowledge. 47 references coded. Representative samples:

1) Examples of applied processes/practices, such as a training program, a research project, poster sessions, or some other class project. References 10-11

2) It would be good to see evidence of carrying out specific safety programs or protocols such as chemical hygiene, MUTCD protocol, NFPA specific guidance, etc. References 18-19

3) Employers are looking for people who understand their business and how to incorporate their specific role into the greater good of the company. Reference 25 - 0.46% Coverage

4) Working knowledge of basic IH equipment: sampling pumps; calibrators; noise dosimeters

5) Ability to research federal regulations, read them and provide appropriate interpretations Reference 31

6) Thorough understanding of behavior-based safety (theory and practice)

7) Ability to conduct simple root cause incident investigations; basic knowledge of photographic documentation of an incident scene Reference 33 -

8) Assuming they have a degree and no post graduate experience - I would want course work with some hands on application in developing a safety process Reference 34 -

9) The individual would have a broad background in safety, health and environmental subjects with the ability to apply this knowledge to a broad range of applications. References 42-44 -

10) Was there a safety internship option or a class such as special projects that the person was able to apply their classroom learnings? Reference 45 -

11) If there were such a class was there time devoted to discussing how applicable the course(s) is/is not to their work experience Reference 46

12) A strong base in systems management and the ability to speak credibly on what this means Reference 47

Topics or courses described as related area e.g. HR or accounting. 28 references coded

Representative samples:

1) Workers comp/business law Reference 1 -

2) I would also prefer to see a basic level of business knowledge including HR, accounting/finance and management. References 3-5 -

3) Financial-business language, influencing skills, risk management, sustainability and other soft skill courses [communications, etc.]. Reference 8

4) Course work that included business insurance including workers compensation insurance and general liability insurance. Reference 13

5) Safety professionals should not only understand how to do their job but why their position exists within their company. Employers are looking for people who understand their business and how to incorporate their specific role into the greater good of the company. Reference 14

6) More direct inclusion of financial mechanisms to evaluate loss impact and develop metrics for including safety into business plans. - Insurance law and coverage analysis as they affect risk transfer and financing options - Liability risk that covers contractual law, common law, and introduces various legal doctrines per jurisdiction that impacts business models and climate. - Crisis management practices both in planning phases and delivery as they affect supply chain players and business continuity preparations for returning to "normalcy." - Food safety curriculum directed at FSMA changes, as well as basic micro-biological and chemical characteristics of foodborne illness prevention, food defense, and overall food safety GMPs. References 16-17

7) I would favor a broad exposure to the sciences—chemistry, biology/ physiology, physics. Reference 24 -

8) Examples of budget experience generally and specific to the safety program relationship to profit. Reference 25

9) Along with basic teaching and human relations skills. Reference 26 –

10) Computer skills in data management & effective presentations. Reference 28 -

Topics or courses are qualified by hi grades or accredited or transcript. 20 references coded Representative samples:

1) Transcript including a course catalog description of each class. Reference 2 -

2) Ability to identify industry standards such as ANSI for specific processes Knowledge of traditional safety topics such as metrics, accident investigation, hazard ID, risk assessment and prioritization, international health and safety regulations, industrial hygiene monitoring, ergonomic assessments, JHAs etc. Reference 3

3) Hazard Risk Analysis Training Reference 4

4) Graduation from an ABET-accredited college or university in addition to university regional accreditation. References 5-6

5) Knowledge of human health characteristics and how to measure health status. Reference 7 -
6) Which college the person went to - accredited or not. References 8-9

7) Graduation from an approved B.S. program in safety or closely related field with high marks in all core requirements. References 10-11

8) Grades should be in the 2.75 - 3.5 range. References 13-14

9) Hazwopper 24-40 hour certification. Certification as competent person for Fall Protection, Trenching, etc Reference 15

10) What courses besides those in their degree program did they take and what grades did they achieve in these courses. Specifically, how many years and what levels of math, chemistry, speech, English, computer, psychology and photography. Reference 19 -

11) Grades if B or better in most of these courses Safety Industrial Hygiene Ergonomics Economics Chemistry Business Administration Industrial Engineering TECHNICAL writing - not just English 101 Biology - Human systems Building Sciences - Basics of fire systems, electrical, mechanical Sustainability/Renewable Engineering Environmental Engineering - with focus on various environmental and safety regulations like CERCLA, HazComm, Right to Know, etc. Safety and Environmental Law - Introduction to the regs and liabilities. Reference 20 -

EHS topics or courses described as basic or core. 124 references coded.

Representative samples:

Examples of participant comments:
1) Fire protection education, fleet safety/DOT, chemistry, Hazcom/chemical safety, Industrial hygiene, incident analysis, OSHA training/class, Workers comp/business law. References 1-5

2) Ability to identify industry standards such as ANSI for specific processes Knowledge of traditional safety topics such as metrics, accident investigation, hazard ID, risk assessment and prioritization, international health and safety regulations, industrial hygiene monitoring, ergonomic assessments, JHAs, etc. Knowledge of business operations. References 6-9 -

3) Emergency Preparedness Training (e.g., Hazwhopper, incident command, EMT, etc.) 3. Confined Space Training. 4. Scaffold Training. 5. Hazard Risk Analysis Training. References 20-26 -

4) Examples of work (sanitized to remove all reference to a specific company or person) including such things as accident investigations, industrial hygiene reports, facility and worker behavior audits, risk assessments, training programs, policies. Reference 31 -

5) Calculus Statistics Inorganic Chemistry Organic Chemistry Biology and human anatomy as related to IH toxicology and ergonomics Physiology and anthropometrics Mechanics Physics Applied Ergonomics - measurement tools applied to live workstations Industrial Hygiene Sampling Methods - noise, vapor, fume/ particulate, Toxicology & epidemiology - routes of exposure, acute vs chronic, target organs, LD50, interpret MSDS Safety - 1910 & 1926 Robotics standard and perform risk assessment Manufacturing processes JHA/ Risk Assessment Machine guarding Electrical safety and arc flash. References 42-49 -

6) Technical knowledge and skills. References 55-56 -

7) Hazwopper 24-40 hour certification. Certification as competent person for Fall Protection, Trenching, etc. If still available - completion of OSHA voluntary compliance. OSHA construction safety 30-40 hour classes. Basic training on Confined Spaces, direct reading, and IH sampling equipment. References 57-58 -

8) I would like to see graduating safety professionals to have a robust “core” curriculum courses to prepare these individuals for a broad scope job. These courses would include both fundamental technical [environmental, ergonomics, health/industrial hygiene and safety], financial-business language, influencing skills, risk management, sustainability and other soft skill courses [communications, etc.]. References 60-63 -

9) Courses covering main safety topics and industrial hygiene, workers compensation, and management systems. References 64-66 -

10) For an EHS position right out of college/university: I would look for evidence of the following: - Chemistry I - Anatomy and Physiology I and II - General physics - Fundamentals of Environmental Science or Ecology - Technical writing - Mathematics up to Statistics and Probability (minimum) - Occupational Safety and Health Concepts, construction and general industry - Risk Management - Ergonomics and Time Study - Fundamentals of Industrial Hygiene - Basic Toxicology - Intro to Fire Science - Public Speaking - Project Management - a nice to have - A basic course in Engineering Concepts - Business related coursework in Microeconomics, business management, legal environment of business. References 72-76 -

