

*A Need to Support Teacher Diversity Through Culturally Relevant STEM  
Education at the Elementary School*

Neha Anand, University of Houston, United States  
Ananthi Shankaranarayanan, University of Houston, United States

The IAFOR International Conference on Education – Hawaii 2020  
Official Conference Proceedings

**Abstract**

There is an urgent need of modifications in traditional teacher education preparation programs in the United States that gears on preparing elementary teachers for culturally applicable science and mathematics curriculum. Such curriculum should focus on a) enrichment of the content and b) addressing the need of racially diverse students (Ladson-Billings, 1995 & 1995; Menshah, 2010). This study investigates two female Indian teachers, engaged in teacher education preparation program in a tier one university at south east Texas. Purposive sampling was implemented to learn the perceptions of participants who are language learners themselves for this auto-ethnographic study. Participants are intensively engaged on a research to improve mathematics and science programs through the lens of culturally relevant practices for marginalized communities.

Keywords: Culturally relevant pedagogy, mathematics, science education, teacher education program, marginalized community

**iafor**

The International Academic Forum  
[www.iafor.org](http://www.iafor.org)

## **Introduction**

United States and European nations are persistently engaged in advocating the need of culturally relevant practices for diverse student population to achieve maximum student participation and engagement in STEM education. However, there exists a huge gap in preparing mathematics and science teachers who could implement culturally relevant practices for the diverse population in the United States (Menshah, 2010 & Sleeter, 2011). Students participation, from marginalized communities, in STEM courses depending on their family background, awareness of higher education courses, and assistance with preparation exams like SAT and ACT (Rawal & Decosta, 2019). This study argues that there are bright possibilities of increasing the marginalized students' participation in STEM through preparing teachers for culturally relevant practices from early grades, through lived experiences of two Indian teachers who are also doctoral candidates at a Southwestern university in Texas.

## **Theoretical Framework: Critical Pedagogy**

In order to practice culturally relevant pedagogy, it is essential to learn how policies effect/affect student education even before practice. Culturally relevant pedagogy is based on Critical Theory and was developed by Freire (1968), who stated that education is an art of heart. Freire (1968) stated that critical pedagogy is a problem-solving activity by eliciting prior knowledge and developing it further in the problem-solving direction and in which teacher, society, and student have active roles. Freire (1968) viewed knowledge as critical awareness and did not believe in accumulating knowledge, he was not a believer of assessing knowledge by the number of pages read in a particular span of time, but creating and recreating knowledge as defined earlier. The only way to attain this is when students are a part of active learning by thinking and reflecting on a problem to suggest solutions for practice. This will bring in changes and reforms for betterment in the society in which they live.

Critical pedagogy integrates pedagogical knowledge, experiences, and policies that benefits urban minority students from a diverse background (Kincheloe, 2011, p. 2). Urban minority students refer to students coming from either a low socio-economic background, a linguistic background, a cultural or an ethnic background and all. Critical pedagogy is suitable for ELLs in an Urban Context as they have wonderful problem-solving abilities and requires a little scaffolding to exhibit their knowledge in their second language. As suggested by Freire (1968) critical pedagogy of questions are more appropriate for students, instead of pedagogy of responses, and classroom instruction should respect ELLs' knowledge. This alone could transform a teaching-learning experience promoting social reform.

## **Method**

This study investigated two female Indian teachers, who are doctoral students now, engaged in teacher education in a Tier One University in the south east Texas. Purposive sampling was implemented to learn the perceptions of participants who are language learners themselves for this auto-ethnographic study. Auto-ethnography is appropriate for exploring personal experiences and connecting it to better understand cultural, social, and political meaning connected to personal experiences. Anu and

Nina come from a middle-class family and are first generation students in their family. They possess more than ten years of mathematics and science teaching experience respectively, in public and private schools in India. Both are engaged in doctoral research to improve mathematics and science teacher education programs through culturally relevant practices for marginalized communities in the south east Texas.

## **Results**

Anu and Nina believe that culturally relevant education as the degree of aspect of understanding need for STEM education for all through the critical lens, when they identified the feel of lack of pedagogical and instructional praxis to make appropriate connections with the racially diverse students, during their doctoral teaching experiences (Boutte, Jackson, Johnson, 2010). Anu and Nina argue that the general perception that runs across with mathematics and science teachers that ‘culturally relevant teaching’ cannot be linked to mathematics or science education as these are mainly an inquiry-based education. Anu and Nina also identified that teachers are lesser prepared for teaching diverse students’ population and fail to make relevant connections with the communities despite developing several classroom activities to engage their students on everyday basis (Bouette et al.,2010). Anu and Nina stated that White teachers often feel discomfort in addressing the concerns of students of ethnically minority groups as they are not fully aware about the minority cultural background, and they feared this can ultimately lead to rudiment teachers’ relationship with their students (Murray-Johnson, 2019). Anu and Nina suggested that promote a stronger foundation in science for elementary level students, preparing teachers to teach core mathematics and science concepts by eliminating their biases mathematics and science as a predominate field of ethnically White or Asian students; promote *Science for All* and incorporating culturally rich experiences in to the class room; adopting the process of Enculturation (Herrera, Holmes & Kavimada, 2012)

## **Significance**

On a typical school day of a mainstream classroom a student devotes less than an hour towards learning core mathematics and science concepts, which is not enough to sustain their interest in core learning of these subjects as they reach higher (Menshah, 2010). Insufficient exposure of content could be strengthened when mathematics and science education are grounded on culturally responsive curricula (Sleeter 2011). Culturally responsive pedagogy is not only about teaching but is also a political endeavor directed toward equity and justice” (Laughter & Adams, 2012).

## References

Boutte, G., Kelly-Jackson, C., & Johnson, G. L. (2010). Culturally relevant teaching in science classrooms: Addressing academic achievement, cultural competence, and critical consciousness. *International Journal of Multicultural Education*, 12(2).

Herrera, S. G., Holmes, M. A., & Kavimandan, S. K. (2012). Bringing theory to life: Strategies that make culturally responsive pedagogy a reality in diverse secondary classrooms. *International Journal of Multicultural Education*, 14(3).

Ladson-Billings, G. (1995). But that's just good teaching! The case for culturally relevant pedagogy. *Theory into practice*, 34(3), 159-165.

Ladson-Billings, G. J. (1999). Chapter 7: Preparing teachers for diverse student populations: A critical race theory perspective. *Review of research in education*, 24(1), 211-247.

Laughter, J. C., & Adams, A. D. (2012). Culturally relevant science teaching in middle school. *Urban Education*, 47(6), 1106-1134.

Mensah, F. M. (2010). Toward the mark of empowering policies in elementary school science programs and teacher professional development. *Cultural Studies of Science Education*, 5(4), 977-983.

Murray-Johnson, K. (2019). (En) gauging Self: Toward a Practical Framework for Race Talk. *Adult Learning*, 30(1), 4-14.

Sleeter, C. E. (2011). An agenda to strengthen culturally responsive pedagogy. *English teaching: Practice and critique*, 10(2), 7-23.