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Redefining professionalism for the informal STEM learning field

Kris Morrissey [a], Joe E. Heimlich[b] and Dennis Schatz[c]

[a]Morrissey Research, Des Moines, WA; [b]Center for Research and Evaluation, Columbus, Ohio; [c]Pacific Science Center in Seattle, Washington, USA

ABSTRACT

Ideas and expectations about professions and about the process of becoming a professional are changing. Once defined largely by licenses or certificates, many fields of work are looking for more decentralized ways to determine what is a profession, and who is a professional. Many are turning to more decentralized ideas about professions and self-directed processes for lifelong professional learning. An increasing number of fields are using competency frameworks as one mechanism to guide professionalization without standardizing the preparation of those who work in the field. Research is needed to assess the viability and the impact of these frameworks on the individuals, institutions, the field, and ultimately on the public audiences they serve. The field of Informal STEM Learning (ISL) is uniquely poised to benefit from and contribute to the conversations and practices that are moving professional learning towards more self-directed paths.

Introduction

The concept of what is a profession and who is a professional is changing (Brock, Leblebici, and Muzio 2014; Evetts 2011; Noordegraaf 2011; Scott 2008; Švarc 2016). Once defined largely by licenses or certificates, and typically controlled by universities or regulating boards, many fields of work are turning to more decentralized ideas about professions and self-directed processes of professional learning (ATD Research 2018; Fain 2018; Price 2013). The field of informal STEM learning (ISL), which struggled to find itself within the previous model of professions (August 1983; Bartels, Semper, and Bevan 2010; Friedman 1995; Mancino 2016), is poised to both benefit from and influence the direction of emerging models of professions. The philosophy and practices of informal learning are particularly well-positioned to address some of the thorny questions about responsibility and accountability when professional learning is personalized and self-directed. In this article, we review some of these changes and advocate for further research on the ways that professional competency frameworks are– or could be–utilized within the ISL field and other related fields.

What is the traditional view of a profession and does it matter?

In a 1964 article, sociologist Wilensky asked 'What are the differences between doctors and carpenters, lawyers and auto workers, that make us speak of one as professional and deny

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the label to the other?' He suggested that the distinctions are based on: 1) 'systematic knowledge or doctrine acquired only through long prescribed training', and 2) 'a set of professional norms' (138). Most studies continue to describe a *profession* as being about specific and specialized expertise that requires a foundation in abstract concepts and formal learning (Brante 2011; Brock, Leblebici, and Muzio 2014; Evetts 2011; Scanlon 2011), and *professionalism* as being about norms and ethical practice (Gorman 2015; Møller 2019; Scott 2008). Scanlon cites discussions of a professional as having a body of knowledge based on abstract concepts and theories and requiring the exercise of considerable discretion, credentialing procedures, and an ethic which emphasizes doing good rather than economic gain. Other discussions cite a high degree of autonomy, collegiality, and self-regulation (Brock, Leblebici, and Muzio 2014); service or public orientation (Evetts 2011; Møller 2019; Scott 2008); and a shared professional identity produced through socialization, training, and experience (Barbour and Lammers 2015; Iarskaia-Smirnova and Kononenko 2017).

The public perception of an area of work as a profession provides a specific and significant value to those who engage in or with the profession. Individuals perceived as professionals gain social recognition, access to cultural resources, the ability to control who practices within that profession, the collegiality among those in the field, and often, a higher level of compensation. Professions typically monitor the conduct and skills of practitioners within that field, which affords the profession a public sense of trust and competence. In short, those who engage with a professional can expect a certain level of expertise and ethical behavior (Brock, Leblebici, and Muzio 2014; Evetts 2011).

An entry in the Encyclopedia of Sociology suggested that professions could be viewed along a continuum of public recognition and prestige (Roos 2000). At the high end are the classic or status professions, such as medicine or law. These professionals typically receive high incomes, exercise job autonomy, and receive deference from the public. Farther along the continuum are newer professions, such as dentistry, which also command respect and relatively high salaries. Finally there are 'semi-professions' and 'marginal professions', which 'exhibit some characteristics of the classic professions but have not acquired full professional status because of opposition from established professions and an inability to convince the public that they command unique expertise. These occupations are less prestigious, and their incumbents are paid less than those in either the classic or the new professions' (Roos 2000, 2259).

Wilenski's research on the natural history of professions found that occupations generally came to be recognized as a profession through a progression of steps that include (Wilensky 1964):

(1) Doing full time the thing that needs doing;
(2) Providing training;
(3) Creating professional associations or boards;
(4) Developing a formal code of ethics; and
(5) Developing licensing and certification.

