Young Children's Inquiry Within and Across Settings

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Introduction

My research expands representations of young children's (2-8yrs) science sensemaking. Three commitments inform my conceptualization of children's activity: (1) Everyday life makes sense, (2) children draw upon sensemaking resources in their everyday lives that help them understand the world, and (3) a primary challenge for educators is taking advantage of children's existing sensemaking resources while introducing new disciplinary sensemaking practices and ideas. My approach contrasts with approaches that emphasize children's inability, their misconceptions, or "deficits". Instead, I assume that it is the researcher's responsibility to understand the ways that the participants' activity makes sense and is well adapted to their experiences. In this way, my research aligns with asset-based approaches, expanding representations of children's sensemaking repertoires to better understand a broader array of young children's resources for learning science. Additionally, I do not see classrooms as isolated containers, sealed off from the family or the community. I recognize a central challenge for educators is to draw upon children's prior experience, including their cultural repertoires and family sensemaking practices. The result of these commitments is an approach that values all children's sensemaking as a resource for learning science regardless of age, class, race, religion, ethnicity, or language fluency.

Focusing on inquiry to expand resources for science learning

I study young children as they engage in inquiry—*moments during which participants orient to a phenomenon as a shared puzzle and explore that phenomenon by drawing upon sensemaking resources (they deem relevant) to the point of their own satisfaction* (Keifert & Stevens, accepted, Journal of the Learning Sciences). This conceptualization of inquiry was developed using data from the Early Learning Across Contexts project (PI Reed Stevens) consisting of hundreds of hours of video observational data of the same children in families and preschool, and again four years later in families and in elementary school. Here is an illustrative vignette:

> As Catherine (2y 11m) and Dad played in their backyard, Catherine was startled by a bee. Dad asked if she was asking the bee to "give you some honey, please". Catherine and Dad then engaged in a thought experiment. Dad asked, "Catherine if you grabbed a bee and ate it, do you think it would be as sweet as honey?" to which Catherine replied, "yes". Dad asked if she would eat it dead, and Catherine suggested that if it was dead they could chop it up. Catherine oriented to ended inquiry by turning away.

Through imagining eating a bee they explored relationships between themselves, honey which they like to eat, and bees that produce honey in a playful way. Moreover, they explored a situation that in reality would be undesirable (eating a bee) to explore these relations. This moment, and others like it from my prior work, may not seem like the inquiry typically seen in school. However, it is inquiry as a members' phenomenon—defined by participants' activity, rather than a definition managed exclusively by researchers. By examining what participants' count as inquiry, we can better recognize sensemaking resources children find relevant to exploring the world. For instance, in the moment above, Catherine and Dad engaged in a thought experiment about eating a bee to explore their relationship to bees and honey. By understanding what children think inquiry is and how they engage in inquiry, researchers and teachers make space for children's competence, and are better positioned to recognize and draw upon that competence for learning.

Recognizing children's competence prepares researchers and teachers to take advantage of children's sensemaking repertories. The Science Through Technology Enhanced Play project (STEP; PIs Noel Enyedy, Joshua Danish) does that by privileging resources that are familiar to children, but which are often overlooked as productive for science disciplinary learning: collaborative play and imaginative embodiment. STEP supports students to imaginatively embody water particles in our physical sciences unit (states of matter), and bees in our biological sciences unit (bees, flowers, and pollination). Once they take on this imaginative identity, they explore a mixed-reality environment, allowing them to learn science concepts through iterative cycles of student-driven inquiry. My analyses of STEP extend my previous work, showing how even very young children can learn about complex science phenomenon when supported to draw upon familiar sensemaking resources (Keifert, Lee, Dahn, Illum, DeLiema, Enyedy, & Danish, 2017; Keifert, Enyedy, Dahn, Lee, Lindberg, 2018).