EHS topics or courses described as advanced. 42 references coded. Representative samples:

1) Characteristic of the SH&E profession such as: - economic analysis or evaluation of an intervention program (specifically cost benefit, NPV or cost effectiveness analysis) - epidemiological principles in tracking and evaluating changes in health status - working in teams and with clients. References 6-8

2) Calculus Statistics Inorganic Chemistry Organic Chemistry Biology and human anatomy as related to IH toxicology and ergonomics Physiology and anthropometrics Mechanics Reference 14

3) I am looking for a balanced course of study that spans Science, Engineering, Technology and Math as well as Psychology (behavioral, organizational)/Sociology, Business Management and Communications. Reference 18

4) Sciences-Physics, chemistry, biology Statistics High level math Psychology Behaviorism Business courses Business math (ROI) Training/teaching experience Computer skills Extensive understanding of HSE theories/authors. References 27-29 –

5) Ergonomic, leadership/management. Reference 38

6) Human systems Building Sciences - Basics of fire systems, electrical, mechanical Sustainability/Renewable Engineering Environmental Engineering - with focus on various environmental and safety regulations Reference 40

7) Strong base in systems management. Reference 41

8) An indication that course work went far beyond compliance topics and introduced them to bigger thinking concepts. Reference 42

Global or international knowledge . 1 reference coded

1) evolution of international and national standards bodies, and how they affect workplace and product safety. Reference 1 -

Capstone § 3 references coded

1) evolution of international and national standards bodies, and how they affect workplace and product safety. Reference 1

2) senior capstones Reference 1

3) .....this work could have been generated as part of an internship or senior capstone project Reference 2

4) class such as special projects that the person was able to apply their classroom learnings. Reference 3

Other preparation and examples (e.g., certifications). 48 references coded.

Representative samples:

1) Strong organizational and time management skills. Reference 7

2) Certification as competent person for Fall Protection, Trenching. Reference 9

3) Completion of OSHA voluntary compliance. OSHA construction safety 30-40 hour classes. Reference 10

4) Case studies and papers written from real world scenarios of today's challenges. Reference 25

5) Analysis of key differences, background of each, and evolution of international and national standards bodies, and how they affect workplace and product safety. Reference 26 -

6) What courses besides those in their degree program did they take and what grades did they achieve in these courses. Specifically, how many years and what levels of math, chemistry, speech, English, computer, psychology and photography. Reference 35

7) Broad exposure to the sciences -- chemistry, biology/ physiology, physics. Reference 38

8) Variety of job challenges explained and resolution methods indicated Reference 41

9) Coverage course work went far beyond compliance topics and introduced them to bigger thinking concepts. Reference 47

10) Computer skills in data management & effective presentations. Reference 48

Communicator written and verbal. 121 references coded Representative samples:

1) Reports written. Technical correspondence. Policies developed. Project write ups. Email correspondence. References 2-9 -

2) Examples of work (sanitized to remove all reference to a specific company or person) including such things as accident investigations, industrial hygiene reports, facility and worker behavior audits, risk assessments, training programs, policies, correspondence demonstrating written communication skills. References 22-23 -

3) I would expect to find 1) written samples of the student's work related to key areas of safety. That might include all or part of written safety programs, either to meet regulatory requirements, or to meet some organization's expectations.....this work could have been generated as part of an internship or senior capstone project. References 35-39 -

4) Papers, presentations, projects... basically evidence of problem solving ability, ability to communicate effectively. References 44-47

5) A description of EH&S related class projects that the individual may have involved with (i.e., internships, papers, etc.). References 51-52

6) Create a business case for change and sell an idea to leadership. Reference 62

7) Or certainly case studies and papers written from real world scenarios of today's challenges. Reference 70 -

8) Publications/presentations. References 73-74

9) Gave a safety talk, what was the feedback from the members of the audience. Reference 75

10) Report writing skill - professional; proper grammar and sentence syntax; thorough; accurate; brief 2. Ability to develop a presentation using PowerPoint and present that information without reading the slides (demonstrate this by providing notes in the Notes portion of slides that show the nature of the presentation) 3. Ability to train by using stories and not non-memorable facts and figures I would want course work with some hands on application in developing a safety process;

Project manager. 11 references coded Representative samples:

1) Knowledge of business operations. Reference 1 -

2) Business social skills Excellent computer skills including advanced use of Excel. Reference 2

3) Experience in project management in a complex environment. References 3-5 -

4) Strong organizational and time management skills. References 6-7 -

5) Projects completed. Reference 8 -

6) Project Management. Reference 9 -

7) Examples of budget experience generally and specific to the Safety program relationship to profit. Reference 10 -

8) Attention to details. Reference 11

Evidence of values or attitudes 148 responses (24%) mentioned the importance of:

Team Player or collaborator. 30 references coded Representative samples:

1) Strong work ethic Expectation of advancement in the field and certification thru personal effort and drive Collaboration with other SH&E disciplines and business personnel. References 1-2

2) Evidence of partnerships forged to achieve items listed above. References 14-16 -

3) No one reduces their incident rate at a company by 50% by themselves. Reference 17 -

4) Even evidence of leadership and/or teamwork. References 18-19

5) Experience with Teams Collaboration. References 23-25

6) A desire to help others succeed. Reference 26

7) Examples of achieving goals when working on a team. References 28-30 -

Professionalism § 10 references coded Representative samples:

1) Business social skills. Reference 1 -

2) Professional dress and demeanor. References 2-3

3) Projects completed. Reference 4

4) Ethics. Reference 5

5) Good situational awareness. Reference 6

6) Understanding that the safety profession is not an 8-hour a day job and that watching the clock sends a bad message. Reference 7

7) An understanding of what it means to be prepared - for a presentation; for a field trip; for an inspection; etc. Reference 8

8) Demonstrate a predilection toward accuracy and thoroughness Reference 9

9) Evidence of contributions to the Safety Profession with certifications, presentations, submitted papers etc. Reference 10

Systems and change perspective. 11 references coded. Representative samples:

1) As well as continuous improvement process skills. Reference 1

2) Champions change. References 2-3

3) Management systems. Reference 4

4) Safety professionals should not only understand how to do their job but why their position exists within their company. Reference 8

5) Such a class was there time devoted to discussing how applicable the course(s) is/is not to their work experience. Reference 9

6) A strong base in systems management and the ability to speak credibly on what this means. An indication that course work went far beyond compliance topics and introduced them to bigger thinking concepts. References 10-11

Problem solver or critical thinker. 23 references coded Representative samples:

1) I would look for evidence of problem solving ability related to the safety profession utilizing state-of-the-art concepts and theory. References 1-3

2) Writing that was efficient and well organized. I would want to see evidence-based arguments or safety presentations that were persuasive. Reference 4

3) Critical thinking/problem solving skills. References 5-7

4) Samples of research work conducted as part of course work. Reference 8

5) Problem solving skills, as well as continuous improvement process skills. References 9-11

6) Thinks strategically. Reference 12

7) Papers, presentations, projects... basically evidence of problem solving ability. References 13-14

8) Critical thinking skills. References 15-19

9) Problem Solving. References 20-22

10) Ability to see challenges/opportunities and choose the best options to address. Reference 23

Motivated - initiator. 9 references coded Representative samples:

1) Strong work ethic. Reference 1

2) Other activities - clubs, organizations - leadership positions, initiative taking. Reference 2