As occupations progress through these steps, the route to becoming a professional becomes more standardized, typically involving university coursework to learn the theory and practices; a structured practice such as student teaching or medical residency;

assessment and licensing to practice; and then ongoing education and certification to maintain credentialing. Acknowledging the complexity of each variable, we suggest that the process of becoming a professional within this traditional model could be characterized by this formula:

$$[Expertise] + [Validation] = [Traditional Professional]$$

Traditionally, institutions of higher education provided the knowledge base and the structured experiences to apply theory to practice; in essence, they provided the path to *expertise*. Professional organizations set the standards and managed the mechanisms for assessing and validating the competencies of individuals who want to practice; they provide the path to *validation*. Figure 1 It is interesting that institutions of higher education and professional organizations both saw parallel growth spurts in the decades between the 1940s and 1970s, often referred to as the 'Golden Age' of universities, which could be attributed at least in part to this mutually beneficial relationship. This relationship is illustrated in Figure 1 which shows a parallel growth of occurrences of the terms 'professional organization' and 'university degree' in public publications.

Within the museum field, discussions of professional identity started shortly after museums began providing salaries for individuals to do the work previously done by avid volunteer collectors. An 1893 address to the Museum Association in London suggested that museum curators needed a level of education 'not dissimilar to that required for most of the learned professions' (Flower 1898/1972, 36). In 1939, the director of the American Association of Museums wrote, 'Museum work is commonly said to be one of the professions. But some people think of it otherwise' (Coleman 1939, 416). He
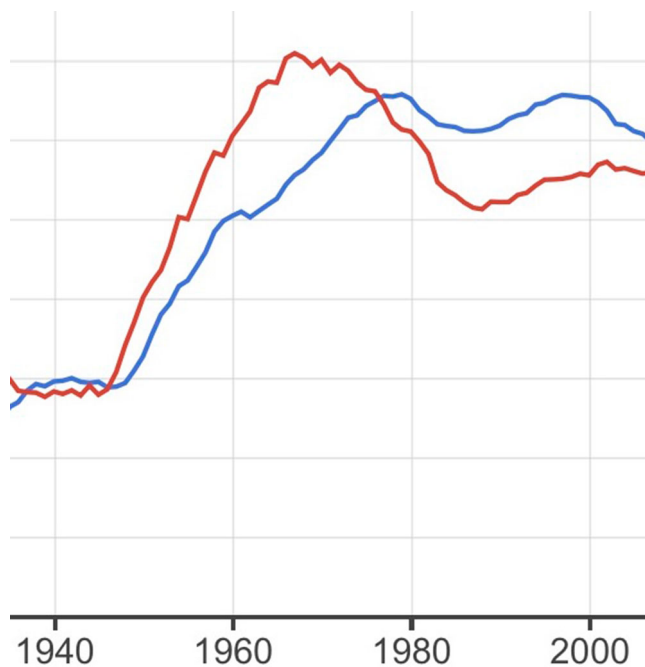

Figure 1. NGRAM of terminology.

suggested that museum work resembles the professions in that it 'requires learning as well as skill, is pursued partly for the benefit of society, has other than financial measures of success, and assumes responsibility through its practitioners as a group for ideals, objectives, and disciples' (417). A 1983 article examined the 'new sense of professionalism, which has pervaded the world of museums in recent years' (Singleton 1983, 28). This discussion continues with periodic spikes of attention (Friedman 1995; Genoways 1996; McCall and Gray 2014; Mancino 2016; Welsh 2013). The question of whether the field is or isn't a profession may become moot, or at least different, in the context of the changing dynamics of occupations and professions.

How are professions changing?

Many people believe that the traditional practices and conceptions of professions do not fully meet the needs of today's global, digital, and diverse work environment, and may even constrain the innovation needed to address the complex, systemic problems facing the world (Fain 2018; Price 2013; Švarc 2016). Digital technologies are dramatically accelerating changes in behaviors, values, and actions of learners. Webinars, YouTube channels, and other platforms have become a significant part of the learning landscape. The growth and popularity of podcasts across the geographical and socio-economic boundaries led one social media expert to suggest that 'Podcasters, rather than the conventional media, political establishment, or even higher education, are in a position to shape the tone and content of public discourse' (McWilliams 2018).

