Improving Math Identity for Underrepresented Populations Implementation and Impact Study of After-School Math Plus: Design

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What Is Math Identity?

Math identity is a person's beliefs, attitudes, emotions, and dispositions about mathematics and that person's capabilities to do mathematics. It involves the ways that students think about themselves in relation to mathematics and the extent to which they commit to and value mathematics. Having a sense of identity and community fosters students' engagement, persistence in the face of challenges, and adoption of effective academic behaviors. Students with a positive math identity feel that they belong in the math classroom.

Math Identity and Underrepresented Populations

If students do not feel that they belong in the math classroom, they are less likely to engage in learning activities and are likely to have lower achievement. In academic and professional settings, members of stigmatized groups are more sensitive than others to issues of social belonging. Therefore, fostering math identity could be particularly important to supporting students from populations underrepresented in STEM.



After-School Math Plus (ASM+) combines:

- Inquiry-based, hands-on activities connected to students' interests outside of school
- Standards-aligned skill development
- Strong focus on reaching groups underrepresented in math
- Role models and career exploration
- Family involvement

Four themes:

Jump Rope Math: students learn essential math skills while jumping rope, having fun, and getting exercise. Activities focus on data analysis and probability, numbers and operations, and communication, representation, and connections.

Built Environment: students explore the immediate environment within and outside their after-school centers and use what they have learned about scale and measurement to create a blueprint and a model for an ideal community—one that works for all its citizens.

ArtMath: students explore ways in which art and math interconnect by studying M. C. Escher and Piet Mondrian. Students create kaleidoscopes and learn firsthand about geometry, tessellation, symmetry, and measurement.

MusicMath: students explore the mathematical connections between rhythm and fractions. They begin by listening and moving to music and constructing simple four-count rhythm patterns using found instruments such as pencils, coffee cans, or blocks. They then extend the patterns as they learn about combinations and permutations to create new arrangements and, eventually, a musical composition that incorporates whole, half, quarter, eighth, and sixteenth notes.

Each theme involves a culminating activity in which students make expert presentations to parents and community members.



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Sample 5th graders

Impact Analysis

Relationships among math identity, interest, engagement and achievement

Implementation Analysis

Quantitative Data

Qualitative Data

Timeline





RESEARCH QUESTIONS

• What is the effect of ASM+ on students' math identity engagement, and interest? What are the effects for historically underrepresented groups?

• What is the effect of ASM+ on student achievement in math as measured by standardized test scores? What are the effects for historically underrepresented groups?

• What is the relationship between math achievement and math engagement, interest, and identity in afterschool programs?

• What elements of ASM+ foster students' math identity, and through what mechanisms is this effect achieved? What are the best practices and lessons learned?

METHODS

40 after-school programs in South Carolina serving 4th and

 Intervention group does ASM+ Comparison group does Mixing in Math

Path Analysis

• Extent to which programs implement ASM+ with fidelity How and under what circumstances ASM+ fosters student math identity

• Measures of math identity, interest, and engagement • Student math achievement, attendance

 Group leader surveys and interviews Program observations

Professional development summer 2016 Implementation 2016-2017