

I Don't Do Science: Urban Minority Girls' Science Identity Development in an Informal Authentic Science Context

Abstract: Urban middle school girls participated in a 10-week voluntary, after-school science club, Science STARS, designed to foster positive science identity development through collaborative, authentic science experiences, culminating in recognition of this work among peers and community members. This study explores the specific roles and paths five participating girls took through STARS as they developed a more positive scientific identity and the role of the facilitators in that development.

Introduction

Urban middle school girls (N=60) at three sites participated in a 10-week after school science club, Science STARS (Students Tackling Authentic & Relevant Science), designed to foster positive science identity development as well as developing expertise in understandings of both science content and process. However, there is very little research about what experiences, tools, and other conditions within informal science environments enable this kind of identity development (NAS, 2009), especially within the under-represented population of urban female youth. During Science STARS, participants met weekly to develop and conduct a student-chosen investigation relating to the overarching theme “Shrinking our Ecological Footprints”. As urban middle school girls successfully engaged in scientific discourse that had a perceptible positive impact on their world, they developed a meta-awareness of their possible roles in science, and they were able to see themselves as more interested in the kinds of work being done, the usefulness of the results of science, and their competence as contributors to this work. This study explores the specific roles and paths five participating girls took through STARS as they developed a more positive scientific identity. Each small group is facilitated by pre-service science teachers enrolled in a graduate program that emphasizes reform-based teaching practices in the context of social justice. This study also explores the impact of these facilitators on participants’ identity development.

Literature Review & Theoretical Framework

Recent research suggests that identity development plays a pivotal role in how girls come to see themselves as science learners and contributors (Brickhouse & Potter, 2001). This is particularly problematic for urban middle school girls who often belong to low socio-economic classes and race/ethnicities that have been traditionally under-represented in science (Brown, 2004). There is evidence that girls’ attitudes towards and achievements in science begin to drop during middle school (Atwater, Wiggins, & Gardner, 1995), a particularly important time for developing high school trajectories and beyond (AAUW, 1996). Multiple reasons for this phenomenon have been identified including: girls do not find school science interesting because they do not see its relevance to their lives or communities and perceive scientific work as isolated and non-collaborative (Miller, Blessing, & Schwartz, 2006); girls are marginalized in school science in subtle yet pervasive ways, including differential treatment from teachers, who have narrow expectations about what boys and girls achieve, and from counselors, who make different recommendations about science course selections for girls (Sadker & Sadker, 1994); and social and parental expectations often convey discriminatory messages that preference males and white peoples’ participation in science (Dentith, 2008). The paradoxical reality is that the very discourse that prescribes and thus restricts one’s identity can serve as the context where a person renegotiates a new identity (Holland, Lachicotte, Skinner, & Cain, 1998).

Research Design

An exploratory case-study approach was used to address two questions: In what ways did STARS impact individual participant’s development of a science identity? What features of the learning environment emerged as central for framing girls’ development? Data sources, spanning both emic and etic, included: pre-STARS surveys focused on characterizing participants’ science identity, mid- and post-interviews, weekly participant journals, researcher field notes, and audio transcriptions of STARS sessions. At the conclusion of Science STARS, each participant was showcased in a mini-documentary about the science they studied and their role as scientists. Data analysis was conducted by four science educators considering lenses of identity development (Wenger, 1998; Barton, Tan, & Rivet, 2008), ecological features of given environments that contribute to learning (Newstetter, 2009) as well as through open-coding of emergent themes (Strauss & Corbin, 1990). Major codes focused on girls’ forms of participation, roles of facilitators and environmental features. Codes and categories were triangulated among the four researchers.

Results

Five participants were selected as case studies because they expressed on their surveys views of self as not a science person, not good in science, and/or having no expectations to use science in their future at the start of STARS. They represented the target audience for Science STARS. In the poster presentation we will present detailed data on all five cases. Here we briefly detail two cases, Brittany and India. Both Brittany and India experienced significant shifts during STARS as evidenced by the increased depth of their science interactions. Often these interactions involved shifting from private participation (with a peer or a facilitator) to voluntary public participation. They both also evidenced shifts in identity towards seeing self as scientist, moving from an outsider perspective to an inbound perspective (Wenger, 1998). Specific ecological features (Newstetter, 2009) of STARS' work that contributed positively and in identifiable ways to their development involved the impact of wrestling with uncertainty (key for India), the role of embodied learning (key for Brittany), experiencing agency (key for both), and making room for diverse participation (key for both). In Brittany's and India's groups, the facilitators made room for diverse participation by creating space, advocating for each girl individually, and at times scaffolding participation until the girl in question began to volunteer her involvement. The facilitators also routinely physically engaged the girls with science artifacts, and respected student voices by letting the individual girls' ideas guide the direction of the next session. Lastly, the facilitators' attention (or lack of) to uncertainty in science was significant in the learning environment.

Discussion & Implications

Implications of this work are two pronged. First, the results of this study suggest that future design and implementation of science programs should seek to foster participation among marginalized youth, whose voices are often missing from the scientific enterprise, through 1) authentic science experiences, 2) continued utilization of informal contexts which can replace the high pressure of seemingly irrelevant high stakes testing with a perceptibly more authentic and meaningful high stakes assessment, such as the public documentary, and by 3) capitalizing on the brief window offered by the middle school years as a critical time to nurture a positive view of self as scientist. Second, this research contributes to our understanding of the role of the facilitator to create space for engagement/participation and to instigate/initiate identity transformation. Questions are raised as to how best to support the facilitators to capitalize on the opportunities they have to impact science identity development.

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