

“But that’s just good teaching!” making the case for multicultural awareness in STEM education

When Gloria Ladson-Billings offered the educational community culturally relevant pedagogy in 1992, she was met with responses that what she was describing amounted to “just good teaching”. Writing later, the scholar clarified what she meant by culturally relevant pedagogy as a critical component in the successes of African Americans and other students in US public schools and agreed that culturally relevant instruction was indeed evidence of good teaching. However, she also argued that culturally relevant pedagogy was more than that (Ladson-Billings, 1995).

Similarly, the articles within this Special Issue on STEM in P-12 schools offer ideas, strategies, considerations and practices that can be described as “just good teaching”. Nonetheless, what these authors have presented are important, relatively new ways of approaching STEM education to ensure its accessibility and appeal for all kinds of students that go far beyond good teaching practices. Take for example, Collier, Burston and Rhodes’s article, “Teaching STEM as a Second Language”. In it, the authors present logical explanation for why we should begin to use the sound pedagogical practices often associated with another discipline – language instruction – to be applied in STEM-oriented classrooms. By giving specific attention to the needs of culturally and linguistically different students’, the authors’ calls for a more integrative approach to STEM pedagogy that draws on the strengths of the culturally relevant practices used in non-STEM-related fields.

Collier and colleagues are not alone. A growing number of scholars (Bryan *et al.*, 2015; Sanders and Wells, 2010; Tonso, 2008) argue for greater interdisciplinarity within STEM education. As such, we have purposely sought to engage a variety of areas related to STEM education in P-12 settings and beyond. From mathematics as a bridge between cultures (Waller and Flood in this issue) to classrooms as spaces to cultivate science efficacy and identity (Flowers and Banda this issue), the authors in this journal concretize the need and the benefits of an integrative approach to STEM. In following this lead, we have intended to include not only the conceptual discussions but also pedagogical strategies from science, mathematics and teacher education offered by contributing scholars. We have endeavored for the included articles to expand how STEM is considered by P-12 educators and other educational stakeholders.

The ordering and grouping of this issue’s articles were intentional and through it we seek to suggest that from a foundation of multicultural education and strategic professional development of teachers and teacher candidates, we can begin to design, implement and improve efforts to increase STEM interest and involvement among marginalized populations in STEM fields.

Expanding the consideration, relevance and sustainability of culture in STEM fields

Although we have intended to provide a breadth and depth of STEM education through a multicultural lens, what remains missing from this issue – and is severely marginalized in STEM education generally – is a systematic analysis of non-Western approaches to STEM across all physical and ideological borders and boundaries. As

such, we wish to call for the development of STEM-C, which is culturally relevant and sustaining STEM education, research and practice that seeks to not only increase minority involvement in STEM fields and careers but also importantly argues for these fields and disciplines to be made more culturally inclusive.

Such inclusivity should include examining the out-of-school and edge of school spaces (Johnson, 2014) to identify individuals' repertoires of practice that might otherwise not be considered as academically relevant in STEM fields. The awareness and consideration of sub-altern ways of learning, doing and working in STEM, through STEM-C, might offer new ways of approaching STEM education for the benefit of all involved.

A case for the kind of culturally relevant education appropriate in STEM-C draws upon students' prior funds of knowledge (Moll *et al.*, 1992). An example of this can be found in Emdin and Adapong's work on "Hip Hop Based Interventions as Pedagogy/Therapy in STEM". In their contribution to this issue, Emdin and Adapong show us how using strategies relevant to students' interests and culture can be helpful in not only enhancing their engagement in STEM-related courses but also in ways that might prove beneficial for the students outside of their academic identities.

Further, because it does little to prepare our P-12 students for fields that may be unwelcoming to them once they enter (Riffle *et al.*, 2013), STEM-C must also challenge the kinds of epistemological and Western privilege shaping STEM occupational experiences for people of color. Through a deliberate insistence that we examine the attitudes and beliefs that inform STEM fields and their practitioners, STEM-C can emphasize a need for greater attention to the structures and policies that undergird the experiences of minority STEM professionals.

Governmental agencies, employers and researchers alike have described the lack of diversity within STEM fields as problematic and needing attention (Byars-Winston, 2014; Hurtado *et al.*, 2010; National Academy of Sciences, 2007; Williams, 2013). We have called for the development of STEM-C. To address the lack of diversity and to assert the argument for greater cultural relevance, authors within this issue have described pedagogies, strategies, concepts, programs, motivations, strengths and beliefs that might be used to engage more youth in STEM. Many of the offerings might be considered good teaching, but they are more than that. They offer an opportunity to broaden conversations among researchers, practitioners and professionals to include culture and language as critical considerations in STEM education.

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Further reading

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