Preparing culturally responsive elementary science teachers: The SCI-Bridge model

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Abstract

Historically, the public education community has struggled with providing all children with equitable access to quality science education; particularly in urban communities. Teachers play a vital role in addressing this challenge. By equipping teachers with the pedagogical knowledge needed to employ culturally relevant/responsive practices, teachers will be better prepared to address the challenges related to broadening participation in science. SCI-Bridge is a teacher development project that seeks to address inequities in access to quality science instruction in urban elementary schools. The project will test a professional learning model that (1) integrates the theoretical principles of culturally relevant/responsive pedagogy with best practices in science education and (2) prepares teachers to use three evidence-based practices: culturally responsive classroom management (CRCM), facilitated discourse, and anchoring.

Research Questions

We hypothesize that teachers who participate in the SCI-Bridge professional learning model will show significantly higher scores on instruments designed to capture culturally relevant/responsive teaching practices in science instruction. The research design examines components of the model hypothesized as critical for improvements in practice (CRCM, discourse, and anchoring). The project also explores predictions on the best pathways for teachers to learn the innovative model. This study examines the following research questions:
1. To what extent do preservice and inservice teachers’ beliefs about, and practices toward, culturally relevant/responsive practices change as they apply to teachers serving in urban schools and communities?
2. Under what conditions do preservice and inservice teachers evidence the most change in the development series?
3. How does CRCM, discourse, and anchoring work in concert to overall effectiveness of the SCI-Bridge model?
4. How do CRCM strategies support SCI-Bridge implementation?
5. Which of the three key practices discourse, anchoring, and CRCM are the most effective when integrating into the classroom setting that aligns with culturally relevant pedagogy?

Context of the Study

The study involves a partnership between Title I STEM-certified schools in one local urban school district and a graduate level teacher certification program at a local Research I university. The district involved serves primarily Black students (72%) and children from impoverished communities (68.78%). The study will involve 30 preservice teachers and 20 inservice teachers over a two year period.

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The SCI-Bridge Conceptual Model

The SCI-Bridge model suggests a connection between the educational context, the consciousness of the members of a community, and the consciousness between individuals in the creation and maintenance of the learning community. The model assumes that these foundational components work in concert to limit or enhance a teacher’s ability to effectively implement culturally responsive practices.

Foundational (Key) Practices

Three practices serve as the mechanism for the actualization of the SCI-Bridge model – culturally responsive classroom management, contextual anchoring, and facilitated discourse. These practices interact with each other in complex and dynamic ways to support the development of students’ academic excellence, cultural competence, and critical consciousness. They represent examples of culturally responsive practices and do not describe the breadth of culturally responsive practices available to teachers in the model.

Curricular Framework

The SCI-Bridge curricular framework is organized around Bybee’s (2009) 5E model as a means of structuring inquiry in the science classroom. Unlike the 5E’s, which are traditionally applied solely to science instruction, the SCI-Bridge framework is intended for use across the curriculum. This design decision is aligned with the idea that, in order to be effective, culturally responsive pedagogy must be integrated across the scope of a teacher’s practices.

References


Analytic Strategies

Examination of Culturally Responsive Classroom Management (CRCM) Practices

Culturally Responsive Classroom Management practices will be examined using the Culturally Responsive Classroom Management Self-Efficacy Scale.CRCMSE (Sliwatu, et al., 2017) which asks participants to rate their confidence in performing CRCM tasks.

Examination of Facilitated Discourse

Discourse patterns will be analyzed using two measures. First, document analysis of lesson plans will identify the presence of intentional spaces in the instructional plan for discourse and students’ science talk. The study adopts the framework outlined by Bowen (2009) as the analytic strategy for document analysis. Second, the Culturally Responsive Instruction Observation Protocol (CRIOP) (Powell, et al., 2017) uses field observations to determine evidence of discourse during instruction.

Examination of Anchoring

Two sources of data will inform the presence of anchoring during science instruction. First, document analysis of lesson plans will identify the presence of expected instructional moves in the context of instruction. The Culturally Responsive Teaching Self-Efficacy-CRTSE (Sliwatu, 2007) will serve as a second data source and will be used to explore the contribution of anchoring in the confidence of science teachers’ implementation of culturally responsive practices.

Examination of the SCI-Bridge Model and Classroom Implementation

The online communities of practice (CoP) will serve as an additional qualitative measure of how classroom structures influence the implementation of the SCI-Bridge model. CoP sessions will be recorded and transcribed. Analysis of dilemmas with SCI-Bridge implementation will be used in design refinement and for usability validation.

Implications

The study contributes to our understanding of effective teacher professional learning models; specifically, as they apply to teachers serving in urban schools and communities. It presents a new model for improving access to quality science instruction while also addressing noted shortcomings in solutions like STEM-certified schools. The case of STEM certification in Title I schools in Georgia is an example of what Thiwai (2015) describes as a “spectacle,” in which teachers (and students) perform the roles of spectators. The SCI-Bridge project directly responds to the “spectacle” phenomenon by designing and developing an instructional model that can direct STEM certified schools to take advantage of the infrastructure and curriculum. In addition to the instructional model, the project also provides guidance regarding the implementation of the professional learning model for preservice and inservice teachers built from theories of learning and communities of practice. Finally, the research extends the current conversations and knowledge base on equity-based science instruction for economically, culturally, and linguistically diverse student populations.

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Image 1. Teachers and students at an earlier iteration of the Summer Science Academy