

OUT-OF-CLASSROOM KNOWLEDGE FOR URBAN SCIENCE TEACHING: AN EXPLORATION OF PEDAGOGICAL CONTEXT KNOWLEDGE

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URBAN SCIENCE TEACHER EDUCATION

Teachers must develop the tools to teach their discipline from a social justice perspective. In this study, we explored how beginning science teachers developed these tools through a longitudinal case study of graduates from the Urban Science Teaching Program (USTP), a one-year master's degree program in science education with a social justice mission.

INTRODUCTION

New science teachers face considerable challenges in working for change in urban schools, including instructional norms, priorities, jaded colleagues, accountability measures, and cultures that contradict the instructional practices learned in preparation (e.g. Davis, Petish, & Smithy, 2006). As schools operate within broader social, community, and policy contexts that influence student learning and teacher retention (Greenlee & Brown, 2009; Simon & Johnson, 2015), teachers must accrue pedagogical knowledge that moves beyond the immediate context of the classroom (Matsko & Hammerness, 2014). Even less literature considers these questions from the disciplinary lens of science education.

Research goals:

1. To identify the out of classroom contexts of urban schools that impacted science teaching and learning.
2. To examine the nature of urban science teachers' emerging understandings about how these contexts impact their science teaching.

PEDAGOGICAL CONTEXT KNOWLEDGE

- A distinct domain of science teachers' professional knowledge encompassing the contextually-situated, relational, geographical, and sociocultural aspects of teaching (Barnett & Hodson, 2001; Frykholm & Glasson, 2005).
- In recent years, greater attention in teacher education has focused on context-based preparation to better prepare teachers for urban education (e.g. Cochran-Smith, 2004).
- We utilize a geographic perspective of pedagogical context knowledge (Matsko & Hammerness, 2014). The layers include: 1) federal/state context, including standards and accountability; 2) district context, referring to local policies and procedures; 3) local culture and diversity; 4) local geographic context, referencing historical, political, social, and physical features; 5) public school context, referring to the broader history of public schooling, current institutional structures, and perceptions of the profession; and 6) student and classroom context.

METHODS

- Participants: 25 alumni of the Urban Science Teacher Preparation (USTP) program (a pseudonym), a one-year MEd program emphasizing social justice. Teaching experience ranged from 1 to 7 years.
- Data sources included:
 - Survey in 2017 about teaching experiences including Likert-scale items and open-ended items
 - Individual interviews (spring of 2012 and 2018)
- Analysis was guided by the geographic framework of pedagogical context knowledge (Matsko & Hammerness, 2014). Inter-rater reliability was .96, in the excellent range for near perfect agreement.

FINDINGS

- *Survey* results indicated science teaching beliefs and practices aligned with USTP goals; however, their beliefs about the ability of teachers to make a difference were lower, as was their rating of pedagogical context knowledge compared to other domains of teacher knowledge. The reasons for changing schools or jobs were most often due to school-based contextual factors.
- *Interview* findings indicated approximately 50% of their discourse about teaching reflected in-classroom knowledge, but approximately 50% are focused on out of classroom contexts (Figure 1). This movement away from the classroom increased with years of teaching experience (Figure 2).

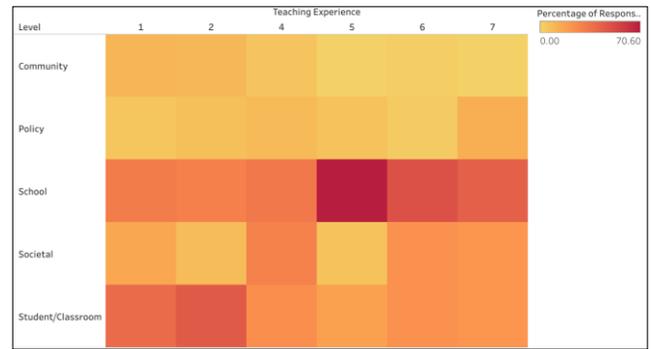
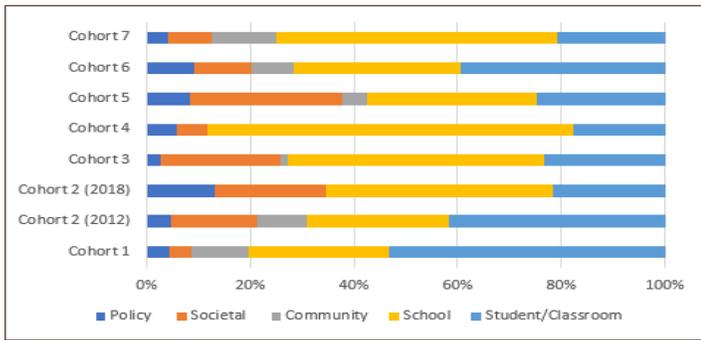


Figure 1: Context layers impacting science teaching.

Figure 2: Context layers identified by years of teaching.

Table 8: Summary of Findings for the Nature of Teacher Contextual Knowledge.

Layer	Theme	Description
School	School	Science teachers developed an awareness of how leadership and school-wide policies, and resource allocation impacted their abilities to provide high quality science instruction.
	Politics	Science teachers developed an awareness of how social power dynamics and interpersonal relations among teaching staff impacted teaching.
	School Culture	Science teachers developed an awareness of the interrelationship between learning science and their own personal lives, motivations, and interests, yet struggled to make these connections with their curriculum and the science content.
Community	Relevance	Science teachers developed an awareness of the social and historical inequalities that impact students' opportunities and access to science and science education but often felt uncomfortable addressing these issues in science class.
Societal	Social Injustice	Science teachers developed an awareness of a divide between policies and the realities and science learning needs of urban students.
Education Policy	Political divide	

DISCUSSION AND IMPLICATIONS

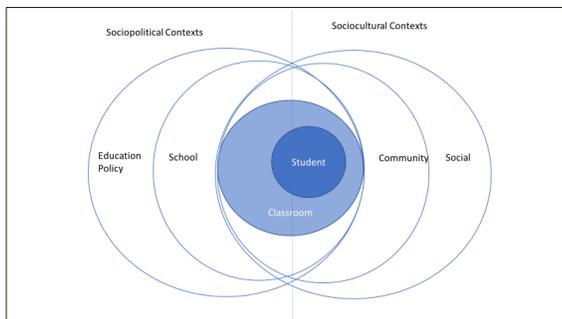


Figure 3: Reconceptualizing PCxK

as a political act (Gutiérrez, 2013). Also, teachers tended to believe science was a-cultural, indicating an emphasis on cultural competence without attention to content and the local community context is insufficient in urban science teacher preparation.

Findings expand and refine the current conceptualization of pedagogical context knowledge, PCxK (Figure 3).

1. *Sociopolitical context knowledge* – Teachers need an awareness of the intersecting layers of education policy (federal, state, and district), their school's interpretation and implementation, and their own instructional priorities based on students and their content.
2. *Sociocultural context knowledge* – Teachers need an awareness of the diverse backgrounds and experiences of students, including focusing on the role of diversity in the classroom and social inequities.

Implications: Although most urban teacher preparation programs integrate culturally relevant pedagogy (Rivera Maulucci, 2010), findings of this study indicate science teaching should be construed

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