A study of the future of the workforce asked technologists, scholars, practitioners, and education leaders to describe the likely future of workplace training (Pew Research Center 2016). A key theme was the emergence of a diversifying education and credentialing ecosystem. Alternative credentialing includes certifications, apprenticeships, digital badges, microcredentials, and other forms of 'stackable credentials' that can be earned at any time in a person's career to expand, specialize, or re-focus job opportunities (Austin 2012; Hall-Ellis 2016; Lakin and Underwood 2017). Many universities are exploring their role in the new learning landscape, providing alternative learning opportunities for students, alumni, and non-students, and including online degrees, weekend certificate programs, and public conferences (Rascoff and Johnson 2016). Rovy Branon, Vice Provost for the University of Washington's Continuum College suggests that, 'While college degrees remain the essential core of higher education, succeeding in the new economy requires new pathways for people to thrive' (Fain 2018, 1). These new pathways are particularly relevant at a time when, 'Debt and high student loan default rates, particularly among underrepresented minority students, have contributed to questions about the return on investment for traditional college degree programs' (Fain 2018, 8).

Professional standards have also come under scrutiny in the context of the diversified workforce. The norms associated with professionalism, designed to separate the incompetent from the competent, often serve to separate those who look and act like the current workforce from those who don't, and 'research suggests that women, minorities, and those from lower-class origins continue to experience disadvantage in most professions' (Gorman 2015, 128). Other factors influencing the changing expectations of professions, include:

- The growth of super-organizations, where the training and cultural norms are set by the organization, particularly in tech-based companies such as Apple and Amazon, but also in organizations such as Walmart, which is now the worlds' largest employer;
- An increasingly mobile and geographically dispersed workforce (Parris 2017);
- A gig economy (Petriglieri, Ashford, and Wrzesniewski 2018);
- The emergence of new fields of knowledge that cross disciplines characterized as the 'expansion of hyphenated professionals' (Scott 2008, 229); and
- Research on how individuals and organizations learn or change (Sawyer and Keith 2008).

Robust discussions about the impetus and the implications of these changes coalesce around the idea that professions are 'changing and being changed' (Evetts 2011, 412). Scanlon describes this as 'iterative professional becoming' (Scanlon 2011, 2). She suggests that adopting the term *becoming* rejects conventional notions of novice-to-expert achievement of expertise with arrival and end points. *Professional becoming* aligns with conceptions of lifelong learning where professionals continually adapt to new knowledge and new contexts as they engage in iterative cycles of identity formation. She argues that this type of lifelong learning is linked to 'both individual and national economic survival' (28).

The Association for Talent Development, an organization that supports those who develop the knowledge and skills of employees in organizations, defines lifelong learning and self-directed learning in this way (ATD Research 2018):

> *Lifelong learning* is the self-motivated, ongoing pursuit of knowledge for personal or professional reasons. It may occur formally or informally, intentionally or incidentally.
>
> *Self-directed learning* occurs when employees take control of their own learning by setting goals, deciding how they'll learn (identifying appropriate content and resources and choosing their preferred learning methods), then evaluating their learning progress.

Putting the learner in charge is not a new concept, and has gone by different names such as 'self-directed learning', 'personalized education', and 'self-regulated learning'. These various approaches share a common epistemology and philosophy described here:

> At the core of learner-centered education is the belief that humans make sense or make meaning out of information and experience in their own way. Because each person is unique in his or her nature (a combination of DNA) and nurture (experiences), we each perceive, feel, and think about things differently. The theoretical foundations of this belief stem from cognitivism, constructivism, and humanism. (Reigeluth, Beatty, and Myers 2016, 12)

A recent national survey found that individuals and organizations that engaged in and supported lifelong or self-directed learning reported better organization performance, improved retention, and improved ability to respond to change (ATD Research 2018).

What is a competency-based profession?

In a seminal article titled Motivation Reconsidered: The Concept of Competency, psychologist Robert White (1959) described competence as 'an organism's capacity to interact effectively with its environment' (297). Largely as a result of that widely cited publication, the term *competence* became commonly used to describe success particularly within

business, but also in education and other settings where people interact with each other and with their environment. Similar to *expertise*, which refers to a body of knowledge, skills, and attitudes related to a discipline, *competency* refers to the ability to apply that expertise to different contexts, problems, and situations. Focusing on competencies rather than expertise acknowledges the ambiguous, contextual, and dynamic nature of complex work in the twenty-first century, and focuses on outcomes rather than potential; A professional competency is the ability to accomplish a desired outcome under a range of situations. Competencies 'may include technical skills, level of motivation, personality traits, awareness of bodies of knowledge, or just about anything else that can assist in producing results' (Rothwell and Graber 2010, 20).