3) Champions change. Reference 3

4) Goals and general potential experience. Reference 4

5) Self-motivated, self-starter. References 5-6

6) Examples of self-motivation. References 7-8

7) Understanding that the safety profession is not an 8-hour a day job and that watching the clock sends a bad message. Reference 9

Customer and or quality focused. 6 references coded

1) Other work experience - demonstration of leadership, communications, customer service. Reference 1

2) As well as continuous improvement process skills. Reference 2

3) Builds relationships. Reference 3

4) Employers are looking for people who understand their business and how to incorporate their specific role into the greater good of the company. Reference 4

5) An understanding of what it means to be prepared - for a presentation; for a field trip; for an inspection; etc. Reference 5

6) Demonstrate a predilection toward accuracy and thoroughness. Reference 6

Facilitator. 7 references coded Representative samples:

1) Excellent written and verbal communication skills. Reference 1 –
2) Some presentation skills that could be further developed. Reference 2
3) I would want to see what kind of experience he or she had in leading a safety meeting. Reference 3
4) Ability to train by using stories and not non-memorable facts and figures. References 4-5
5) Individual counseling and recommended practices. Reference 6
6) Basic teaching. Reference 7

Referrals or recommendations. 8 references coded Representative samples:

1) If safety professional is more experienced, they should demonstrate results in current / previous SH&E positions. Reference 1 -
2) Letters of recommendation. References 2-3
3) RECOMMENDATIONS Would like to see a letter of recommendation from previous employer, peer advisor, college advisor. References 4-5
4) . If they gave a safety talk, what was the feedback from the members of the audience. Reference 6
5) Referrals from previous jobs. References 7-8

Leader. 25 references coded Representative samples:

1) Other work experience - demonstration of leadership, communications, customer service. Reference 2
2) Leadership positions Reference 3
3) Drives results. References 4-5
4) Leadership positions held. References 9-11

5) and possibly even evidence of leadership and/or teamwork. References 12-14

6) Supervisory experience. References 15-17

7) I would want to see what kind of experience he or she had in leading a safety meeting. References 18-19

8) Leadership/management. References 20-21

9) A demonstration of leadership skills....i.e. leading a fundraiser, an officer in a club. References 22-24 -

10) Human relations skills. Reference 25

Learner. 19 references coded Representative samples:

1) High marks in all core requirements. Reference 1

2) Good situational awareness. References 2-3

3) Ability to see challenges/opportunities and choose the best options to address them. References 5-6

4) Examples of self-motivation, a desire to help others succeed. Reference 7

5) Interested in gathering knowledge. References 8-10

6) Awareness of regulations and ability to research new areas they don't yet have experience in. References 11-12

7) Continuing education. References 13-14

8) Course work with some hands on application in developing a safety process. Reference 16 -
9) Solid understanding of culture. Reference 17

10) Examples of failures either personally or organizationally and how they were overcome. Reference 18

11) Attention to details. Reference 19

Experience. 122 responses (20%) mentioned the importance of:

Volunteer and extracurricular. 39 references coded Representative samples:

1) work and volunteer experiences, and involvement in extracurricular activities. References 1-3

2) Field Experience (i.e. internship, volunteer work, trade work in industry). References 6-7 –

3) Which college the person went to - accredited or not Work experience - anything safety and/or environmentally related. Reference 8

4) Other work experience - demonstration of leadership, communications, customer service. Reference 9

5) Other activities - clubs, organizations - leadership positions, initiative taking. References 10-11

6) Graduation from an approved B.S. program in safety or closely related field. Reference 12

7) Leadership positions held. Volunteer work completed/led. References 13-15

8) Like to see volunteerism. References 16-18

9) Goals and general potential experience. Reference 20

10) Developmental years full of variety, such as sports, summer jobs, volunteer work, etc. References 27-28

11) Wide area of 'experiences', if possible multiple fields (not all in safety). References 30-31

12) Experience Publications/presentations. References 32-33

13) Leading a fundraiser, an officer in a club. Reference 34

14) Adaptability & accountability - a broad-based life experience, whether professional or personal, particularly where there is some responsibility tied to the experience. Reference 39

Experience: Internship or CO-OP. 81 references coded Representative samples:

1) Practical application experience (internship/co-op/safety-related work). References 1-3 -

2) It is important that some experience is brought to the table. Gaining a degree is not enough. Internships, cooperative education, volunteerism should be a part of their development. References 6-8 -

3) Field Experience (i.e. internship, volunteer work, tradework in industry). References 9-10 -

4) Examples of work …including such things as accident investigations, industrial hygiene reports, facility and worker behavior audits, risk assessments, training programs, policies, correspondence demonstrating written communication skills. Reference 14 -

5) A description of EH&S related class projects that the individual may have involved with (i.e., internships, papers, etc.). References 39-40

6) Successful completion of an internship or Co-op program where the candidate can demonstrate that they were able to do the following: - Identify hazards - Quantify risk - Create a business case for change and sell an idea to leadership. References 41-43 -

7) Would love to see practical application through internships or certainly case studies and papers written from real world scenarios of today's challenges. References 51-52 -

8) Something that Internship/work for at least 3 - 6 months. in related field - doing something meaningful. Examples: internship with mining company helping with IH monitoring, PPE, etc.; Job shadowing experiences working with construction company shadowing their safety officer. Working for a state DOT getting construction experience and experience with highway safety requirements. References 74-76

9) Was there a safety internship option or a class such as special projects that the person was able to apply their classroom learnings References 77-79

10) Adaptability & accountability - a broad-based life experience, whether professional or personal, particularly where there is some responsibility tied to the experience. References 80-81

Resume required not a portfolio; 6 references coded said: Representative samples:

1) If safety professional is more experienced, they should demonstrate results in current / previous SH&E positions. Reference 1 -

2) I don't have time to look over a portfolio. I want a short resume and I will determine knowledge, skill and disposition if I choose to interview a candidate. References 2-4 -

3) Let me start by stating the fact that they have a BS doesn't mean they are "prepared" Safety Professional--nor would it demonstrate competence unless there were some pertinent employment experience. Things I look for in a employment app are the following: • Do they have a "professional" grade resume? References 5-6

Appendix 1.0 Questions 2 - 13

Question 2 Within the last five years…have you worked with new grads?

