Culturally Responsive Instruction in Algebra Nation

Pervasive disparities exist in minoritized students' algebra achievement in Charleston County School District (CCSD), which may be explained by a dearth of culturally responsive instruction (CRI) and students' foreclosed identities as math learners. To address this gap, we propose applying the tenets of CRI to supplement the Illustrative Mathematics (IM) curriculum, creating culturally relevant interactive learning modules (CR-ILM) hosted on Algebra Nation's platform, which is already reaching over 12,000 students in CCSD. If efficacious as assessed by our team and AIR, the CR-ILM will be made available to all Algebra Nation users, which reaches over 500,000 students today.

CR-ILM will (1) allow students to choose from sociopolitically contextualized math problems; (2) show members of priority groups using algebra in everyday life; and (3) integrate goal setting and self-assessment of learning to promote positive mathematics identities.

This pilot will enhance two sections of IM in Algebra Nation and examine the effects through A/B testing. Ultimately, this solution may be expanded to all sections and all states currently using Math Nation.

To date, CRI has not been extensively or thoroughly applied to online learning applications (Adams, et al., 2018). The proposed will be the first solution to provide large-scale access to CRI materials designed to support teacher-led instruction. By incorporating CR-ILM, our solution will provide rich mathematical content that will simultaneously connect culture and critical consciousness to ultimately enhance mathematical agency and success. For example, students traditionally learn to use bivariate statistics to estimate a linear model for equations, which may seem irrelevant to them. With our CR-ILM, student agency and engagement will drastically increase as the lesson is embedded in multiple sociopolitical contexts, allowing students to "choose their own adventure." Sample contexts include the effects of policing, public health in food deserts, and salary trajectories with vocational jobs versus college degrees.

We believe this approach will be successful because

- the existing Algebra Nation platform has already promoted academic achievement for racially minoritized learners;
- IM is closely aligned with College and Career Ready Standards; and
- Ladson-Billings (1997), Gutiérrez (1999, 2000, 2013), and Boekaerts (2016) correlate CRI with higher mathematics achievement among priority students.

There are no anticipated risks for our priority students. The necessary infrastructure to support Algebra Nation in CCSD already exists including new materials and skilled Math Nation staff. CCSD recently adopted Math Nation for use across grades 6-8 and are eager to launch the CR-ILM version of this initiative. Additionally, teacher training in CRI and student orientations to the new format will make for a successful launch. Math Nation has increased previous Algebra 1 pass rates 7-14% across multiple demographics for CCSD students; this significant success has been replicated repeatedly across states and school districts. We expect these numbers to further increase for priority students in addition to reinforcing positive math identities, increasing students' application of algebra, and encouraging interest in STEM careers.