Chapter 6
Teaching Nature of Science (NOS) through Cultural Windows:
A Framework for Latinx Preservice Science Teachers

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ABSTRACT

This chapter presents a comprehensive framework for teaching Nature of Science (NOS) to preservice science teachers through cultural windows, implemented through six targeted activities. The framework, developed through rigorous meta-synthesis of NOS literature and analysis of Latinx preservice teachers' autobiographies, integrates Culturally Sustaining Pedagogy (CSP) and Rightful Presence (RP) theories with NOS curriculum elements. This theoretical foundation informs the design of activities: Dolores Huerta environmental justice, Tangram exploration, historical cases, cultural picture analysis, nixtamalization black box, and family-scientist interactions. Each activity systematically maps to curriculum elements while demonstrating how the framework enables cultural knowledge integration in NOS instruction for meaningful, identity-sustaining science education.

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INTRODUCTION

The persistent underrepresentation of Latinx students in STEM fields remains a critical challenge in the United States educational system, with Latinx individuals holding only 9.5% of science and engineering jobs despite representing 18.2% of the total workforce (NSB, 2023). This disparity is particularly pronounced in positions requiring advanced degrees, where Hispanic representation drops to 9% among STEM workers with bachelor's degrees or higher, compared to 20% in technical positions not requiring advanced degrees. While predominantly White institutions have made efforts to increase minority enrollment in STEM, disparities persist due to inadequate support systems and structural barriers (Hurtado et al., 2015; Sowell et al., 2015).

These ongoing educational gaps underscore the critical importance of understanding how Latinx students navigate what Aikenhead and Jegede (1999) describe as "cultural border crossings" between their home cultures and the culture of Western science. Such crossings often require students to negotiate multiple epistemological frameworks simultaneously, creating cognitive challenges that traditional science instruction rarely addresses (Aikenhead, 2001; Costa, 1995). Boundary spanning literature further illuminates how teachers can serve as bridges across these cultural borders, creating "third spaces" where diverse knowledge systems can coexist (Akkerman & Bakker, 2011; Gutiérrez et al., 1999; Moje et al., 2004). These theoretical frameworks help explain why students from nondominant groups often struggle to engage with science presented in ways that conflict with their cultural epistemologies (Bang & Medin, 2010; Carter, 2004).

Research has documented multiple barriers including systemic inequities in educational opportunities (Crabtree et al., 2019), stereotypes about gender and race that influence faculty perceptions (Eaton et al., 2020), and gatekeeping features in introductory courses that disproportionately affect Latinx students (Convertino et al., 2023). These challenges are compounded by feelings of isolation and academic invalidation in STEM environments (Yang & Gentry, 2023). However, studies have also revealed important factors that foster success - Latinx students thrive when provided with strong mentorship, supportive peer networks, and validation of their experiences (Acevedo et al., 2021; Pumaccahua & Rogers, 2023). Furthermore, research highlights how Latinx students actively draw upon various forms of cultural capital to persist in STEM fields, including aspirational, navigational, social, and familial capital (Rincón & Rodriguez, 2021). Understanding these nuanced dynamics between barriers and sources of resilience is essential for developing effective educational interventions.