A competency framework identifies the suite of competencies and the progression of learning competencies for a particular area of work. A competency framework is similar to a curriculum, but a curriculum provides the teacher with guidance in what to teach; A competency framework provides the learner with guidance in what they need to learn, and the learner determines how and when to learn. Within formal education, competency-based learning has become a strong component of many school reform efforts. Success is determined by demonstrating competence rather than completion of specific units of study or hours of training. One website (U.S. Department of Education n.d.) states that, 'This type of learning leads to better student engagement because the content is relevant to each student and tailored to their unique needs'. Proponents argue that 'with clear and calibrated understanding of proficiency, learning can be tailored to each student's strengths, needs, and interests and enable student voice and choice in what, how, when, and where they learn' (Aurora Institute 2020).

Within informal learning fields, a number of competency frameworks (or guidelines) have been developed to 'define what professionals need to know and be able to do' (National Afterschool Alliance (NAA) n.d.), and 'assist with planning a personal development plan' (VSA 2008). Examples include:

- The *Visitor Studies Association*'s (VSA) Evaluator Competencies for Professional Development includes six areas of competencies, such as 'Principles and Practices of Informal Learning Environments' and 'Professional Commitment'. These competencies are not associated with any certification but do include tools for self-assessment and guidelines for self-study, and professional development in visitor studies (VSA 2008).
- The *North American Association for Environmental Education* (NAAEE) identified six sets of guidelines that 'outline the abilities and understandings – or competencies – an educator needs to implement environmental education successfully'. The Guidelines for Excellence include themes such as 'Planning and Implementing Environmental Education' and 'Foundations of Environmental Education' (NAAEE n.d.)
- The *National Afterschool Association* (NAA) identified ten areas of knowledge and competency, such as Community Relations, Youth Engagement, and Professional Development and Learning. Tools are provided 'to help professionals self-evaluate and develop a personal Professional Development Action Plan'. (NAA n.d.)
- The *National Association for Interpretation* describes certifications as a way to document that an individual possesses the skills and knowledge to allow them to perform effectively in an interpretive profession. NAI provides several types of certification and includes training programs towards certification (NAI 2019).

- *The ISL Professional Competency Framework (ISL Framework)* is described as a tool for individuals, institutions, and organizations to understand, plan, and advance their professional capacity in the field of informal STEM learning. The framework includes four areas of competencies: Institutional Impact, Institutional Operations, Job-Specific Expertise, and General Expertise. Tools and resources for using it are under development.

Most of these frameworks were developed through a process similar to those of traditional professions: They turned to the recognized experts in the field to identify core competencies. For example, NAI used a think tank called the Interpretive Standards Committee, representing multiple specialties within the profession including academics, independent consultants, managers, and planners, starting with the question, 'What does a good interpreter need to know and do?' They conducted interviews with leaders in the profession, collected job descriptions from NAI members, and hosted fourteen focus group sessions, both online and in-person, to determine what members/experts believed was 'good'. The ISL Professional Competency Framework, developed by the authors and colleagues, identified competencies through a national study of professionals practicing within the field in a range of functions and at different levels of career progression. Using a research-based workshop format called a DACUM, the research team identified the 'duties and tasks consistent across job descriptions of those who work in informal science learning institutions' (Heimlich and Meyer 2017). The findings were validated by a national survey and was the foundation of the ISL Professional Competency Framework. The VSA framework used several levels of working groups and reviewers from the field to identify and field-test the competencies identified and articulated.

The frameworks described above share a number of commonalities including:

- *Foundational body of knowledge, history, theory, and principles*. The *National Afterschool Association*'s guidelines state that all professions share 'a body of knowledge and skills, culture, a code of ethics, and public recognition'. NAAEE guidelines state that environmental educators 'must have a basic understanding of the goals, theory, practice, and history of the field of environmental education'. The NAI areas of certification all include a 'basic knowledge of the history, principles and current literature'.
- *Complex and context dependent knowledge*. For example, the ISL Framework includes competencies, such as 'identify and address increasingly complex problems and opportunities with creative and analytical thinking skills', and NAI lists the skills and abilities to develop an interpretive presentation that includes audience, goals, measurable objectives, and other elements. NAA guidelines include, 'reflects on the effectiveness of learning environments and curriculum to meet individual needs, interests, development, and skill levels, and makes appropriate accommodations'.
- *Responsibility to society*. The ISL Framework includes, 'understand and support the characteristics of an equitable and culturally-responsive work environment', and VSA identifies 'a sophisticated understanding of the complexities of treating respondents ethically'.
- *Responsibility to their field*. NAA's category of Professional Development & Leadership and VSA's category of Professional Commitment both speak to the responsibility of professionals to contribute to and support the knowledge and goals of their field. The ISL

Framework describes this as 'create and advocate for a professional culture within the field of ISL that is robust and sustainable'.

