Model Curriculum for OSH

Key to Becoming a Profession

By Jim Ramsay and Wayne Hartz

IN BRIEF

- **Some professions mature from occupations into sovereign (established) professions. Several well-accepted characteristics define professions, including education standards and occupational closure.**
- **This article describes how a model curriculum was created and, from that, how a new set of standards was developed for the OSH discipline.**
- **The authors also explain that by leveraging the model curriculum and subsequent set of education standards, a road map might be constructed for professionalization of OSH that includes occupational closure.**

All professions start as occupations. Over time, some develop into sovereign (i.e., mature, established) professions. The road map to professionalization is well understood, although there is no single route that all occupations take.

Several characteristics define professions: a common set of educational standards uniformly adopted by academic programs residing in institutions of higher education; professional certifications; and continuing professional education processes, which are themselves closely coupled to the education standards. In addition, established professions have peer-reviewed journals and conferences, a common understanding and use of terms regarding job descriptions, and a code of professional ethics as well as mechanisms to enforce it. Lastly and most critical, mature disciplines require occupational closure, which allows for professional definition and provides barriers to entry.

Typically, the best mechanism to widely disseminate education standards is program-level, recognized accreditation. However, with less than 7% of OSH programs accredited nationwide, this is a noticeable omission in the requirements for professionalization in OSH. Accreditation seems most successful if two factors exist simultaneously. First, the discipline must have a credible set of standards, credible in that they are based in research, policy and best practices, and viewed by consensus of practitioners and academics as being appropriate. Second, occupational closure must exist to enhance standards adoption by requiring all applicants to have graduated from an accredited academic program. Lacking occupational closure in the OSH discipline results in education standards that are not widely adopted.

The purpose of this article is twofold: 1) to describe how a model curriculum was created and, from that, a new set of standards was developed for the OSH discipline; and 2) by

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leveraging the new model curriculum and subsequent set of education standards, how a road map might be constructed for professionalization of the OSH discipline that includes occupational closure.

OSH Profession's Perfect Storm

It is a time of unprecedented change for higher education marked by reduced state funding, students consistently questioning the relative value of a college degree, increasing and shifting employer needs, and, in general, a more dangerous world in terms of terrorism and organizations' need for emergency management expertise to work alongside safety and health expertise, all with increasing healthcare costs and an aging workforce.

These circumstances, combined with shrinking availability of qualified OSH professionals, employer confusion of how to define qualified OSH professionals, lack of accreditation in most OSH programs and lack of state regulation of practitioners, collectively create challenges to the OSH profession. These challenges require the wisdom of faculty, students, employers and professional associations to address. This article offers a specific perspective as to how best to advance the OSH profession by achieving occupational closure vis-à-vis a new set of education standards.

The OSH profession is wonderfully dynamic and complex. It consists of a mix of line and staff positions, incorporates practitioners from varied backgrounds, has dozens of professional credentials (e.g., CSP, CIH, OHST, ARM, CPE), is compliant to reams of state, federal and global mandates, standards and guidelines, exists in hundreds of industries, and includes dozens, if not hundreds, of disparate work sites from nanotechnology, manufacturing and healthcare to construction sites and nuclear power plants.

Characterizing the professional boundaries of OSH is difficult and arguably cannot be done using job descriptions or titles, since these are typically idiosyncratic to an organization (particularly in OSH as opposed to medicine, nursing or law). Rather, it is best done by applying a research-based and consensus-reaching method that results in a set of educational standards that is widely adopted across OSH programs in higher education. Implementing a system of continuous quality improvement based on the education standards of a profession is best accomplished through accreditation, of both the institution and the program. The authors note that program-level accreditation is different from institutional accreditation, yet, both are essential to a mature profession by ensuring that undergraduates are capable of performing OSH competencies.

As academics may already know, accreditation is often cited as a quality-control measure in higher education. However, the general term *accreditation* is broad and includes many types and application levels. Consequently, Ramsay (2013) observes that accreditation suggests different things to different people including thoughts of elitism, undue barriers to entry and exclusion to some, and excess expense and effort to others. To others it may provide a measure of sanctification, akin to the USDA stamp of approval.

Like any social system, accreditation cannot guarantee quality; rather, specialized (program-level) accreditation is a focused process by which programs must present evidence of the degree to which their students meet minimum professional standards (i.e., knowledge, skills and abilities) as well as evidence of the processes used to sustain continuous quality improvement.

The traditional objective of accreditation is to assure students, faculty, programs, constituents (e.g., parents, employers) and institutions that graduates have accomplished the learning outcomes (defined here as the collective set of skills, knowledge and behaviors) required in their chosen profession.

