Perspectives on Informal Learning: Cross-Disciplinary Concepts and A New Venue for Adult Education

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Abstract: Informal learning is a canonical concept in adult education but is used differently in other disciplines. We explore those differences and describe a new opportunity for adult education.

Keywords: STEM, informal learning, nonformal learning, national science foundation

Informal learning is a canonical concept within the field of adult education, yet the term is conceptualized and applied differently by other academic disciplines. As part of an effort to build connections across disciplines and increase funding opportunities for adult education research and practice, this paper has two purposes:

- Explore the ways in which informal learning is defined and used by the NSF, the projects it funds, and related disciplines, in comparison to the ways the field of adult education defines and uses the terms.
- Present evidence of opportunity for adult education at one type of informal learning site, biological field stations, as supported by empirical research.

Comparisons of the Usage of Informal Learning

Informal learning was originally defined by Coombs, Prosser, and Ahmed (1973; and subsequently refined by Coombs, 1985), later grounded in the workplace learning research of Marsick and Watkins (2015), and conceptually extended or elucidated by numerous others (e.g., Eraut 2000, 2004; Colley, Hodkinson & Malcolm, 2002; Manuti, Scardigno, & Morciano, 2015). Commonly understood within the field of adult education as "the experiences of everyday living from which we learn something" (Merriam, Caffarella, & Baumgartner, 2006, p. 24), informal learning is often neither intentional nor structured. Typically, informal learning is compared to formal education, such as university coursework. In addition to formal and informal learning, nonformal learning refers to "organized activities outside educational institutions, such as those found in community organizations, cultural institutions such as museums and libraries, and voluntary associations" (Merriam, Caffarella, & Baumgartner, 2006, p. 24). Informal and nonformal learning both typically both occur outside of mandatory or credentialed programs, with a key difference being the intentionality and structure of nonformal as opposed to the incidental or spontaneous quality of informal.

In contrast to the differentiation among formal, nonformal, and informal learning in adult education and related fields, other disciplines and organizations with educational interests use the terms differently. Given such inconsistencies, it is necessary to translate terminology for the purpose of collaboration and scholarly connection. In the following sections, we explore the use of the terms in science, technology, engineering, and mathematics (STEM) education, environmental education, and adult education.

STEM Education

In the United States, the National Science Foundation (NSF), a major federal funding agency, describes informal learning as ubiquitous and encompassing elements of what the adult education discipline considers both informal and nonformal learning. From the description of the NSF's Advancing Informal STEM Learning (AISL) program, the NSF conceives of informal STEM education broadly, stating "almost any environment can support informal science learning, such as a home, a museum, a library, a street, or a virtual or augmented reality game" (NSF, 2017, p. 4). The NSF's presentation of informal is arguably a combination of informal learning and nonformal learning. For example, AE scholars may consider a structured learning opportunity at a museum or library as a nonformal opportunity rather than informal, while both disciplines might agree that learning on the street is most likely informal. Certainly informal learning could also take place in a library or museum, but the NSF description places the emphasis on informal and encompasses contexts that likely also deliver programs that would be considered nonformal by the adult education definition.

Further, some STEM education literature presents formal and informal as the only two possibilities. For example, Stocklmayer, Rennie, and Gilbert (2010) refer to formal and informal learning as two different sectors of learning, in which formal learning occurs in school environments, and informal learning takes place outside school environments. Some studies have attempted to define informal learning but these descriptions focus on the *context* of the learning and not the *nature* of the learning (e.g., Stocklmayer et al., 2010). There appears to be less acknowledgement of breadth of types, structure, or environments in the STEM learning literature as compared to adult education.

Environmental Education

Environmental education has typically focused on reorienting children's formal education (e.g. Knapp, 2000) toward informal and nonformal approaches for learning about sustainability and environmental concerns (e.g. Carleton-Hug & Hug, 2010; Powers, 2004). As a key component of environmental education, Knapp (2000) discusses the need for environmental education and education towards sustainability to include "all levels of formal, non-formal, and informal in all countries" (p. 39). In environmental education, a related but distinct use of informal and nonformal education is widespread. Guevara, Whelan, and Flowers (2009) posit that the use of nonformal instead of informal normally refers to a difference in sponsorship and setting, not content or structure, and they argue that informal learning should be defined more by a form of pedagogy than previously described in the literature.

Although children have been the focus of much of the research and action surrounding environmental education, an understanding of the need for adult nonformal environmental education is not new (Slattery, 2000; Knapp, 2000; Guevara et al., 2009). Slattery (2000) suggests that adults are more active in the community than children, and they have more of an ability to organize and advocate for change. There are doubtless many examples of calls for adult environmental education most of which occur in informal or nonformal settings (e.g., Slattery, 2000; Knapp, 2000; Guevara et al., 2009). Yet, despite the repeated calls for research and action, Guevara et al. (2009) emphasize the ongoing need for more documentation, description, and evaluation of the informal environmental education efforts geared towards adults, and their subsequent impacts. Field stations represent locations where this research on adult environmental education programs could be studied in depth, but current and ongoing efforts do not yet meet the needs of the field.