- *Continuous and ongoing professional learning.* Similar to the traditional professions where ongoing learning is required to maintain licenses or certificates, these frameworks typically describe the achievement of competencies as a continuum, with phases or levels represented across the continuum. All professionals are expected to engage in professional learning throughout their careers. While learning is assumed to be continuous, there is also an acknowledgement that all individuals may not want or need to move beyond a certain point for a particular competency, given their career goals, or they may choose to explore more deeply a particular set of skills rather than move upward into a leadership role.

What these and other frameworks share is the articulation of the competencies that define the specialized area of expertise. We believe that it is this clarity and transparency that can shift the occupation of informal learning work towards a more robust model of professionalization. The advantages of articulating competencies are significant. Currently, the path to enter or advance within the ISL field is ambiguous and often more closely correlated with luck and circumstances than competence. Figure 2 In an interactive activity at the 2018 Association of Science-Technology Centers annual conference, participants were

Figure 2. How did you enter the science center field?.

asked to indicate whether entering the field was the result of 'a happy accident', 'fulfilling my dream', 'worked my way in', or 'changed my career'. Sixty-three percent of respondents indicated it was a 'happy accident', while fewer than 25% indicated that it was 'fulfilling a dream' or they 'worked their way in'. This non-scientific result mirrors anecdotal information in the field; people enter by chance. One of the potential costs of this uncertain path, is that those who want to enter the field may be frustrated and turn to unpaid internships or a graduate degree in an attempt to find a path into museum work. Both those options are dependent on some level of existing financial security and future financial risk, a factor that limits who enters the field. Similarly, individuals who want to advance in the field, or who advance or move across the field, often have unknown gaps in their skill set. A framework can articulate the competencies necessary for individuals to strategically follow a path.

Advantages, disadvantages, and challenges

There are significant advantages to both those who practice within and those who interact with professionals within formal professions and it is likely that this model will continue to have a place within contemporary society. However, competency frameworks provide an alternative approach to advancing the professional capabilities of a field. This alternative approach is more aligned with the values and practices of informal learning and it provides some of the advantages of a formal profession without the barriers that are sometimes associated with formal professions. In Table 1, we compare the characteristics of alternative models of professions. While there are varying definitions of, and distinctions between, the terms *informal learning, formal learning, and nonformal learning* we use those terms here for the sake of comparison. We use the term *formal learning* to refer to learning that is structured, prescriptive, and externally managed professional learning such as earning a law degree or a medical license. We use *nonformal learning* to refer to the many ways that professional learning happens without a sustained

Table 1. Characteristics of professional learning approaches.

	Non Formal Approach ISL Current	Formal Approach Traditional Professions	Informal Approach Competency Frameworks	
			With Certification	Without Certification
Competencies Learning Path	Not articulated Not-standardized or required	Identified by Experts Standardized and required	Identified by Experts Coordinated around certificate, not required to practice	Identified by Experts Self-directed, organized around competencies
Validation	Anecdotal, self-presentation	Licenses & Certificates to practice	Certificate awarded by Professional Organization	Evidence provided by learner
Advantages	Passionate workforce Diverse skill sets Flexible	Clarity Consistency in practice Higher compensation	Clarity to professional and those hiring, shared knowledge base and vocabulary, Self-efficacy Certificate	Clarity to professional and those hiring, shared knowledge base and vocabulary Self-efficacy
Disadvantages	Uncertainty Lack of evidence Lower retention Lower compensation	High cost to entering May hinder diversity	Requires financial and time commitment	Challenge of providing evidence

structure or system. We characterize the ways that professional learning currently takes place within the field of informal learning as nonformal; Although there are many structured and successful professional development activities, there is no field-wide articulation or expectation of the skills and knowledge that are necessary to enter and to be successful. While there are significant advantages to this status, including flexibility, there are also disadvantages including the lack of clarity in how to enter or advance within the field. We use the term *informal learning* to refer to professional learning that is not required or standardized but is deliberate and self-directed, such as a competency framework might support.