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Anecdotal debates continue at professional conferences and on blogs as to whether OSH is a profession in the same manner as is medicine, law, nursing, teaching, engineering or theology. Others have anecdotally observed that because less than 7% of all OSH programs are accredited, most safety graduates come from unaccredited programs. Further confusing the quality argument is that some OSH programs reside in institutions that are nationally accredited and not regionally accredited.

Ultimately, to the layperson, parent or employer, accreditation is not only confusing, but understanding it requires navigating a largely complex web of unfamiliar terms, measures and organizations. Sometimes, what constitutes quality and legitimacy is unclear and often lies in the eye of the beholder.

Program vs. Institutional Accreditation

Accreditation occurs at various levels in higher education. Hence, it is important to distinguish the sort of accreditation being discussed. For example, regarding higher education institutions, institutional accreditation is a process concerned only with the educational institution, its structures, processes and finances.

"The goal of accreditation is to ensure that education provided by institutions of higher education meets acceptable levels of quality. Accrediting agencies develop evaluation criteria and conduct peer evaluations to assess whether those criteria are met" (U.S. Department of Education, 2016).

In contrast, program-level accreditation is focused strictly on the quality of the faculty, curriculum and the processes of a degree-granting academic program. While an academic program may reside in an institution of higher education that has itself been accredited, such institutional accreditation status has no bearing on the quality of any of the institution's academic programs. In this way, accreditation at both the institutional and program levels is required to ensure that professionalism and continuous quality improvement are present.

Several examples exist of organizations that conduct program-level accreditation, such as Association of Technology, Management and Applied Engineering (formerly National Association of Industrial Technology), and Accreditation Board for Engineering and Technology (ABET). These organizations enhance the reliability and credibility of the program accreditation process by becoming recognized by either the U.S. Department of Education or Council for Higher Education Accreditation (CHEA, 2002). The accreditation that such organizations bestow is referred to as recognized program-level accreditation, specialized program-level accreditation or simply accreditation.

How Best to Frame the Identity of a Profession?

For a maturing discipline to frame its operating boundaries, it is most logical to emulate how more established professions have done so. Professions such as nursing, dietetics, engineering, medicine and law use student learning outcomes, which are knowledge, skills or abilities/behaviors (KSAs) demonstrated by the student upon successful completion of a teaching module/course, to create professional identity. In turn, the KSAs that students are expected to be able to demonstrate at graduation become the ultimate basis for occupational closure.

As charged by the ASSE board of directors, defining minimum education standards for the OSH profession is a primary goal of the ASSE Education Standards Committee (ESC). ABET is the main accrediting body the ESC has used over the past 20 years. In turn, ASSE currently supports several of its members to serve on the ABET board of directors and the Applied Sciences Commission (to which OSH programs belong within ABET).

In addition, ASSE supports program accreditation by selecting and training program evaluators, and the Society helps more than a dozen programs seek and achieve ABET accreditation. Interestingly, the ESC's standard operating guidelines call for a revision of the education standards used in accreditation on a regular basis. As a revision deadline loomed, ESC and ASSE leadership sponsored two national workshops that brought together a large representational set of subject matter experts (SMEs) to help build the first OSH model curriculum, and, subsequently, to define and update existing education accreditation standards.

The concept of using SMEs and workshops to revise OSH education standards was consistent with prevailing ASSE strategy. As expressly stated by past and standing ASSE presidents and in ASSE's strategic plan, demarcating the road for OSH professionalization has a long history. Michael Belcher, 2015-16 ASSE president, carried this theme in his April 2016 President's Message. He noted the ASSE executive board reorganization and four strategic goals: 1) enhance member communities recognizing their important role; 2) assure quality and pertinent opportunities for professional development; 3) serve the profession by facilitating OSH consensus standards; and 4) build the value of the profession, including "do everything possible to advance professionalism and ensure that only competent professionals perform OSH duties" (ASSE, 2016). Ferguson and Ramsay (2010) note that the success of the OSH profes-

OSH as a Sovereign Profession

The intent of both OSH core competency workshops was to produce a model curriculum for the OSH discipline that was based on a thorough literature review, best practices and policies, and the consensus wisdom of acknowledged SMEs in the discipline. In turn, the model curriculum was organized around a set of knowledge domains and competencies within each domain. From the model curriculum, a new set of accreditation standards would be derived by the ASSE Education Standards Committee. As in other mature disciplines, this is a critical component to having OSH accreditation standards enjoy widespread credibility and adoption in higher education. Ultimately, widespread adoption of such education standards paves the way for occupational closure, and the ultimate demarcation of OSH as a sovereign profession.

