



Leveraging the community context of Family Math and Science Nights to develop culturally responsive teaching practices



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HIGHLIGHTS

- Culturally responsive teaching lens focused attention on experiences in the course.
- Family Math and Science Nights emphasized focus on cultural specificity of context.
- Repeated practice is required to disrupt assumptions about teaching science and math.
- Reconceptualized methods course allowed for moments of introspection and awareness.
- Teacher candidates worked with children/families in non-evaluative ways.

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ABSTRACT

This paper examines how elementary teacher candidates experience Family Math and Science Nights with culturally and linguistically diverse children and families. Weekly reflections were analyzed using Gay's (2002, 2013) Culturally Responsive Teaching framework to highlight the process of *enacting* and *thinking* in key areas: (1) Changing attitudes and beliefs, (2) Leveraging culture and difference, (3) Grappling with resistance, and (4) Improving pedagogical connections. An action-oriented focus underscores that teacher candidates need multiple rounds of practice to disrupt traditional notions of teaching and move towards cultural responsiveness. Findings suggest the importance of repeated practice, context, and focused guided reflection.

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1. Introduction

Learning to teach science in equitable and culturally responsive ways has been a central part of the national reform agenda in science education for the past several decades (AAAS, 1993; 1998; NRC, 1996). This reform effort continues with the Next Generation Science Standards focus on equity (NGSS Lead States, 2013; Córdova & Balcerzak, 2015). Banks as cited in Banks et al. (2007) characterize this as a 'demographic imperative' and a call to action in order to address systemic inequities in opportunities and educational outcomes within the educational system (p. 236). To this end, teacher preparation programs must continue to find ways for beginning teachers to develop the skills and mindset to create inclusive and equitable classrooms (Darling-Hammond &

Bransford, 2007; Lee & Buxton, 2010). Gay (2002) suggests that culturally responsive teachers utilize "cultural characteristics, experiences, and perspectives of ethnically diverse students" to engage them in learning (p. 106). In this approach, academic content and skills are "situated within the lived experiences and frames of reference of students, [so] they are more personally meaningful, have higher interest appeal, and are learned more easily and thoroughly" (p. 106). As teacher educators, we are working on how to address this diversity imperative to understand how to effectively engage teacher candidates in developing equitable practices. Recent restructuring of our science teacher preparation coursework has drawn from culturally responsive approaches to investigate how candidates learn to teach "to and through cultural diversity" (Gay, 2013, p. 48).

The classrooms that elementary novice teachers enter may look nothing like their own educational experiences, and learners may have very different needs than the teacher candidates did as

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learners. This discrepancy means educators' preparation for teaching in the 21st century must include a range of diverse needs and backgrounds (Bryan & Atwater, 2002; King, Shumow, & Leitz, 2001; Lee, Hart, Cuevas, & Enders, 2004). Teacher candidates may feel apprehensive about working with culturally and linguistically diverse populations (Song, 2006). It is crucial, therefore, that these novices receive adequate and relevant experience in preparation for their teaching careers. To better serve the children and families in school communities, elementary teacher candidates can learn to understand and value their students' sociocultural and linguistic backgrounds (Lee, 2012). To support this effort, situating the teaching of science in informal settings with diverse children and their families has been shown to be an effective tool in teacher education (Ciechanowski, Bottoms, Fonseca, St. Clair, & de la Hoz, 2015; Gaitan, 2006; Harlow, 2012; Sullivan & Hatton, 2011).

Many teacher education programs have created experiences for candidates to work in diverse settings through the context of multicultural education classes (Amatea, Cholewa, & Mixon, 2012). In these cases teacher candidates are examining work with diverse populations of children using the framework of their multicultural class. Researchers have suggested that this separation of the experience from their other methods classes allows the novice teachers to only examine the issues of working with diverse families in the context of the particular class (Brayko, 2013; McDonald, Tyson, Brayko, Bowman, Delpont, & Shinomura, 2011). Southerland and Gess-Newsome (1999) and others make the argument that method courses need to place teacher candidates in contexts that create familiarity with science content and diverse populations. These experiences allow these beginning teachers to construct meaning around what it means to teach culturally and linguistically diverse children, families, and communities they serve and to more effectively teach science that is inclusive of all learners. Field experiences that integrate teaching science while working with diverse populations provide candidates with the opportunity to examine the concept of culturally responsive teaching outside of the context of school. These experiences may challenge their ideas of science, teaching and learning (Barton, 2000).