Within the last 5 years, in your Safety, Health and Environmental (SH&E) employment, have you worked with new Baccalaureate grads of SH&E Programs?		
Answer Options	**Response Percent**	**Response Count**
Yes	73.7%	42
No	26.3%	15
	answered question	**57**
	skipped question	**1**

Question 3 What describes your professional activities…

Please check each box that describes your professional Safety, Health and Environmental (SH&E) activities in the last 5 years:		
Answer Options	**Response Percent**	**Response Count**
You have continued your Professional Membership with the ASSE.	100.0%	55
You have hired, led, managed or supervised at a facility or job site identified as having demonstrated excellence in the SH&E field.	60.0%	33
The facility or job site in which you were employed was identified as having demonstrated excellence in the SH&E field.	58.2%	32
You have served on a SH&E national committee, task force, board or council.	32.7%	18
You have mentored SH&E baccalaureate degree program interns for 15 weeks or more.	27.3%	15
You have authored in two field applicable, peer reviewed journals or other literature (e.g., text books, chapters, white papers, policy papers, etc.).	23.6%	13
You have served as SH&E adjunct faculty.	21.8%	12
You have served as an advisory committee member of SH&E baccalaureate degree program.	16.4%	9
You have served as SH&E full-time faculty.	16.4%	9
You have served as an advisory committee member of an ABET or ATMAE accredited baccalaureate degree program.	9.1%	5
	answered question	**55**

	skipped question	**3**

You have participated in other professional activities (please explain):	21

Number	**You have participated in other professional activities (please explain):**
1	Mentored interns but not for 15 weeks
2	Attended and spoke at local, regional, national SH&E conferences and National ERM conferences
3	ASSE Board of Directors
4	CDC/NIOSH task forces, ABET board member, NIOSH board of scientific counselors, federal grant review teams, NORA reviewer
5	Course Development for Fleet Safety Course in approved B.S. program.
6	Currently lead a team of safety & health professionals to construct and launch a new auto manufacturing facility
7	Was on a team for writing questions for BCSP certification testing
8	Continued professional development activities and produced presentations for education of others.
9	Regional and Local Chapter PDC volunteer
10	Served as a local chapter treasurer for three years with ASSE. Served as local section president for one year with AIHA.
11	Currently serving as Chair, AIHA-Minority Special Interest Group; awarded 2012 AIHA Fellow Award; 2011 Round Table Speaker/2012 RT Moderator at AIHC&Es
12	Board member for Granite state Chapter of ASSE and Safety and health council of Northern New England
13	System Safety Organization member, NFPA member.
14	Member of NFPA, SME, ASSE; ANSI B11.2 re-write committee, chair PCIAA GL committee
15	Chair a graduate-level external advisory board for an ABET OHS program; member of an advisory board for a graduate-level IH program; Review / edit 70-100 articles submitted to Professional Safety per year
16	Scaffold Industry Association
17	Presenter at the Behavior Based national conference in Reno NV and Florida
18	Stakeholder team for state governmental rewrite of safety standards, global auditing, training EHS staffs on their role in capital expenditure requests
19	Speaker at ACGIH 2012
20	Environmental Engineer; Safety Committees; assist regular site Safety Manager; Safety trainer and mentor.
21	Supported facility SHE personnel at 17 locations in the Southern Western Hemisphere. Assist them and management w/implementation of an HSEMS.

Question 4…please explain the key processes resulting in excellence…

If you have hired, led, managed or supervised at a facility or job site identified as having demonstrated excellence in the SH&E field, please explain the key processes resulting in "excellence" at the facility or job site:

Participants provided 38 usable comments coded into seven nodes:

1) **Continuous Improvement Process.** 22 references coded [23.81% Coverage]

   a) Process safety management. Reference 1

   b) Behavioral based safety programs; Continuous improvement culture. Senior Management participation in Safety Observation Tours (SOTs); behavior based safety program, employee involvement, management and union commitment. Application of behavior-based safety and behavioral ergonomics; use of facility-specific health and safety plan to reduce and prevent injuries; emphasis on injury prevention and injury management when such things occur; promote teamwork and open communication among all levels of employees. Safety teams comprised of operations personnel who are involved in problem-solving and continuous improvement initiatives. Reference 2 - 5, 10, 16

   c) The key process that have resulted in excellence at my worksite include: routine inspections/audits, frequent training and safety meetings, adequate reporting of hazardous conditions and/or accidents, risk assessment/job hazard analysis, and ensuring our written programs are specific to our worksite. Management Systems. HSE Integration. LEAN Principles. Reference 11 – 14

   d) Putting a lot of upfront effort in identifying risks and how to take compensating measures to reduce those risks to an acceptable level. incorporating continuous improvement in management systems. Reference 17, 18

   e) An experienced workforce with adequate training and materials seems to be working. There are no fancy programs at this time just diligence and the reward of keeping our contract. Worker safety performance improvement as a result of "worker-to-Safety Professional" interaction at the field level. Reference 19, 20

   f) A well-defined safety management system that provides clarity through specific expectations to all layers/departments of the company in terms of their roles in meeting targeted leading metrics. Genuine communication with employees, which requires active listening and consistency. Reference 22

2) **Recognition such as VPP-Health-Insurance-ISO-OHSAS**. 16 references coded [22.68% Coverage]

   a) Safety Management Systems as identified by 6 VPP Stars in 5 years Awards in the Wellness field. We had a voluntary protection program due to supervisors doing what they were supposed to do. OSHA did not need to make regular safety inspections at our facility, as it had an overall, excellent safety record. SHARP Site. Reference 1 - 3, 11, 16

   b) Sites are externally-certified to ISO 14001 / OHSAS 18001, OHSAS 18000 certification R&D site to be the first US-based ISO 14001 and OHSAS 18001 certified. Reference 5, 8, 9

c) Been recognized as a Top 10% employee for several years as Manager of a Loss Control/Safety team. Reference 12

d) We use a number of ways to examine and bring customers into the 'excellence' category, beginning with cutting edge tools as AOSE (architecture of safety excellence) audit methods, and SPEAR (safety plan evaluation and rating) audit. Each are trademarked processes and SPEAR is a peer reviewed validation project. Reference 13 –

e) Approximately 100 workers worked over 2 years without a lost-time or reportable injury. Work was at a nuclear D&D site, perhaps one of the most hazard prone jobs or occupations. My current site has a perfect record of 1610 days without a loss time to include our employees as well as our subcontractors. Reference 14, 15

3) **Not working in place of excellence or unsure**. 5 references coded [8.86% Coverage]

a) Not working in an environment of excellence. Trying to move an organization in that direction. Reference 1

b) I managed SH&E function for the US operations of an international building products producer. Unfortunately, the organization measured safety using only traditional metrics....that of LTI incident rates, and injury incident rates. Reference 2 -

c) My facilities closed to financial and I am now doing consulting on my own. Where I am working needs a lot of help. Reference 3

d) Unsure; I did not; however. Reference 4 - 5

4) **Accountability and or management systems**. 9 references coded [10.95% Coverage]

a) SH&E included in business risk reviews; SH&E senior most position in organization reports to President / CEO; Front line employee engagement coupled with leadership support at all levels, with appropriate resources provided (in both staff and finances). Reference 1 - 3

b) Employee involvement, Employee empowerment, Excellent Hazard Analysis education/training, Not overly complicated procedures, Auditing process to verify that you "say what you do and do what you say"; Ongoing inspection programs at multiple levels; Accountability; Employee involvement; Clear and understandable performance standards, training and conformance auditing; Management involvement in the HSE management system. Management actively involved and knowledgeable about the system, how it functions, responsibilities, and accountability; Developing an HSE group that works as part of the operations team achieving goals, but does not compromise safety. Reference 4 – 9

5) **Leadership; choosing best vs. good, people development**. 7 references coded [8.50% Coverage]

   a) The better sites will have good participation of many on site (however politics can create a better image than is may actually exist). A leader that understands and is knowledgeable of specific risks associated with the work is imperative and separates the best from the 'good'. Reference 1

   b) A key process was keeping focused, persistence and perseverance with continuous influencing meetings with all management levels, HSE as a value. management leadership and commitment. Reference 2, 3, 7

   c) Ability to collaborate/partner with others to creatively identify solution paths that meets needs of all stakeholders. Reference 4

   d) Upper management support & an experienced staff of OHS professionals. Reference 5

   e) The HSE manager being a good mentor and coach to his boss and peer managers. Reference 6