FIGURE 1
Conceptual Flow Guiding the National SME Workshops

sion is dependent on differentiating member capabilities by assuring minimum OSH educational standards, defining competent experience, passing appropriate credentialing exams, meeting certification continuance requirements and, ultimately, achieving occupational closure.

Within ASSE, professionalizing OSH in one form or another has been underway for more than 50 years. During this time, professionalization efforts have been strongly supported by scholarship as well as senior leadership within ASSE and in higher education. Utilizing methods from Hartz (2014), the authors facilitated both workshops that included members from the ASSE ESC and several other SMEs to codify and establish a set of knowledge domains that describe the OSH discipline and a minimum set of learning outcomes (or competencies) for each knowledge domain.

SMEs were defined according to Hartz (2014), who defined experts or SMEs as those professionals who have in the past 5 years, singularly or in combination:

1) served on an advisory committee of an ABET-ASAC accredited program;

2) published peer-reviewed OSH literature;

3) served on a national OSH committee or research task force;

4) served as a terminal-degreed associate or full professor faculty member, holding a current and germane board certification;

5) worked full time as an OSH practitioner at a facility or job site with demonstrated OSH performance excellence, verified by a third party;

6) hired and managed B.S. OSH program graduates at a facility or job site with demonstrated OSH performance excellence, verified by a third party (Hartz, 2014).

Functionally, the first workshop focused on producing a consensus set of knowledge domains that would be used to characterize and define the OSH discipline. The second workshop focused on developing a consensus set of learning outcomes (i.e., competencies) within each domain. Ultimately, a set of knowledge domains and competencies within each domain would comprise a model curriculum.

Semantics: Competencies, Capabilities & Learning Outcomes

When assessing an employee's performance, employers typically use themes of knowledge, skills and behaviors coupled with an assessment of accomplishments measured by performance of budget and/or objectives or goals based on objective data and subjective feedback from subordinates, peers and internal or external clients. In professional preparation programs, higher education focuses on completion of learning outcomes to define what a student will be able to do upon completion of a course or degree.

For purposes of this work, competencies correspond to learning outcomes. Learning outcomes and established areas of research and practice that together define the OSH profession's body of knowledge can be organized into themes or categories of knowledge domains. Seven knowledge domains were established, with corresponding competencies or learning outcomes. Competencies are based on/reflect the knowledge, abilities and skills learned and applied by evidence of communication, reasoning and ethical conduct, ultimately benefitting workers and their corresponding organizations (Epstein & Hundert, 2002), that all OSH professionals should know and be able to do after completing an undergraduate education.

In the case of OSH, the authors believe that performance expectations of competence (or successful completion of learning outcomes) must be established to demonstrate OSH undergraduate capability. According to International Network for Safety and Health Practitioner Organizations (INSHPO, 2015), *competence* is the ability to execute/complete a task skillfully, correctly and professionally. In contrast, *capability* is the ability to apply theoretical

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knowledge that underpins practice in occupations and the industry-specific knowledge and skills that transcend a specific workplace and the tacit knowledge of the workplace.

For OSH, the two categories of competencies, technical and adaptive, work together to create capability. Technical competencies are those derived from the literature, from best academic practices and appreciating employer needs, while adaptive competencies are more focused on the softer skills of day-to-day professional life and leadership such as communication, relationship building, trust, partnering, collaboration and learning (Heifetz, 1994).

Methodology

To develop a minimum core of OSH competencies, the authors proposed that ASSE sponsor two national workshops. Thirty-one OSH SMEs were invited to meet in April 2015 to begin the process of developing a consensus set of knowledge domains that would collectively define the profession's intellectual core.

To develop a competency-based model curriculum, each workshop was intended to have SMEs identify and define OSH knowledge domains, then competencies within each domain (not course or degree titles) that could be used to structure an academic program (Voorhees, 2001). Following the success of the first workshop, a second meeting was held January 2016, with the same SMEs (workshop participants are listed in the Acknowledgments at the end of this article).

The focus of the second meeting was twofold: 1) to confirm support of the knowledge domain titles and definitions; and 2) to define a set of outcomes-based competencies for each domain. Leveraging the ESC's need to refine its own standards, the cumulative aim of both workshops was to define the OSH profession around education standards, just as most other mature disciplines have done. To better focus the SMEs before engaging in each workshop, they received a schematic of underlying logic of using core competencies to define a profession (Figure 1, p. 43).

Professionalizing the OSH discipline requires a consensus set of educational standards that are based on a body of knowledge or intellectual framework derived from SMEs, best practices, scholarly literature, prevailing policy and academic standards. Oddly, ASSE's ESC had never used this process, as it has developed and modified its own education standards over the years. Hence, tying education standards revision to the consensus methodology used in both workshops would not only allow the OSH discipline to define itself credibly via education standards, but it would also empower OSH academic programs nationwide by infusing a new set of education standards developed through the largest nationwide effort to date.