The Value of Place in Informal and Nonformal Learning

Adult education perspectives on informal learning typically embrace the workplace as the context of such learning. The individual and organizational need for people to learn while in the

workplace creates an inherent value in the workplace as the informal learning site. Informal STEM learning, such as that advocated by the NSF and embedded in environmental education, shares this quality and values place in the sense that sites of informal learning, such as museums, libraries, and biological field stations are supported through federal funds. In both the workplace and sites of STEM and environmental learning, the opportunities may be very broad, including both structured, intentional learning, and the incidental learning that derives from simply being exposed to new knowledge, information, or contexts. Thus, we have an opportunity to build from adult education perspectives to add additional depth and clarity to the conversation around informal STEM and environmental learning. In the following sections, we focus on one such site of STEM and environmental learning—biological field stations.

Methodology

Biological field stations are sites of natural or scientific interest, often associated with universities or national parks, where scientists conduct research and create opportunities to engage the public through outreach of some kind. We designed an exploratory online survey asking biological field station personnel to report on their resources and provide details on up to five outreach activities they offer.

Survey Instrument

In addition to basic contact information, the survey included five short-answer, six open-ended, five yes or no, five multiple-choice and two percent-estimation questions asking about field station mission, purpose, funding, affiliations, and size (e.g., numbers of personnel, annual outreach budget, resources, and numbers of visitors or program participants). The survey also asked for key features of STEM activities, including the target audience, the STEM content area, the curriculum design, and implementation strategy.

Participants

We recruited respondents by email via the Organization of Biological Field Stations (OBFS) member list and in person at the 2016 OBFS Annual Meeting. The person who completed the survey was always someone with a thorough knowledge of the station's outreach activities – usually a field station director, an outreach or education coordinator, or conservation specialist. Representatives of 25 U.S. field stations responded, comprising 6% of U.S. field stations.

Analysis

Descriptive statistics were used to summarize responses to short answer survey questions. Data derived from responses to open-ended questions were analyzed using a content analysis process (Merriam & Tisdell, 2015) in which responses are broken down into units (unitization) to examine their content and meaning. A multi-coder approach was applied to ensure the confirmability and dependability of the analysis (Lincoln & Guba, 1985). Based on its content, each unit was assigned a code by two researchers working independently. Some codes were established *a priori* based on the research questions and other codes emerged as part of the analysis process. The researchers then met and discussed the items on which they differed and the exact meaning of the codes until consensus was reached. The outcomes of the analysis are presented in detail in the following findings section.

Results

Of the 25 field stations included in our survey, 22 had dedicated funding for outreach programs and paid staff to conduct programming. Of the paid staff, many also have other management responsibilities and are not professional educators. The 25 field stations reported on a total of 73 outreach programs. Of those programs, 18 (25%) specifically targeted adult audiences (ages 18 and older) and reported engaging over 11,000 participants annually. Among the 20 programs (27%) appropriate for all ages, field stations reported engaging another 22,000 participants (many of whom were likely adults).

The programs for, or including, adults varied widely in structure and topic. Some programs relied on informal learning, such as those associated with casual interactions between participants and scientists or environmental experts. Other programs applied a more nonformal approach, delivering structured but voluntary learning opportunities such as one might see at a zoo or museum. Examples illustrating the variety of structures and topics include: lecture series on natural history or science research at the field station; guided nature walks; citizen science projects, in which laypeople support science research by collecting or processing data; volunteer trainings for environmental restoration or protection projects; and classes on nature hobbies, such as birding or collecting edible mushrooms.

Discussion, Conclusions, and Implications

There is a substantial opportunity for adult educators to engage with and support the outreach activities of biological field stations. These venues provide STEM and environmental educational programs outside formal or other commonly understood venues, and beyond the typical P-16 context. Results from the survey indicate an opportunity for adult education scholars and practitioners to become more involved in informal STEM learning, as conceptualized by the NSF, and through the AISL program in particular. Beyond those included in the survey, many other field stations likely conduct similar kinds of outreach programs, presenting a significant opportunity to engage adult learners. Within that opportunity to engage are mutually beneficial prospects to build scholarship and effective practice around adult learning at field stations and other informal STEM sites. Further analysis of these programs offered at field stations could provide valuable insight into informal (and nonformal) learning in contexts other than the workplace.

Despite the merging of the terms informal and non-formal within the NSF program information and some STEM learning literature, we see a potential augmentation or broadening of the concepts in the literature rather than a competing paradigm. The true strength of informal learning, in our view, is the inextricable connection to place and the opportunity that connection creates for participants to be centered in the learning process. The connection to context and place is a shared priority within adult education and informal STEM learning, creating a new venue for the application of adult education expertise. Field stations present a unique opportunity to disseminate STEM knowledge and better understand the value and impacts of environmental education for adults.

As previously discussed, Guevara et al. (2009) emphasize the ongoing need for further investigation of informal (and nonformal) environmental education efforts geared towards adults, and their subsequent impacts. With over 400 field stations in the United States, there is a tremendous opportunity to explore this context and build a substantive data set on informal and nonformal educational outreach opportunities at field stations. Even though field stations are similar to national parks in the types of informal (and nonformal) education they provide for adults, little has been studied about the value of these programs. Thoughtful study and analysis of field station outreach programming could provide insight into the impacts of adult environmental education on the participants' behaviors, values, and attitudes. Building and making use of such a dataset would not only provide the opportunity to examine adult STEM and environmental education on a much larger scale, but it also opens our discipline up to additional avenues for potential collaborations and funding resources.

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