6) **Professional EHS staff development** 5 references coded [2.95% Coverage]

   a) 5 CSPs in the last 2 years, 4 COHNs in same timeframe, 1 OHST, and 3 onsite vendors with COHN. Technical competence and professionalism of staff members. an experienced staff of OHS professionals. adequate EHS staff. Reference 1 - 4

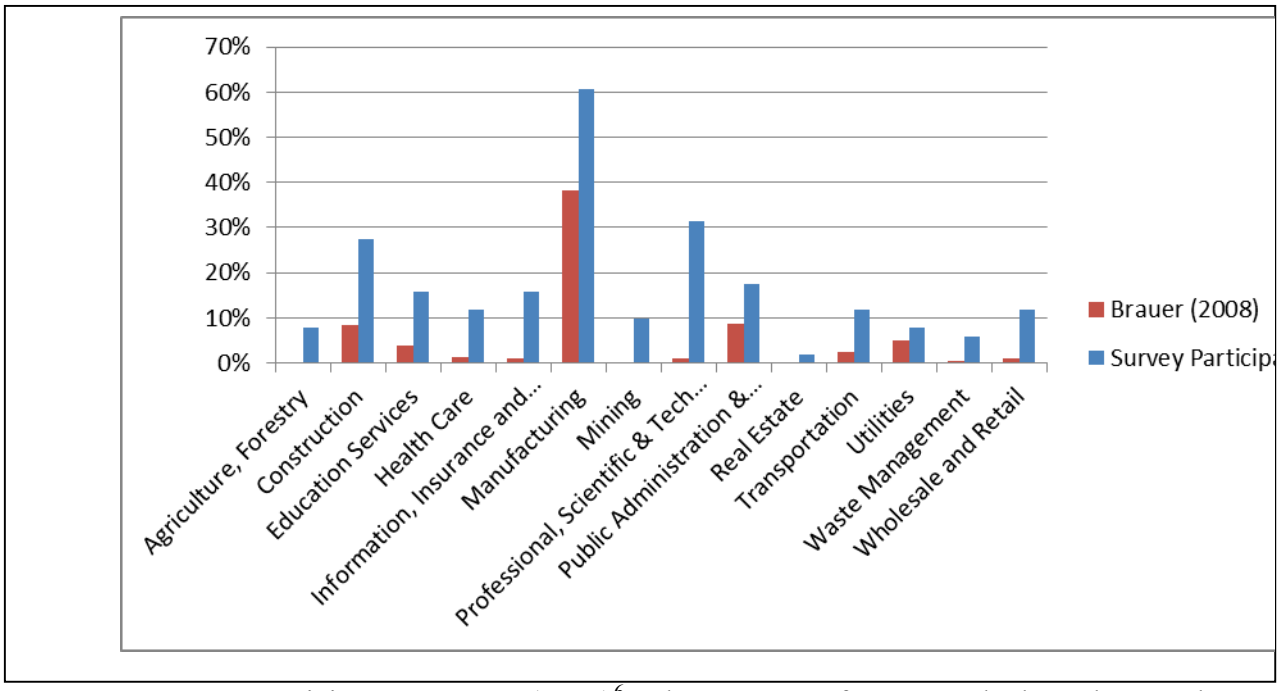
   b) A program of continuing education for supervisors and technical personnel. Reference 5

7) **Mentor other companies**. 2 references coded [1.56% Coverage]

   a) Mentor other companies in safety management systems, occupational health and wellness Asked to speak at national conferences regularly due the breadth of programming and results. Reference 1

   b) My role involves mentoring our field staff to help them implement these tools (and many others) at our customer's sites to achieve that 'excellence'. Reference 2

Question 5 With which industry types are you most experienced? (check all that apply).



Compares survey participant to Brauer (2008)[6] Salary Survey of CSP's and where they work.

Question 6 What is your age?