While consensus can be achieved through various mechanisms, the method used was the modified nominal group technique (MNGT). MNGT is a qualitative research process that is dependent on a capable leader/facilitator(s), invested group members and purposeful MNGT method application (Delbecq, Van de Ven & Gustafson, 1975). Although total elimination of individual influences on group processes is impossible, key attributes of the MNGT process are equal opportunity to participate, discussion to flesh out understanding and anonymous voting on index cards, which nullifies unintended influence and other group dynamics.

The result is a process that prioritizes results, thereby reaching consensus and maximizing group meeting time that results in participant satisfaction and results (Delbecq, et al., 1975). Delbecq and Van de Ven are credited with developing the nominal group technique (NGT) method for broader use in 1968 (Delbecq, et al., 1975, p. ix). NGT was modified (Pokorny, Lyle, Tyler, et al., 1988) and improved (Fox & Glaser, 1990, p. 1) by providing participants with the question or problem to focus on and the prompting data *before* the actual NGT process meeting.

MNGT methods are dependable for generating meaningful results, while participants report that the process builds consensus, is fair, and more efficient and effective than other group meetings (Delbecq, et al., 1975; Fink, Kosecoff, Chassin, et al., 1984; Jones, 2004; Sink, 1983). Potential pitfalls of the MNGT process include unprepared or unwilling participants, weak leader/facilitator skills and loss of participant authenticity (Delbecq, et al., 1975; Fink, et al., 1984).

NGT has been applied in many settings. A literature review resulted in about 200 sources, including 46 in higher education, 32 in applied healthcare and 52 by the World Health Organization (WHO, 2010), describing a range of applications from developing action plans following hospital incidents to ensuring patient safety.

Literature supports modifying the NGT process by providing participants the prompting question and relevant information before the NGT process-

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ing meeting; this allows participants to reflect and prepare before the meeting (Fox & Glaser, 1990).

The MNGT process has been culled from many sources, including group dynamics, creativity and brainstorming. Delbecq, et al. (1975), offer that NGT is applied when the "central element . . . is the lack of agreement or incomplete state of knowledge" (p. 5). Girotra, Terwiesch and Ulrich (2009) cite "Osborne's (1957) book, *Applied Imagination*, which introduced the term *brainstorming* . . . and research that the *number of ideas generated* (i.e., productivity) is significantly higher when individuals work by themselves" (pp. 2-3). O'Connell (2010) reports, "people really do like [brainstorming, believing it] . . . is a tremendously beneficial process . . . [while] 50 years [of research] show[s] that a brainstorming team generates fewer ideas than the same number of people working solo." Girota, et al. (2009), say 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).

The process of collecting data objectively creates a rigorous method for supporting a discussion process that ensures understanding of, but not necessarily agreement with, SME ideas, as well as anonymous voting. MNGT process leaders face complex, dynamic issues such as ensuring adequate discussion, facilitating conflict or tension, and determining when to move the meeting along. These issues can be improved by using the MNGT method as well as the leader's skills and judgment (Fink, et al., 1984). Some issues are simply beyond the researcher's control, such as completing the prework and being a willing participant. Furthermore, preplanning is critical to optimizing an NGT session and meeting academic rigor requirements concurrently. Barbour (2007) posits:

> It is essential . . . the researcher gives thought at the planning stage of the research [to the] . . . theoretical approach . . . [and] in particular to sampling decisions, which provide the key to the comparisons that can be made." (p. 14)

As a qualitative research method, MNGT relies on the completion of prework, meeting participation and the person's contribution (Delbecq, et al., 1975).

Individual Idea Generation & Round-Robin Recording of Ideas

Participants were instructed to record their answers to this prompt: "As you think about baccalaureate preparation for emerging safety professionals now and in the future, explain what you would like to see in a student portfolio demonstrating competence." After approximately 7 minutes, all ideas were documented on an easel pad one at a time and in a round-robin order in front of the group. However, while clearly duplicate ideas were omitted, "hitchhik[ing]" or building on other ideas was encouraged and the results recorded (Moore, 1987, p. 27).

Serial Discussion of Ideas

The next phase included facilitated group discussion and clarification of each idea (Moore, 1987). Once again, facilitators used the easel pad to document revisions, which were sought through verbal agreement. Then, working alone, participants were instructed to write down one idea per index card that captured what they deemed as the five to nine most important ideas from the list (Moore, 1987, p. 27). Note that as Delbecq, et al. (1975), recommend, for "research purposes . . . increasing the number of cards beyond five is desirable . . . where lists are longer (around 20) selecting eight priority items is desirable" (pp. 58-59).