Family culture

Through further analysis of ELAC data I conceptualize *family culture* to explore how families engage in particular inquiry practices (Keifert, under review). I draw on M.H. Goodwin's *family ethos* (Goodwin, 2007) and Nasir, Rosebery, Warren, & Lee's *culture* (2006) to define *family culture* as constellations of practices in families, nested within larger cultural communities. For instance, while Catherine engaged in a particular kind of thought experiment in her family inquiry practice, thought experiments more generally are common in scientists' professional practice, a community to which her father belongs. In this way, Catherine's family practice is embedded within a broader constellation of practices of her father's professional community. Like larger communities of practice, families are locally organized cultures. In my analyses, I show how young children transform their world into culturally-relevant activity (C Goodwin, 1994; C Goodwin, 2017), and are seen by others in their family community as competent inquirers (Keifert 2012, under review). However, members of other communities may not share their understanding of practices and competence.

Connecting learning across settings

This nested nature of culture has implications for supporting children to learn as they move across settings. My prior work documented the family sensemaking practices of Catherine and her classmate Charlie and examined how these practices were differentially afforded in interactions with their teachers in their preschool classroom (Keifert, 2015). Charlie often attempted to engage teachers in inquiry of story narratives by asking questions like "Remember what this was like when this happened?" Several of Charlie's teachers engaged with him in response. However, Catherine attempted to engage others in her family practice of thought experiments by asking questions like "Imagine what this would be like if this happened?" just as she did with Dad and the bees. A series of these attempts about crickets were rejected ("What if the crickets got out?"), one after the other, by her preschool teacher. Even though both children shared a similar socioeconomic and cultural background (white, middle class), one encountered more difficulty in drawing on her family practice. In a conference paper that won best student paper award at the International Conference of the Learning Sciences (Keifert, 2012), I argued Catherine's family inquiry practice was constrained because there were few adults in the classroom who engaged in this form of imaginative exploration. Teachers' roles here are critical for supporting learning across settings.

This work illustrates that mismatches between cultural communities' practices across home and school settings have profound implications for children's experience—children may give up on trying to engage in familiar practices, may be told their practices are inappropriate or bad, or they may even be constructed as bad or problem children. After four more years of schooling, Catherine (age 7) articulated to me having abandoned attempts to engage in her family inquiry practice at school altogether, yet she was not constructed as a problem child by her teacher. Furthermore, she felt comfortable claiming that her own family activity more closely resembled science than what happened in school (she engaged in "experimenting" at home while at school it was just "testing" where "the teacher knows what's gonna happen"). A nested understanding of culture helps to articulate both the constraints on her family inquiry practice, and the protective layers of culture at the level of her father's professional science practice and her membership in white middle-class culture. Thus, an understanding of culture as nested positions researchers to recognize the constraints and affordances of culture at multiple levels for children as they move within and across settings for learning. This understanding also prepares researchers and teachers to better design to support children to develop horizontal expertise (Cole & Gajdamashko, 2009) as they move across learning settings.

Designing learning environments that privilege family practices

In future work, I hope to develop partnerships with teachers and families in a diversity of communities. I am interested in exploring how to create contexts for very young children from nondominant communities to share their family practices, and professional learning for teachers to support their noticing of these practices. Historically, classrooms have been created with expectations that children learn the canonical versions of disciplinary practices. Furthermore, extensive research in the learning sciences has illustrated that the sensemaking resources of children from nondominant communities is often excluded as non-scientific and non-academic (see Warren, Ogonowski, & Pothier, 2005 for thorough discussion). However, by supporting teachers to notice and value children's family inquiry practices as resources for science learning, I hope to shift classrooms into spaces for collaborative learning that privileges these resources.

In collaboration with families, I will document and explore a wide variety of children's competencies in engaging in family sensemaking practices. I will also develop video clubs and other professional learning opportunities to support teachers to notice and draw upon children's family sensemaking practices within

classrooms. In collaboration with teachers, I hope to develop learning opportunities that are (a) aligned with Next Generation Science Standards and/or state standards for science, (b) create opportunities for children to engage directly with scientific phenomena, (c) create interactional spaces that support children to draw upon family sensemaking practices and their cultural repertoires of practice, and (d) support children to learn with and from classmates. Through reflection and analysis with teachers, I hope to collaboratively design learning environments for young children that support bridges between home and school rather than barriers. This future research agenda is where the power of my commitments and my prior research and experience will combine to allow me to reconceptualize classrooms to empower all children, particularly those from nondominant communities, to learn through connected experiences across home and school.

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