Bridging Multiple Ecologies to Support and Research Learning in Contested Spaces

Joanna Weidler-Lewis, The Pennsylvania State University, jrw96@psu.edu
Cynthia Graville, St. Louis University, cynthia.graville@slu.edu
Mary Gould, St. Louis University, mary.gould@slu.edu

Abstract: This poster presents a theoretical and methodological framework for studying complex phenomenon and organizing for learning in contested spaces. A contested space challenges assumptions about power, privilege, and possibility. Our early-stage work is designing a family maker space in a minimum-security prison to support STEM pathways for incarcerated women and their children. In order to design for - and research learning - from an equity perspective, multiple "ecologies" are drawn from that we argue are applicable to other contested spaces, further supporting learning for vulnerable and marginalized populations.

Introduction and background

Our early-stage research project, STEM Ecologies of Learning for Families (SELF), foregrounds the expertise of currently incarcerated women as both makers and mothers as we develop a family maker space in prison. A women's prison is a highly-contested space challenging the scope of STEM-for-all initiatives; it challenges both our notions of who "deserves" education and whose voices are privileged in designing learning opportunities. For Learning Scientists who want to move forward with "equity-oriented" making practice and expand the work being done (e.g., Vossoughi, Escudé, Kong, & Hooper, 2013; Schwartz & Gutiérrez, 2015) to other contested spaces and for vulnerable populations, our theoretical framing and methodological approach to learning research and design must reflect the complexity, power, and possibility inherent in these spaces. This poster presents our framework for undertaking such an endeavor.

Ecologies of STEM, cognition, and research

SELF has three key ecological frameworks that reflexively support each other: ecologies of STEM, cognition, and research. We use the term "ecology" to represent how all learning processes are interrelated and dependent on the people, tools, and disciplinary practices under investigation.

First, this project is focused on creating a STEM ecology that recognizes both horizontal and vertical movement within STEM activity. Horizontal movement refers to the ways in which everyday practices can be leveraged toward more expansive forms of learning (Engeström, 1987; Gutiérrez & Vossoughi, 2014). We examine how incarcerated women can connect their and their children's everyday practices to STEM practices, widening the possibilities for what can be seen as STEM. At the same time, opening the possibility for a range of STEM practices, also allows women and their children to take interest in particular STEM activities and support their movement into more focused and deeper learning in particular practices, or the vertical dimension of learning (Engeström, 2003).

Second, SELF is grounded in sociocultural theories of learning in that we view learning as socially organized, dialogic, and relying on cultural tools. While the role of individual cognition has been deemphasized in social practices theories of learning, we argue that cognition plays an important role in the mutual construction of persons and practices (Packer, 2010). Tools, including making activities, are cognitive artifacts that carry and elaborate information for us (Norman, 1991), they are also reflections of our thinking. Neither the tool, nor our thinking can be separated from the cognitive ecology under study (Hutchins, 2010). It is important to recognize how people shape and are shaped by their technology use (Bowker, et.al, 1997; Hollan, Hutchins, & Kirsh, 2000). Tools not only afford participation, they can potentially limit the identities available in a practice.

Lastly, our project represents an ecology of research. As researchers, we are aware that dominant forms of research often reproduce power-laden relationships between the researcher and "the researched" that need to be interrogated for whom – and with what consequences – the knowledge gained from research is generated (Gutiérrez & Penuel, 2014; Esmonde & Booker, 2016). We draw on principles from participatory design research (Bang & Vossoughi, 2016) to acknowledge the expertise of our participants including incarcerated women, STEM professionals, and the researchers. Our ecology of research is a partnership with all involved to "extend the notion of the so-called 'expert' to encompass a wider range of stakeholders" (Dimitriadis, 2008). For this reason, not only are our research questions jointly negotiated with our participants, our participants are co-designing family maker activities, as well as constructing and analyzing research data.

Discussion and significance

Enlisting incarcerated women as co-researchers is not new (e.g. Fine et al., 2003); however, leveraging the expertise of incarcerated women as makers and mothers is. This project has implications for research involving making and the underrepresentation of women and vulnerable populations in STEM disciplines, as well as the ways to support STEM identity development. However, we argue that our theoretical and methodological framing extends to all spaces where dominant ideas regarding disciplinary learning, cognitive agency, and the researcher as epistemic expert are present. Furthermore, if we interested and committed to designing for learning in a truly equitable manner, as many of the STEM-for-all initiatives claim, then our theories and methods must encompass this as a possibility. In our work, we are attempting to create an equitable design of learning locally for incarcerated women and their children that will extend to other communities more broadly (Gutiérrez & Penuel, 2014). Understanding the foundations for how this is accomplished supports other equity through learning endeavors.

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