Voting & Prioritizing

Participants were later asked to spread the cards out in front of them, review all of the ideas they recorded, then rank their cards (Moore, 1987, pp. 29-30). Each card only included three documented items: 1) the idea reference number; 2) the idea; and 3) the number reflecting the importance or ranking of each card. To ensure voting anonymity, participants were asked to omit their names from the cards. Ultimately, 22 types of portfolio evidence were identified and prioritized from most to least important. This process produced consensus-derived results.

Results

The first workshop produced seven knowledge domains, which were further developed into identifiable student learning outcomes (SLOs) during the second workshop. Knowledge domains and SLOs were intended to be representative rather than exhaustive. A consensus set of SLOs from a national sample of SMEs means that a representative group of SMEs has agreed that they are the best, most important SLOs to teach undergraduates in each knowledge domain. This step is critical to establishing legitimacy of the intellectual core of a profession. Identified SLOs are a minimum; that is, of all the possible SLOs one might conjure in each knowledge domain, the resulting SLOs represent the most important ones.

This approach provides all academic programs with appropriate guidance, while advancing the profession by educating and equipping students with the best practices and most relevant literature possible. Consequently, all academic programs will have enough latitude to allow them to express their individual identities, to teach to their specific program strengths and to serve their specific constituents, while ensuring that graduates are capable of entering OSH roles and subsequently pursuing credentialing.

The "OSH Model Curriculum" sidebar (p. 46) details the knowledge domains and SLOs produced collectively by the workshops and post hoc consensus by the ASSE ESC.

Discussion

The workshops were intended to produce a model curriculum for the OSH discipline based

The OSH Model Curriculum

The Final Set of Knowledge Domains & Competencies Within Each Domain

1) Evidenced Based. The OSH professional will utilize research and evidence to drive problem solving and integrate value-added practical solutions into organizational goals.

a) Discern, collect, analyze and interpret relevant data to reduce the risk profile of an organization.

b) Conduct a thorough literature review utilizing peer-reviewed scientific literature to develop practical solutions for identified problems.

c) Integrate financial justifications into the development of policies, procedures and systems that outline with organizational strategic plans.

d) Develop and track both leading and lagging indicators to measure OSH program effectiveness and demonstrate continuous improvement.

e) Apply knowledge of working requirements and best practices to prepare, review and revise OSH policy.

f) Develop a computer program to help analyze complex processes.

g) Develop and present training at worker and management levels.

2) Communication. The OSH professional will interact effectively with stakeholders, colleagues and employees fostering mutual respect and shared decision making to enhance worker safety and health.

a) Apply interpersonal communication skills to effectively influence audience.

b) Demonstrate effective written communication skills.

c) Demonstrate the development and delivery of effective training by employing various media.

d) Apply facilitation, team-building and problem-solving skills.

e) Interpret and disseminate relevant OSH information to inform target audience.

3) Risk Management. The OSH professional will participate in and contribute to the process of conserving assets and earning powers of an organization by minimizing the effects of loss.

a) Generate controls based on risk assessment.

b) Analyze the financial and nonfinancial benefits of controls.

c) Demonstrate ability to communicate the financial and nonfinancial benefits of controls.

d) Relate to concepts of risk transfer and corporate and social responsibility.

e) Define risk terminology.

f) Provide examples of risk assessment techniques.

4) Business. The OSH professional will be able to develop, articulate and execute a business case for protecting the company's internal and external assets, stakeholders and the community.

a) Analyze and calculate return on investment to be able to plan, articulate, market and sell OSH initiatives to executive management.

b) Demonstrate the ability to align the business case with the safety goals of the organization (case studies and teaching notes).

c) Understand, interpret and translate financial performance ratios and their impact on safety, health and environmental initiatives.

d) Identify issues and problems that impact the business; in that, articulate the problem, identify the merits in addressing the problem on economic, societal and social responsible basis, and collect and analyze data to inform.

e) Determine tangible and intangible return on investment in presenting the business case to protect the business, people and environment.

f) Understand the relationships and business impact on work site safety and health, and human resources benefit programs, and, through that, role identification, collaboration and relationship building.

g) Build and apply financial business budgeting process for OSH operation.

h) Explain to management how the business case impacts the community.

i) Demonstrate servant leadership to achieve measurable business and people-focused results.

5) Leadership. The OSH professional will possess the ability to influence the behavior of individuals, systems and work groups in a way that will facilitate the achievement of shared goals.

a) Demonstrate the ability to lead multidisciplinary teams.

b) Build relationships with all stakeholders.

c) Analyze human behavior, team dynamics and individual performance to prevent occupational injury.

d) Support all stakeholders to manage risk.

e) Conceive ways to add value.

f) Demonstrate problem-solving skills.

g) Explain the importance of leadership in a risk management context.

