

Broadening Participation through Scaffolding

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Abstract: This research project aims to examine how participation in authentic community-situated science contributes to adolescent apprentices' sense of the scientific enterprise and identity development in this discipline. Using a theoretical framework based on the current research perspectives on informal science learning, learning science in the context of the local community, and research on communities of practice, we examine how apprentices develop an identity in science while also strengthening ties to their own community.

Issues Addressed

Our research follows adolescent youth through a year-long community-based science apprenticeship program (CBSA), composed of their peers and members of an oceanographic lab on a large university campus in the Pacific Northwest. The program aims to positively influence the learning trajectory of adolescent apprentices from groups that are underrepresented in the sciences; engage the local community in scientific inquiry through community relevant, researchable questions; and cultivate and showcase the scientific skills and interests of the youth apprentices through presentations of findings through public venues. The guiding research questions are: How does the identity of individual apprentices as science learners shift over the course of their participation in a CBSA? How does their sense of the scientific enterprise change?

Potential Significance

Understanding how adolescent apprentices begin to solidify a scientific identity while leveraging that identity within their own community has implications for future study design in informal science learning. This research can help to bridge the gap between school and community science and provide a new framework for practitioners, as well as for future research.

Theoretical Framework

In order to serve as a bridge between school and community, informal science programs must be culturally-responsive, utilize cognitive apprenticeship models, and focus on authentic, interrelated science practices.

The program should be tailored to the needs, interests and values of the local community (NRC, 2009). Project stakeholders partner to identify specific mentoring supports, educational experiences, and research activities. The focus on youth science learning in CBSA is based on prior approaches taken in ocean science education research (Tzou, Scalone & Bell, submitted).

CBSA is premised on a cognitive apprenticeship model in which novices develop an understanding of disciplinary thinking and practices through scaffolded inquiry, structured feedback, and guidance from more expert mentors (Collins, Brown & Holum, 1991). Participation in bona fide ocean science research projects associated with a university-led citizen science effort allows apprentices to identify and investigate hypotheses of interest to them. Learning trajectories must be considered long-term pursuits associated with deepening participation and emergent problems over multiple years of involvement in disciplinary research and learning (Lave & Wenger, 1991).

CBSA participants include youth from non-dominant groups and scientists who are primarily from the dominant cultural group. Thus, there is a critical need for cultural bridging among participants in order to promote a generative and inclusive educational experience for the youth apprentices (Banks, et al., 2007; Bell, et al., 2006). Educational supports must be responsive and appropriate in order to promote the academic achievement of youth from historically non-dominant groups (Banks, et al., 2007; Gordon, Bridglall & Meroe, 2004).

In contrast to pursuing science "content" and "process" goals as is typical in science standards and curriculum, the current perspective in research on science learning is that goals should reflect an integral vision of interrelated science practices. The notion of science practices outside of school is elaborated in the NRC's (2009) report *Learning Science in Informal Environments* which describes six strands of scientific proficiency in nonschool settings. Focusing on these strands of learning in the informal environment of the apprenticeship program will lead to more equitable participation in the scientific community. Our research focuses most heavily on Strand 1 and Strand 6. These state that in ideal informal learning environments, learners who engage with science:

- ...experience excitement, interest, and motivation to learn about phenomena in the natural and physical world (Strand 1); and
- ...think about themselves as science learners and develop an identity as someone who knows about, uses, and sometimes contributes to science (Strand 6). (NRC, 2009, p. 43)

Specifically, this research addresses these issues by examining apprentices' identity as science learners through analysis of their participation. We are exploring the ways in which participation in authentic community-situated science contributes to the apprentices' sense of the scientific enterprise and sense of identity regarding science.

Data Collection

Data collection will include three parts:

- Baseline, pre interviews with participants about their familiarity with water quality, their interests in environmental science, and their academic and career goals science.
- Videorecording of social interactions. The primary data collection activity of the study will consist of videorecording the youth apprentices across settings of the scientific work: in data collection, analysis and interpretation, and in public events related to disseminating findings. As we are interested in how participation in particular scientific activities relates to understanding the scientific enterprise and identity in science, we will conduct systematic discourse analysis on this video data. We employ a theoretical framework premised on "professional vision" (Goodwin, 1994), "distributed cognition" (Hutchins, 1995), and "collaborative repertoires of practice" (Barron et al., 2009).
- Delayed post-interviews approximately three months after the end of the year-long apprenticeship. We will document post-apprenticeship learning, apprentices' interest and sense of identity in scientific research.

Research findings are still emergent. Initial insights suggest that apprentices see only vague connections between science and their local communities. Their understanding of science is that it is something that happens in a classroom or a lab and requires expertise in specific scientific domains. We anticipate that through participation in this program, this distinction will begin to blur- that apprentices will begin to recognize their place in the scientific community, and the science in their local community.

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