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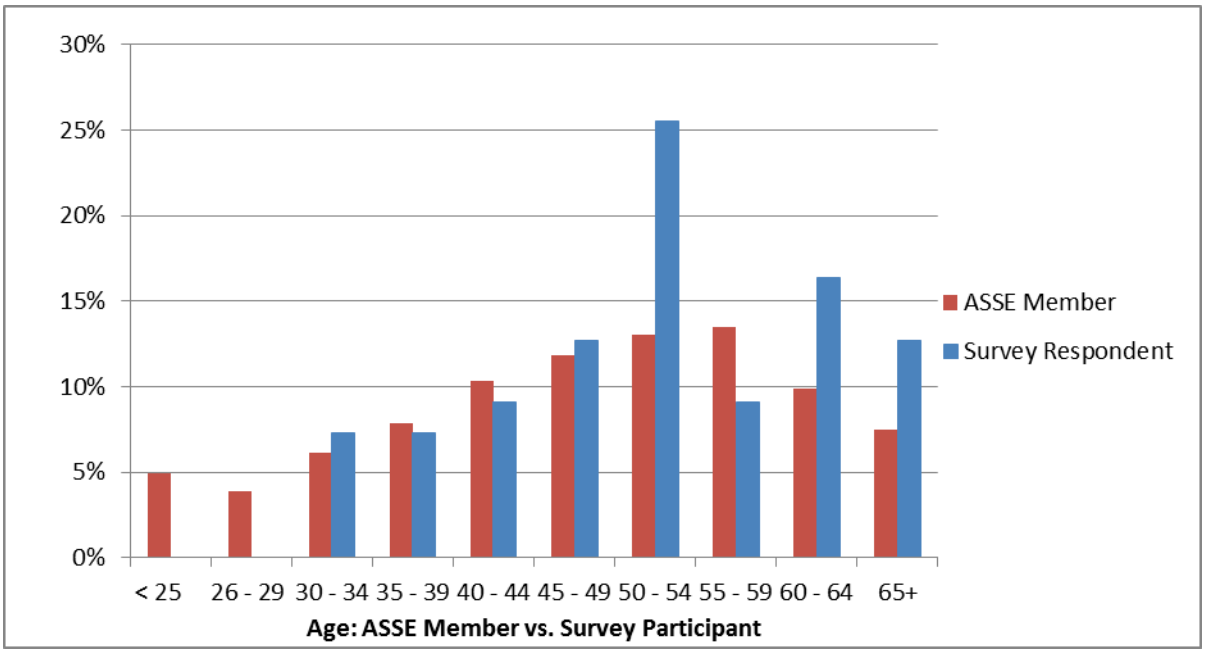
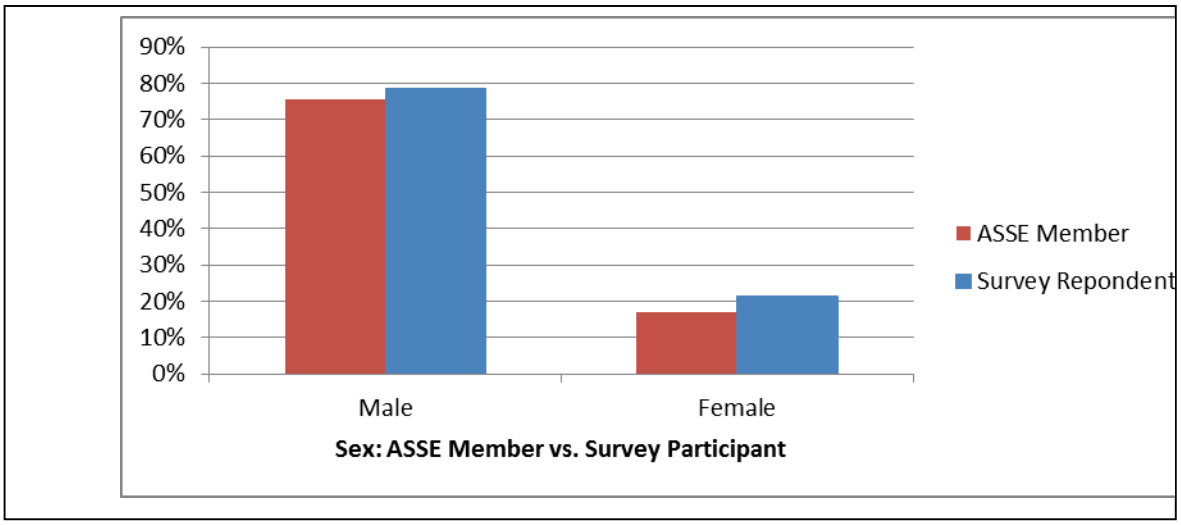
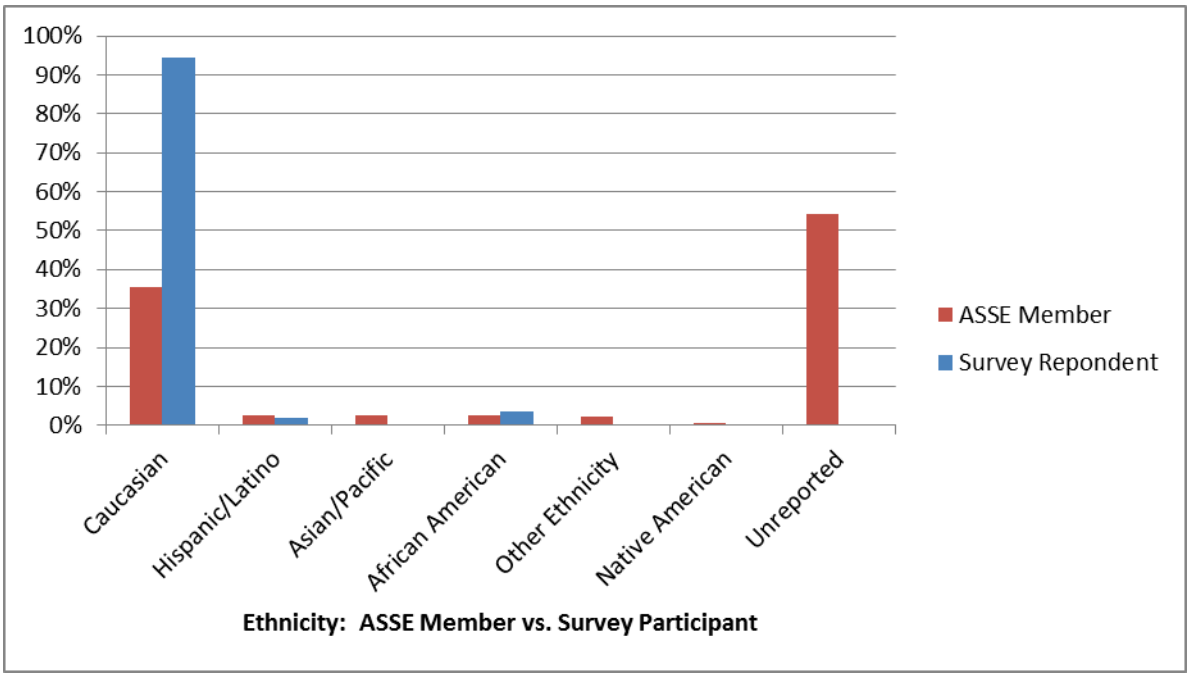
[6] Brauer, R. Career Success: Lessons Learned from a New CSP Salary and Demographic Survey, (2008), http://www.bcsp.org/pdf/PresentationsArticles/Session551.pdf.