6) Informatics. The OSH professional will possess the ability to gather and use credible information and technology to communicate, manage knowledge, mitigate risk and support decision making.

a) Demonstrate proficiency using software and equipment needed to identify occupational hazards and risk.

b) Analyze data to support risk reduction decision making.

c) Utilize contemporary computer skills to gather applicable data and present relevant metrics to influence decision making.

d) Apply consensus standards and regulatory resources to mitigate risk.

e) Demonstrate knowledge of various OSH management systems.

f) Effectively use contemporary instrumentation and technology to gather pertinent data.

g) Access, interpret and apply applicable standards to subject operations.

h) Demonstrate application of risk-based principles to prioritize between competing operational needs.

i) Understand how to implement OSH audit and inspection testing systems.

j) Understand and apply risk assessment methodology to support decision making.

k) Demonstrate knowledge of basic engineering skills (e.g., reading CAD/CAM drawings).

7) Professionalism. The OSH professional will be accountable to establish workplace programs and worker safety and health advocacy practices in a moral, legal, ethical and socially responsible manner.

a) Recognize and accept their level of competence and need for assistance.

b) Demonstrate legal, moral and sustainability principles through actions.

c) Identify legal and regulatory obligations in the work environment.

d) Explain the difference between compromise and professional obligations.

e) Address gaps between policy and practice.

on a thorough literature review, best practices and policies, and the consensus wisdom of acknowledged SMEs. The model curriculum was organized around a set of knowledge domains and competencies within each domain produced through an iterative consensus-building method. The ESC would derive a new set of accreditation standards from the model curriculum.

Organizing the results of both workshops as a model curriculum accomplished three important goals for the OSH discipline. First, as in other mature disciplines, the methods used to obtain the knowledge domains and competencies were critical to the aspiration of the subsequent set of accreditation standards achieving widespread credibility and adoption by academic programs. Second, widespread adoption of such education standards ultimately paves the way for occupational closure and the ultimate demarcation of OSH as a sovereign profession. Third, organizing the discipline around knowledge domains and competencies allows for a formal, professional identity for the OSH discipline, akin to how several other mature disciplines have defined themselves. That is, it provides a professional identity that is concise, based in science, best practices and policy, is supported by the consensus opinion of a robust set of SMEs and includes student competencies that will in turn structure OSH higher education nationwide.

In qualitative research, context is central to understanding the results. Foundational to the methods used in this project were the characteristics of the SME participants. Collectively, the SMEs represent an estimated 1,000 years' worth of combined professional experience, several dozen professional credentials, more than 100 peer-reviewed articles and book chapters, national and global work experience, and long-standing active roles in professional, governmental and volunteer positions.

The backdrop to both workshops was threefold: a) ASSE's role regarding global involvement around the structure of the OSH discipline (i.e., ASSE's role with INSHPO, standards development and professional engagement); b) its calls for consistent higher-level qualification criteria and certification standards (IOSH, 2011; ENSHPO, 2008; Hill & Hudson, 2012); and c) recognizing the opportunity for ASSE to serve its global membership as a leader-partner (Hill & Hudson, 2012).

The following discussion provides a literature background for understanding the identified knowledge domains and their relevance to the OSH discipline.

1) Evidence Based

The OSH professional will utilize research and evidence to drive problem solving and integrate value-added practical solutions into organizational goals.

Employer expectations identified by American Association of Colleges and Universities (AAC&U) are pertinent across many professions. These include oral communication, teamwork in diverse groups, written communication, critical thinking and analytical reasoning, complex problem solving, information literacy, innovation and creativity, technological skills and quantitative reasoning (Hart Research Associates, 2010).

OSH literature addresses the need for evidence-based practice, including the need to advance from traditional approaches of safety practice, such as education, engineering controls and enforcement, to research-based and continuous improvement models (ANSI/ASSE, 2012a, 2012b; Allegrante, Marks & Hanson, 2006; Gielen, Sleet & DiClemente, 2006; Manuele 2008, 2013, 2014; Petersen, 1998, 2003, 2005; Salazar, 1989).

ASSE (2014) also established the expectation of applying evidence-based practice in its hiring guide definition and in the recently revised ANSI/ASSE Z590.2 standard that articulates the scope and function of the OSH practitioner (ANSI/ASSE, 2012a). In addition, Brauer (2005) and BCSP's (2015) CSP role delineation study identify the need for evidence-based practice.

