

## A case for inclusion of non-standard languages in educational contexts for STEM learning

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Racial and ethnic minorities are underrepresented in science, technology, engineering and math occupations and degree programs (Espinosa et al. 2016). In order to promote a more diverse intake for STEM degree granting programs, and to create a more diverse and innovative STEM workforce, barriers in educational settings that are placing minority students at systematic disadvantages need to be identified, and strategies to overcome these challenges need to be developed. Such interventions can contribute to narrowing the socioeconomic gap experienced by minorities, as STEM occupations are generally higher paying than non-STEM occupations (Langdon et al. 2013).

While some attention has been given to the effect that the language of instruction used in education can have on the success of students, the effects of language on student success in STEM learning specifically has remained largely understudied (Lodge 2017). In addition, research focusing on minority-language speakers of non-standard language varieties is rare despite the fact that these speakers often have to attend school in a language that is not their native language (UNESCO 2016). This is the situation faced by speakers of minority varieties such as African American Vernacular (AAVE), and of Creole language varieties in the United States (Rickford 1999).

One specific example is found on the island of St. Croix, in the U.S. Virgin Islands, where although English is the official language and the language used in education, the majority of the population are native speakers of Crucian, an English-lexifier creole language. However, as is common in Creole contexts, the use of Crucian in education is stigmatized. Given that students in the U.S. Virgin Islands underperform below all other states in SAT scores (College Board 2018), we aimed to determine the possible effects of language of instruction on students' success in STEM subjects.

In this experimental study, a sample of 37 students at The University of the Virgin Islands, located on the island of St. Croix was studied. Volunteer student participants were presented with two videos of novel mathematical concepts. One was presented in academic English, and the other in their native language variety. Students were then tested regarding their procedural and conceptual comprehension of the topics presented to them. Results of the study found that while students overall performed similarly in both conditions (English vs. Native language) in regards to their procedural knowledge of the topics presented, they performed significantly better ( $t = -2.38$ ,  $p < 0.05$ ), in the evaluation of their conceptual comprehension of the mathematical material after they had received instruction in their native language variety ( $m = 10.04$ ,  $sd = 2.1$ ) as opposed to when they had received instruction in academic English ( $m = 8.87$ ,  $sd = 2.8$ ).

Although the use of creoles and other non-standard language varieties in educational environments is often criticized (Lodge 2017), linguistic research in education often shows positive outcomes in students' learning when they are taught in their native language variety (Wigglesworth et al. 2013). Results of our study suggest that students can benefit from using their native languages in the classroom. We suggest that in the future the stigma surrounding the use of non-standard languages in the classroom should be minimized and that linguistically responsive pedagogical practices be implemented.

## References

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