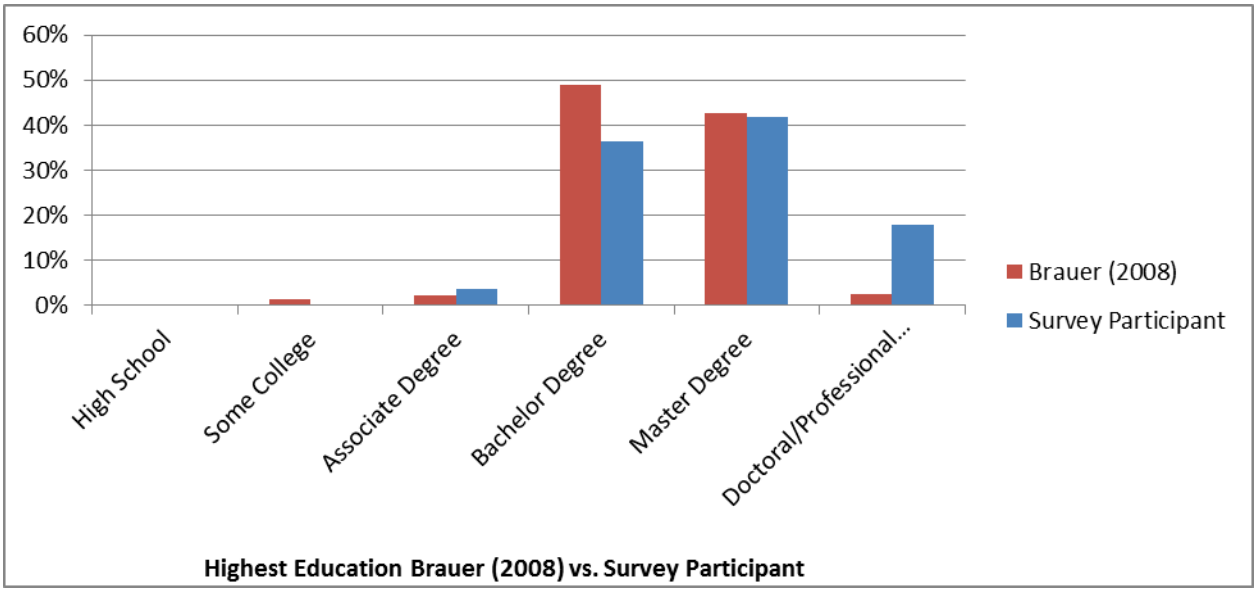
Question 7 What is your gender



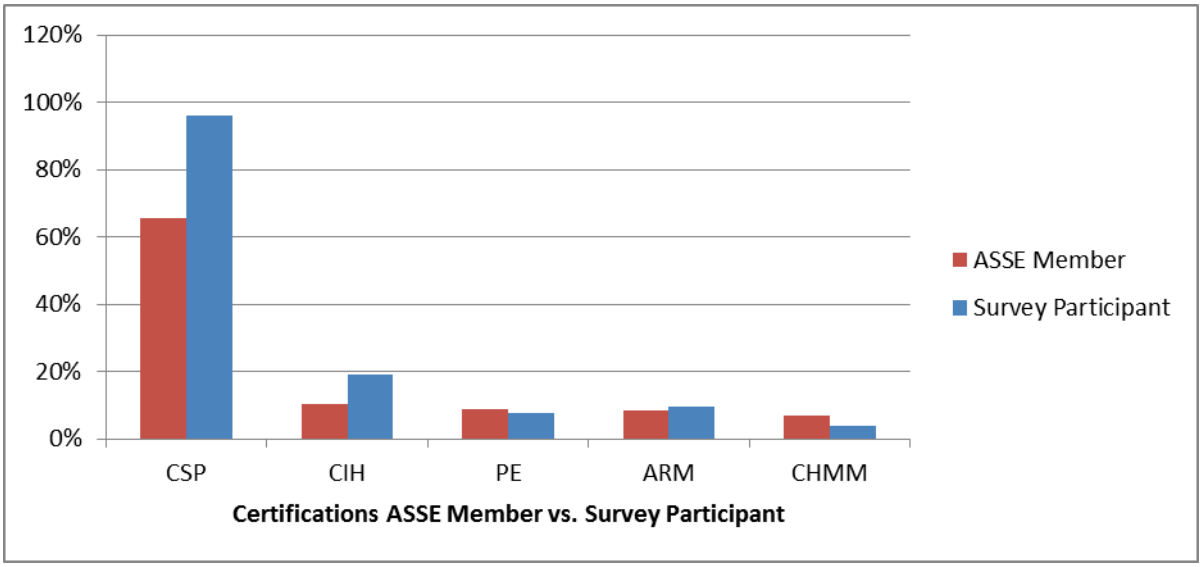
Question 8 What is your ethnicity?



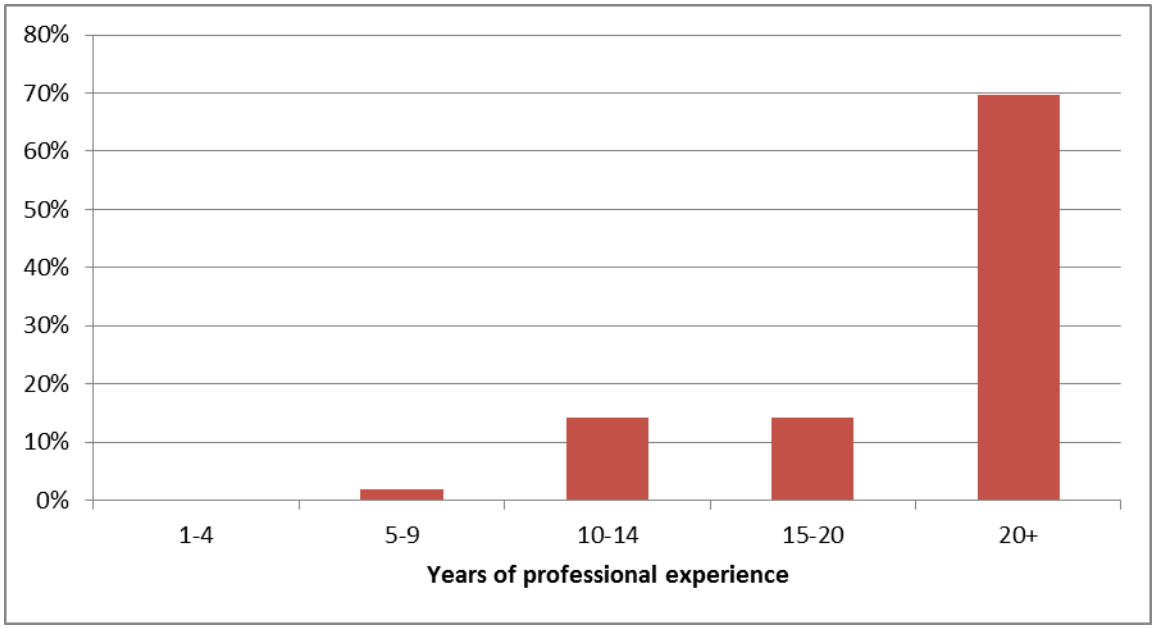
Question 9 What is your highest level of Education?



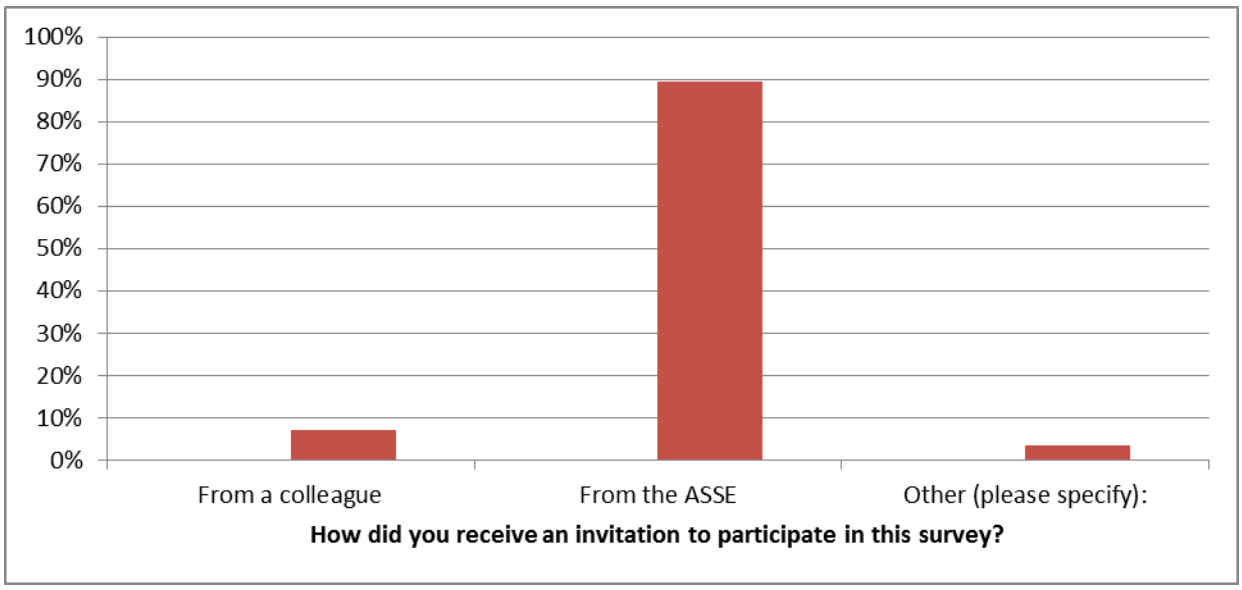
Question 10 Please indicate all professional board certifications you have held in the last five years (check all that apply):



Question 11 How many years of professional experience do you have?



Question 12 How did you receive…the survey?



Two Other (please specify): email from Wayne Hartz, Via email.