Professions also charged with safety and health, such as nursing and engineering, share the call for dependence on data or evidence to guide assessment and corresponding actions. For example:

- Nursing: AACN (2008; 2013), Massachusetts Department of Higher Education (MADOHE, 2010), and Sroczynski, Gravlin, Route, et al. (2011);
- Engineering: Council of Engineering and Scientific Specialty Boards (CESB, 2011), The Carnegie Foundation for the Advancement of Teaching (Sheppard, Macatangay, Colby, et al., 2009; Sullivan, 2005), and Volkwein, Lattuca, Harper, et al. (2007);
- Teaching: National Research Council (2010) and other groups, The Carnegie Foundation for the Advancement of Teaching (Sullivan, 2005), U.S. Department of Education (2006).

2) Communication

The OSH professional will interact effectively with stakeholders, colleagues and employees, and foster mutual respect and shared decision making to enhance worker safety and health.

Written and verbal communication effectiveness are required throughout one's education and career. This need was clearly identified by the AAC&U employer expectation research (Hart Research Associates, 2010) and specifically by NIOSH's OSH workforce assessment (McAdams, Kerwin, Olivo, et al., 2011).

Kines, Andersen, Spangenberg, et al. (2010), specifically identify how lack of communication played a significant role in construction worker deaths and, once addressed, contributed to effective risk management. Sandman (1993), Petersen (1989), Geller (2001) and Krause (2005) all discuss the role of effective communication as foundational in an organization's interpretation of leadership messaging to ensure alignment of espoused and practiced values. A North Star Research study commissioned by ASSE (2008) identified the absence of effective communication between safety professionals and an organization's leadership as the source of a significant perception gap. Cekada

Imagine if, collectively, higher education could ensure that OSH graduates pursuing an OSH career were competent in seven knowledge domains. Those outlined here, evidence based, communication, risk management, business, leadership, informatics and professionalism, serve as the categories to frame minimum education standards.

(2012), and Kirkpatrick and Kirkpatrick (2006) emphasize the role of effective communication to assess training needs, provide training and assess effectiveness based on audience (including different languages) and training needs or purpose.

3) Risk Management

The OSH professional will participate in and contribute to the process of conserving assets and earning powers of an organization by minimizing the effects of loss.

Effective risk management (i.e., hazard identification, assessment, prioritization, controls, reassessment adjustment if necessary) is foundational to the professional practice of OSH and exists in affiliate professional organizations (ASSE, BCSP, AIHA, ABIH). ANSI/ASSE (2012a) Z590.2 states that the OSH professional "is to facilitate a shared understanding of the role of the OSH professional as a key advisor, strategist and leader in the management of risk and sustainable business practice." The OSH management systems identified in OSHA's Voluntary Protection Programs are modeled on a continuous improvement process that incorporates risk management, a process also featured in ANSI/ASSE (2012b) Z10, Occupational Health and Safety Management Systems standard (Manuele, 2006).

4) Business Skills

The OSH professional will be able to develop, articulate and execute a business case for protecting the company's internal and external assets, stakeholders and the community.

Several sources state the need for a business solution approach and alignment with corresponding organizational goals (Haight, 2008), to position hazard controls and positively influence organizational change (Biddle, 2013) and as a means to ensure business sustainability (CSHS, 2016; Hill & Seabrook, 2013).

5) Leadership

The OSH professional will possess the ability to influence the behavior of individuals, systems and work groups in a way that will facilitate the achievement of shared goals.

Leadership is situational or occurs in context (Hersey & Blanchard, 1993), and is learnable (Parks, 2005). Employers ask for more leadership from bachelor's-level safety graduates with additional leadership and communication skills (McAdams, Kerwin, Olivo, et al., 2011). Krause (2005) defines a safety leader as anyone who "influences others in the organization regarding safety" (p. 8). Geller (2000) posits qualities such as listening, learning, process and outcome focused as key to driving a total safety culture. Petersen (2003) offers "leadership forms the culture that determines what will and will not work in the organization's efforts on safety (or anything else)" (p. 84), and explains that the safety specialist "obtains results" by influencing executives or other leaders (p. 86).

Disciplines of engineering and nursing also address the need for future graduates to take on leadership roles and responsibilities. Sheppard, Macatangay, Colby, et al. (2009), posit that students must "develop the skills and attitudes for effective leadership, teamwork and communication" (p. 192). Nursing (MADOHE, 2010) identified 11 knowledge domains including leadership, defining it as the need to "influence the behavior of individuals or groups . . . [to] facilitate the establishment and acquisition/achievement of shared goals" (p. 17).

6) Informatics

The OSH professional will possess the ability to gather and use credible information and technology to communicate, manage knowledge, mitigate risk and support decision making.

