

Chapter 2

“What Are We Missing?”: Examining Culturally Relevant Teaching Practices in STEM Educator Preparation Programs

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ABSTRACT

The STEM field now faces a two-fold crisis of students' waning interest and underrepresentation of marginalized populations such as People of Color and women contrary to the high demand for STEM-qualified professionals. STEM subjects such as mathematics have been viewed as a critical filter for high-status, high-salary careers. Thus, it is essential to examine EPP STEM methods curriculum as culturally relevant pedagogy that has been proven to enhance learning outcomes, pique and retain interest, and foster confidence in students from underrepresented groups and all students. Through a content analysis, we examine course descriptions from top-ranked teacher-training universities in the United States to determine the presence or lack of training that STEM PSTs receive in their respective EPPs regarding culturally responsive teaching.

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INTRODUCTION

Despite efforts to bolster the STEM (science, technology, engineering, and mathematics) career pipeline, underrepresentation of marginalized groups such as women and People of Color persists (National Science Board, 2016). For instance, in 2018, a disproportionate percentage of bachelor’s degrees in science and engineering were earned by students of Hispanic or Latino descent (15.1%), by Black students (8.5%), and by students of Indigenous group origin (0.4%) (Bock, 2022). In 2019, although women made up 48% of the workforce, women made up only 27% of the STEM workforce in the U.S., and the percentage of women of color in the STEM workforce was even lower (Martinez & Christnacht, 2021). Moreover, there is an overall drop in STEM career interests in adolescents (Henry, 2018), and this disinterest is only exacerbated by inequitably dispensed opportunities for historically marginalized students to take STEM courses in their P-12 journey (Crabtree et al., 2019; Casto & Williams, 2020). The large-scale change in student dispositions towards STEM threatens to widen the gap between STEM labor demand and qualified STEM workers (Vilorio, 2014). Thus, it is imperative to reinvigorate and improve educational practices in STEM fields (Litzler et al., 2014). To this end, providing high-quality instruction and hands-on experiences with research-based practices to elementary pre-service teachers (PSTs) in Educator Preparation Programs (EPPs) is essential (McClure et al., 2017). Furthermore, providing PSTs’ with a strong foundation in culturally relevant pedagogy in their STEM methods courses allows an avenue to mitigate the leaky STEM pipeline and make STEM learning accessible and engaging for all students. Currently, EPPs seek to bridge gaps in PSTs’ STEM knowledge and skills by immersing students in interdisciplinary learning activities using models such as inquiry learning, engineering design, problem-based learning, and project-based learning. Participation in epistemic activities provides PSTs with firsthand experiences with contextualized-applied learning. Moreover, the STEM curriculum grounded in constructivism and social cognitive theory has positive effects on students’ STEM sense of belonging and persistence (Bell et al., 2017; Maiorca et al., 2021; Young et al., 2017). As the sociopolitical climate changes and the intersection of social justice and education becomes more pronounced, EPPs have a role to assist pre-service teachers in developing the knowledge and training necessary to work with students of color. To shift the trajectory of marginalized students’ involvement in STEM, EPPs must enrich their programs and courses with approaches that align with the lived experiences of students that teacher candidates are seeking to instruct. One such approach is culturally relevant pedagogy (CRP, Ladson-Billings, 1995).

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