Question 13 Comments (raw data):

Comments:	
Answer Options	**Response Count**
	23
answered question	**23**
skipped question	**35**

1	Wayne, good luck with your dissertation!
2	Good luck
3	The Framing the [Safety] Profession Task Force, Educational Standards Committee, Council on Professional Affairs and ASSE Board of Directors must be key "drivers" to promote and advance the SH&E profession.
4	Well done! Good luck! It's important to keep the portfolio tied to outcomes and to look for ways to distinguish between undergraduate education and graduate education in terms of learning level. Will you also develop a model curriculum?
5	None at this time.
6	I believe in the program that I am currently associated with and in their curriculum. Most hiring managers who are interested in hiring a person holding a B.S. degree (at least in the insurance industry) prefer the person to have graduated from an approved program with specific requirements and to be able to express themselves sufficiently.
7	I truly feel that we need to bring younger candidates into the safety and health profession. We need to reach out to keep this industry growing. The problem is a lot of the BS programs and MS programs are not

	sponsored at the universities. We need to expand the programs and increase internship plus going to schools to spark interest in the youth.
8	I have oversaw and mentored Baccalaureate and Masters Safety and Industrial Hygiene interns for the past 15 years from numerous programs. Our company went on to hire 6 of them as permanent employees throughout the nation. Two more earned their professional certification. All had the necessary technical skills, but some were not suited for the petrochemical industry. The new interns and graduates have a lot more knowledge, drive, and enthusiasm than when I graduated.
9	None at this time.
10	Best of luck with this endeavor.
11	Clearly, there are many needs for curriculum advancement to take on today's workplace challenges. But few have kept pace. The basis of professional safety has to expand far beyond the traditional employee safety focus and spread into collaborative understanding and practice of most of today's business practice, but still retaining a broad risk perspective. That connection with real world instruction and moving into more subjects to link safety and risk within the working business model is paramount to keep pace with international competition and the exporting of American jobs overseas.
12	I believe that the upcoming graduate needs to have a broad level of safety education (environmental, system safety, risk management, engineering, R&D(lab), industrial hygiene, etc.) this allows for the individual to have a basic level that would better help the individual enter the field. In large companies, a specialist is necessary, but for smaller to medium sized companies, the EHS professional must know a wide range of topics to be beneficial.
13	Thanks for asking! Some students today are so used to communicating by text or in short sound bytes they have trouble communicating.
14	graduates also need the "soft skills": communications, oral presentations, writing, conflict resolution, negotiation, active listening, organization/time management
15	Internships are extremely valuable
16	Recent grads should show a willingness to learn and "get their hands dirty". Seems that at least a few recent grads think they already know it all and that they don't have to work hard to establish themselves and their reputations. Not many recent grads are going to start at the top and they need to be prepared to earn the respect they think they already deserve.
17	None
18	I really don't think this survey will show how poorly educated and trained most of the individuals that come out of these brick and motor BS Safety programs are.
19	I do wonder at times how one's own predispositions bear on professional success in the safety profession. For instance, an extrovert may have some innate capabilities when relating to others to advance safety in organizations. Perhaps there are other measures that could be beneficial, such as enneagram personalities 1, 2 or 3. I do not suggest we force selection; I do think baccalaureates would be well served to know themselves.
20	Hope it helps!
21	None
22	Good luck with the survey.
23	test

Appendix 2.0 Qualitative Analysis Method of Survey Question 1.

Of the 1,000 surveys emailed to ASSE Professional Members, 58 participated, completing the survey between February 11 and 22, 2013. The email invitation included a SurveyMonkey link, landing a prospective participant on informational page explaining how the survey would be used and how participant anonymity would be maintained. The 13 question survey originates from a literature search examining the state of higher education, the state of the safety profession and stakeholder expectations of the safety profession. The survey was vetted with the ASSE Education Standards Committee via email and two meetings 2012. Participant data was analyzed using combinations of SurveyMonkey data analysis tools, Microsoft Excel and QSR NVivo 10 software.[7] NVivo 10 software is specifically designed to facilitate meaning making of participant answers by identifying and coding synonyms and similar meaning descriptions or phrases.

NVivo 10 relies on interpretive data analysis of the researcher. As the primary researcher and Safety Professional, I chose participant words that I thought would serve well as category titles or codes.[8] Every participant response was read, interpreted for meaning and captured to be part of a category or code, The process is comparable to highlighting selected text in a book that is interpreted to have significance and/or similarity. NVivo coding works by attaching a link to comparable data meanings for future retrieval, tally, and interpretation.[9] Internal validity, revealing agreement of data interpretation is possible by checking percent agreement between coding results between three coders (as of this writing), me and two additional Safety Professionals James Ramsay, PhD, CSP and David May, ScD, CIH, were determined to be strong (typically at least 80% agreement) in this project.

Appendix 3.0 Survey Assumptions

1. ASSE Professional Members for the purposes of this research are considered experts in the SHE field. They have at least five years' experience, are hold at least one advanced credential (such as a Certified Safety Professional (CSP) or Certified Industrial Hygienist (CIH)), "are in good standing" with respective boards, are at least baccalaureate degree holder from an accredited institution, and/or hold a certification or licensure of from 1 of 15 recognized organizations (such as a Professional Engineer). [10]

2. Survey participants provided valid responses based on their interpretation of each question.[11]

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[7] For more information see http://www.qsrinternational.com/products_nvivo.aspx.

[8] This describes my process of "discriminate sampling" (Sage, 2008, p. 108) , by using participant words or "In Vivo" (Saldaña, 2009, p. 1).

[9] Presentation, NVivo Training Program, Boston, MA, August 2-4, 2012.

[10] ASSE Professional Member criteria: http://www.asse.org/membership/reclass.php.

[11] Miles, M. B., & Huberman, A. M. (1994). *Qualitative data analysis: An expanded sourcebook*. Thousand Oaks: Sage Publications.

3. Competencies include knowledge, skills and dispositions (or attitude) and will serve as the foundation of defining learning outcomes (what a student should be able to demonstrate by thinking and doing at the conclusion of a course and or a professional preparation program).[12]

4. Outcome based learning, that is demonstrating evidence of student learning in areas of knowledge, skills and dispositions as now expected by several baccalaureate professional preparation programs such as nursing, dietetics, athletic training, and teacher preparation.[13]

5. Portfolio's are established and reliable tools to demonstrate learning.[14]

6. College course titles, are not synonymous with competence or proficiency in a topic, however, they likely reflect participant expectations of knowledge. [15]

7. Knowledge can be subdivided into levels to express a range,[16] such as:

Level 1	Level 2	Level 3	Level 4
Recall	Skill/Concept	Strategic Thinking	Extended Thinking
Able to: List, draw	Able to: Graph, modify	Able to: Compare, assess	Able to: Synthesize, connect

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[12] For more on competencies see http://www.mass.edu/currentinit/NiNofCompetencies.asp For learning outcomes see http://www.celt.iastate.edu/teaching/RevisedBlooms1.html.

[13] Nursing: Commission on Collegiate Nursing Education (CCNE) http://www.aacn.nche.edu/ccne-accreditation/standards09.pdf Dietetics: Accreditation Council for Education in Nutrition and Dietetics (ACEND), http://www.eatright.org/WorkArea/linkit.aspx?LinkIdentifier=id&ItemID=6442468849&libID=6442468831and teacher preparation: Council for the Accreditation of Educator Preparation (CAEP) http://caepnet.org/commission/standards/.

[14] For more information see National Institute for Learning Outcomes Assessment (NILOA) http://www.learningoutcomeassessment.org/TFComponentESL.htm.

[15] U.S. Department of Education. "A Test of Leadership Charting the Future of U.S. Higher Education" 2006. http://www2.ed.gov/about/bdscomm/list/hiedfuture/reports/final-report.pdf.

[16] Webb, Norman L. and others. "Web Alignment Tool" 24 July 2005. Wisconsin Center of Educational Research. University of Wisconsin-Madison. 2 Feb. 2006. http://dese.mo.gov/divimprove/sia/msip/DOK_Chart.pdf.

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