This work is part of a larger research project, Families Involved in Education Sociocultural Teaching and Science, Technology, Engineering, and Mathematics (FIESTAS) (Ciechanowski, et al., 2015; Bottoms, Ciechanowski, & Hartman, 2015). In FIESTAS, teacher candidates work with children and families from culturally, linguistically, and socioeconomically diverse populations at Spanish/English Dual Language schools. FIESTAS uses a community-based research approach and involves outreach through partnerships with College of Education, Boys and Girls Club, 4-H Youth Development, Science and Math Investigative Learning Experience (SMILE) program, K-12 school, community organizations and businesses (Ciechanowski, et al., 2015). Our research is situated at the intersection of science teacher preparation, culturally responsive teaching, and out-of-school learning. Candidates worked with culturally and linguistically diverse children and families during Family Math and Science Nights (FMSN), which was embedded in a science methods course where they explicitly addressed what it means to learn to teach science with these learners. This approach requires the teacher candidates to critically examine their assumptions, biases, and privileges. It also requires instructors to be fully engaged by analyzing and sharing their own perspectives and privileges. We argue that the context of Family Math and Science Nights is a way for teacher candidates to use "localism and contextual specificity" (Gay, 2013, p. 63) to begin to understand and process what it means to engage in culturally responsive teaching. We focus on candidates' reflections *before*, *during* and *after* their participation in FMSNs, guided by two research question: (1) How does this course leverage the community context of FMSN to

support the actions of becoming a culturally responsive teacher? (2) How do elementary teacher candidates reflect about developing culturally responsive practices through the specific context of Family Math and Science Nights?

1.1. Family Math and Science Nights as a context

Family Math and Science Nights have been part of other science methods courses (Harlow, 2012; McDonald, 1997) with the intent to engage teacher candidates with children and families in informal settings. Informal science events can help broaden the concept of what constitutes science learning and how children, families and candidates might interact with each other (Harlow, 2012). The informal environment changes the expectations for engagement for children at the events and for the candidates (Fenichel & Schweingruber, 2010). Sullivan and Hatton (2011) describe Family Math and Science Nights as a way to support inquiry and math and science literacy and another venue to engage families in schools. Harlow (2012) incorporated Family Science Nights into her methods course and reported a change in perceptions about teaching science as well as an increased sense about teacher candidates' ability to teach science. In a similar study, McDonald (1997) found that these events provided an opportunity for teacher candidates to engage with families and develop a better understanding of the community in which the children and families lived.

2. Theoretical and empirical perspective

We draw upon culturally responsive teaching (Gay, 2013) as a framework for situating science teacher preparation in the context of Family Math and Science Nights. The following sections discuss a rationale for this framework and its intersections with scholarship on beginning teacher development of critical consciousness, learning contexts, emotions and resistance, teacher reflection, and family engagement.

2.1. Culturally responsive teaching

The FIESTAS Project draws from broad notions of cultural responsiveness that include attention to constructing anti-deficit perspectives, developing critical perspectives, expanding notions of the learner to include family and community, and harnessing the benefits of out-of-school contexts for learning. Gay (2002, 2013) scholarship on culturally responsive teaching provides a broad framework that integrates multiple dimensions of transforming teaching towards equity and inclusiveness. In the last decade, Gay (2013) has written about new conceptualizations of culturally responsive teaching that move beyond extensive portrayals of particular ethnic and racial groups and their experiences to recognize the diversity within these groups and to discuss how educators might teach "through" their experiences in engaging ways (p. 49–50). She argues that teaching children from diverse ethnic, racial, and cultural groups should connect in- and out-of school lives for rich learning opportunities. This type of teaching should focus on equitable learning opportunities and maintain high expectations, meaning that learners have multiple access points, varied approaches to encourage learning, and move successfully towards desired outcomes. The educator should orient children towards one another in work that fosters collaboration and community building. Furthermore, culturally responsive teaching makes advocacy a central tenet and develops children's sense of empowerment and efficacy. Her conceptualization of culturally responsive teaching includes four central ideas, included in the sections below: challenging attitudes and beliefs, grappling with resistance, leveraging culture and difference, and improvising

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