Petersen (2003) describes the publishing of an annual report as "crucial to a safety professional's relationship with management" (p. 85). Nursing (MADOHE, 2010) identified 11 knowledge domains including informatics, which is "using information and technology to communicate, manage knowledge, mitigate error and support decision making" (p. 22). Transference of technical information to people with a wide range of language and cultural skills is a desired skill set identified in NIOSH's national OSH workforce assessment study (McAdams, et al., 2011).

7) Professionalism

The OSH professional will be accountable to establish workplace programs and worker safety and health advocacy practices in a moral, legal, ethical and socially responsible manner.

ASSE has been on the journey of professionalization for at least 50 years as brought to life in Gorbell's (2006) 1970 article calling for professional credentialing. ANSI/ASSE (2012a) Z590.2, Criteria for Establishing the Scope and Functions of the Professional Safety Position, addresses the OSH professional as having a "high standard of competence, informing employers and regulators

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as to the capabilities of OSH professionals and providing information to be used in professional education and certification processes" (p. 7). Educator Palmer (1998) offers, "we teach who we are" (p. 15), or practice what we preach. We claim to be professionals; are we?

Curry and Wergin (1993) note that the medicine, law and dentistry professions came about as the result of "the move of professional education into university settings that carefully separated 'foundation' learning from 'practical application'" (p. 323-324).

Imagine if, collectively, higher education could ensure that OSH graduates pursuing an OSH career were competent in seven knowledge domains. Those outlined here, evidence based, communication, risk management, business, leadership, informatics and professionalism, serve as the categories to frame minimum education standards.

Conclusion

A defining characteristic of all mature disciplines and professions is a common core of educational standards used to define what they are and what they are not. As occupations mature over time and eventually become professions, they tend to develop professional certifications, education standards followed by recognized accreditation, professional associations, peer-reviewed journals and a body of knowledge, continuing professional education, and conferences that share and disseminate scholarship and best practices. They also develop mechanisms that filter those who are and are not eligible to practice in the profession.

Currently, OSH seems to be well along the trajectory of professionalization, exhibiting many of the characteristics of more mature professions. However, a widespread and uniformly adopted set of accreditation standards has been difficult to achieve in the OSH discipline. Several reasons, albeit anecdotal ones, likely exist. Accreditation can be expensive and labor intensive, a seemingly unnecessary step in markets eager to employ graduates as well as in disciplines without occupational closure. Widespread and uniform adoption of accreditation can also be difficult if the education standards appear irrelevant or unhelpful, or fail to represent current research, policy or best practices.

By leveraging the collective wisdom of a national panel of SMEs to produce a consensus set of knowledge domains and competencies, this article presents a partial solution to the professionalization trajectory for OSH. What remains to complete professionalization is a mechanism for occupational closure and a uniform adoption of education standards using recognized accreditation.

Road Map to Professionalization

The OSH discipline has tremendous opportunities to shape its own future and meet the many emergent challenges its practitioners will face. At last, it seems logical to claim that the OSH "profession" has reached a time in its history when it should be able to define what it is and what it is not per a body of knowledge that describes professional competence and behavior. That is, it is time for the OSH discipline to become a mature profession. Therefore, to advance the profession, achieve occupational closure and subsequent professional sovereignty, the authors recommend the following:

1) Establish widespread, uniform adoption of a common set of education standards as presented in this article for college and university programs producing OSH job seekers. This can best be achieved through recognized program-level accreditation through, for example, ABET. Recognized program-level accreditation should be the gold standard by which program quality is considered.

2) Until perfect uniformity of accreditation is achieved (as is the case for engineering, medicine, dietetics, nursing, law programs), an alternative system of academic accountability should be constructed and implemented nationwide. For those programs not pursuing accreditation, ASSE should create a structure and process that transparently characterizes the degree to which the nonaccredited program complies with its model curriculum and competencies. Although the process may vary somewhat, the process would be somewhat similar to criteria used in the program-level accreditation process.

3) All practitioners should be professionally certified by certifications that are themselves accredited (e.g., BCSP as accredited by CHEA), and which require an educational background from an accredited academic program. Professional certifications and education standards should stay sustainably coupled.

4) Practitioners, board examiners, academics and policy makers should form a mechanism whereby education standards and continuing education and professional certifications communicate and work in concert to achieve long-term sustainable professional competence.

5) Achieve occupational closure. That is, there should be barriers to entry for practicing OSH professionals. This will require the first four recommendations to be achieved first. Once those four are achieved, a national system of registration or licensure should be developed. In addition, employers and the federal government must be included in the development of common understanding of terms and requirements used in job descriptions.

6) A code of professional ethics must be uniformly adopted by all practitioners. This can be achieved through the professional certification process or the licensure/registration process. **PS**

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