Competency frameworks can provide clarity to those who want to enter or advance within the field. They can help individuals pinpoint the learning that is important and to learn at their own pace (Johnstone and Soares 2014). They can help organizations and institutions be more strategic and deliberate in planning professional development or in crafting job description and communicating qualifications (Rothwell and Graber 2010). They might encourage more collegiality and a sense of professional identity which might encourage more societal recognition.

We believe that competency frameworks can advance the effectiveness, efficiency, and impact of the informal learning field without compromising the values, principles, and practices of informal learning. However, there are also a lot of questions about the efficacy, effectiveness, and practicality of frameworks. One of the most vexing questions that frameworks face is how to validate or document competency. Without assessments or standardized preparation, how does an individual know they have achieved a particular competency? How would employers recognize a particular competency in a job candidate? Some competency frameworks use a peer review system to observe an individual's performance and offer certificates or documentation of demonstrating a set of competencies in practice. Some frameworks are associated with workshops or other resources around a particular suite of competencies. In our work developing the ISL Professional Competency Framework, we are developing indicators for each of the competencies and we are studying what type of evidence would be flexible but not overly subjective and we know other organizations are working on similar challenges.

In reviewing frameworks, we found anecdotal and some empirical evidence of the use and presumed value of these models of professional learning, including membership numbers, participation in credentialing, and references to the frameworks in the literature of the various organizations. However, we found very little empirical research on the impact of these frameworks on individuals or on the field and we advocate for strategic, deliberate discussions and research around frameworks as a whole and on the components and the mechanisms for using frameworks. With the range of frameworks and different approaches to implementation that are in place, the time is ripe for research to build a theoretical and practical base for developing concepts and practices around professional learning within the fields of informal learning.

The field of informal learning has developed a robust body of literature about the processes, products, characteristics, benefits and barriers to informal learning. Arguably, the field is well situated to advance the limited research about how professional learning can be individualized, self-directed, and aligned with the principles and practices of informal learning. We propose addressing the following questions through research, dialogue, and thoughtful, field-wide deliberation.

(1) Are there valid and reliable mechanisms for recognizing and validating competencies developed through self-directed learning?
(2) In what ways might professional competency frameworks expand the pathways into and across the field for workers that reflects the increasingly diverse demographics of our society?
(3) Does advancing the competency of individuals lead to greater resilience, efficiency, and impact of the field?
(4) Will stakeholders engage with and benefit from a model of professional learning that is grounded in the self-directed approach?
(5) In what ways could a professional competency framework aggregate the work of the disparate professional development efforts across the field?

Summary

The word profession is a complicated term that is ambiguous in its meaning, potentially biased in practice, and according to some, antithetic to the dynamic realities of today's work. While professions have most often been associated with positive societal values, such as craftsmanship and public value, they have also been criticized for flattening standards and limiting equity and diversity in workplaces. Within the field of informal STEM learning, there has been a long-standing debate about whether we are a profession, even though many of the assumptions and practices of professions run counter to the core principles and values of informal learning. There is an opportunity and arguably, a responsibility for the ISL field to reconceptualize the definition and expectations for 'being a professional' in today's complex, diverse, and challenged world. Competency frameworks may provide a decentralized, self-directed path for individuals that may circumvent the limitations of centralized control over who enters and how they are prepared. Research efforts have successfully described the body of expertise, or competencies, that are the foundation of the occupations served by these frameworks. Additional research is needed to assess the viability and the impact of these frameworks on the perceptions, the practice, and perhaps even the compensation for these important areas of lifelong learning.

Disclosure statement

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Notes on contributors

Kris Morrissey, PhD. Morrissey's career has focused on the intersections between museums, learning, higher education, and social change. She was formerly the Director of the Museology Graduate

Program at the University of Washington. She is now an independent researcher and a principal investigator on the ISL Professional Competency Framework research team.

Joe E. Heimlich, PhD. Heimlich has worked in environmental education, specifically in environmental learning in informal settings, for more than 35 years. He is currently Senior Director of Research at COSI and a researcher in COSI's Center for Research & Evaluation. He is also an Academy Professor Emeritus at Ohio State University

Dennis Schatz is Senior Fellow at the Institute for Learning Innovation in Portland, OR. He is currently serving as Retiring President of the National Science Teaching Association (NSTA) and is active in the Association of Science and Technology Centers (ASTC) and other professional organizations. He is the author of 25 science books for children and is also co-author/editor of several curriculum resources for teachers.

ORCID

Kris Morrissey 🔟 http://orcid.org/0000-0003-0948-3216

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