

Fam Jam STEM: Fostering Rightful Familial Presence in middle school STEM

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Purpose: This study investigates research and instructional practices that support *rightful familial presence* in STEM to address the continued racial/class inequities in STEM learning. We ask: *What practices grounded in research-practice-partnerships support rightful familial presence, and how do these practices facilitate capital movement between families and schools for STEM teaching and learning?*

Framework: A macro-structural inequality in STEM education for youth of Color is how parents/families are valued in school settings. Most models of parental/familial involvement are rooted in White, middle-class power structures that reproduce racial/class inequalities (Paredes-Scribner & Fernández, 2017), and obscure familial social/cultural capital (Delale-O'Connor, 2019). Deficit thinking and narrow views of what is considered involvement of parents of color limit interactions between schools and parents (Marchand et al., 2019). Studies are needed on how parents of Color can be rightfully invited to contribute to STEM learning designs and how teachers can be supported in leveraging their contributions (Stoehr & Civil, 2019). We need to explore how to activate parental funds of knowledge (2006) and familial community wealth (Yosso, 2005) into school and STEM-relevant capital in ways that simultaneously elevate and amplify its role in STEM teaching and learning.

We ground our work in the Rightful Presence Framework for justice-oriented teaching/learning (Calabrese Barton & Tan, 2020), and Yosso's (2005) Community Cultural Wealth. *We define rightful familial presence as a form of authentic family engagement that legitimizes families' community cultural capital, and fosters capital movement between families and schools, especially when these forms of capital have historically been marginalized within STEM learning.*

Research Questions: What are parents/families' experiences throughout the FAM JAM STEM collaborative project approach? What are the impacts of specific experiences on the relationship between parental presence and students' STEM learning?

Methods: Drawing upon DBIR with researchers, teachers, parents, and youth in two urban school districts, we enacted the Rightful Familial Presence in STEM (FAM JAM STEM) project, through four collaborative activities: 1) Exploring familial capital for STEM learning, 2) Curricular explorations/adaptations through parental capital, 3) Enactments, and 4) Reflective Dialogues. Parents, youth, teachers, and researchers engaged in co-design meetings for activities 1 and 3. Classroom enactments (3) then followed, and Reflective Dialogues (4) included interviews with parents, youth and teachers during and after the classroom enactments.

In addition to participating in pre-enactment sessions, we studied 4 classrooms in two settings, taught by partner teachers. Teachers focused on a life science unit (Stressed!) in one state and an engineering unit (Sustainable Communities) in another. Classrooms were visited daily for 6-week enactments of two units: Sustainable Classrooms & Stress. Data sources include: Student practical measures (e.g., feedbacks via electronic exit tickets); classroom observations; teacher reflections; student work (e.g., sketches and artifacts); teacher, parent, and

student interviews. Analysis involved multiple stages and levels of coding based on constant comparison procedures.

Findings:

We identify two cross-cutting practices (both settings/units) that created spaces for authoring familial presence in STEM learning, even when parents were not physically present during classroom enactments. These cross-cutting practices were threaded through the pre-enactment co-design meetings (involving parents, youth, teachers, and researchers) and the subsequent classroom enactments of the curricular units.

We also discuss tensions in these change-making efforts, in relation to shifting normative practices/perspectives of parental engagement and familial capital in STEM.

Cross-cutting practice 1: *Rooting/tending to emergent STEM epistemologies in familial values/wisdom*: Youth and families centered their experiences, expectations, and aspirations during co-design meetings. For example, they expanded the definition of sustainable communities to include “loving” and “respecting” in addition to more canonical ideas such as localizing community input and drawing from community expertise. Teachers grappled with how to include “loving” as an engineering criterion and turned to students to operationalize it in their electric art projects and applied these insights to the sustainable classrooms challenge. We share sample artifacts and trace the thread of rightful familial presence from ideation through the iterative engineering prototyping process.

Cross-cutting practice 2: *Storying ourselves into STEM*: During co-design meetings, parents described children’s school-related embodied stress and how their stress impacted both their schooling and family life. These stress stories became a central theme to the Stressed! curriculum that was subsequently enacted: 1) Students produced school-stress maps, designed a key to indicate where, how, when, and what they experienced/witnessed stress; 2) Students conducted a community survey to further map their stress school-scape that included factors like racism, bullying and school disciplinary measures as well as specific spatial locations in the school grounds; 3) The 4 youth who were part of the co-design team in one state collaborated on writing their stress story as a curricular resource that was part of the Stressed! lessons; 5) Students created a 60-to-75 second Public Service Announcement educating their peers about stress at their school. Teachers who enacted the Stressed! unit were challenged to connect this local, authentic focus on the sociopolitical environment of their students in the everyday transition from home to school life, to teaching long-term stress models on the body.

Across the two practices, we trace how rightful familial presence was evident in what kinds of activities during the co-design meetings and then in curricular classroom enactments. We conjecture on how such an arc across time and space supported a form of rightful familial presence in STEM teaching and learning and the implications of such. We also discuss tensions that arose, including how teachers negotiate the FAM JAM STEM activities in their classrooms.

Significance: Parents of Color have historically been marginalized in school-parent interactions in disciplinary-consequential ways. This study provides insights into how rightful familial presence in STEM might be infrastructured and supported through design-based implementation research, and how teachers learn to grapple with the emergent tensions. The study’s implications contribute insights to advancing justice-oriented STEM teaching and learning.

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