

IMAGES of STEM

Building Strategies to Support Undergraduate STEM Students at an HBCU

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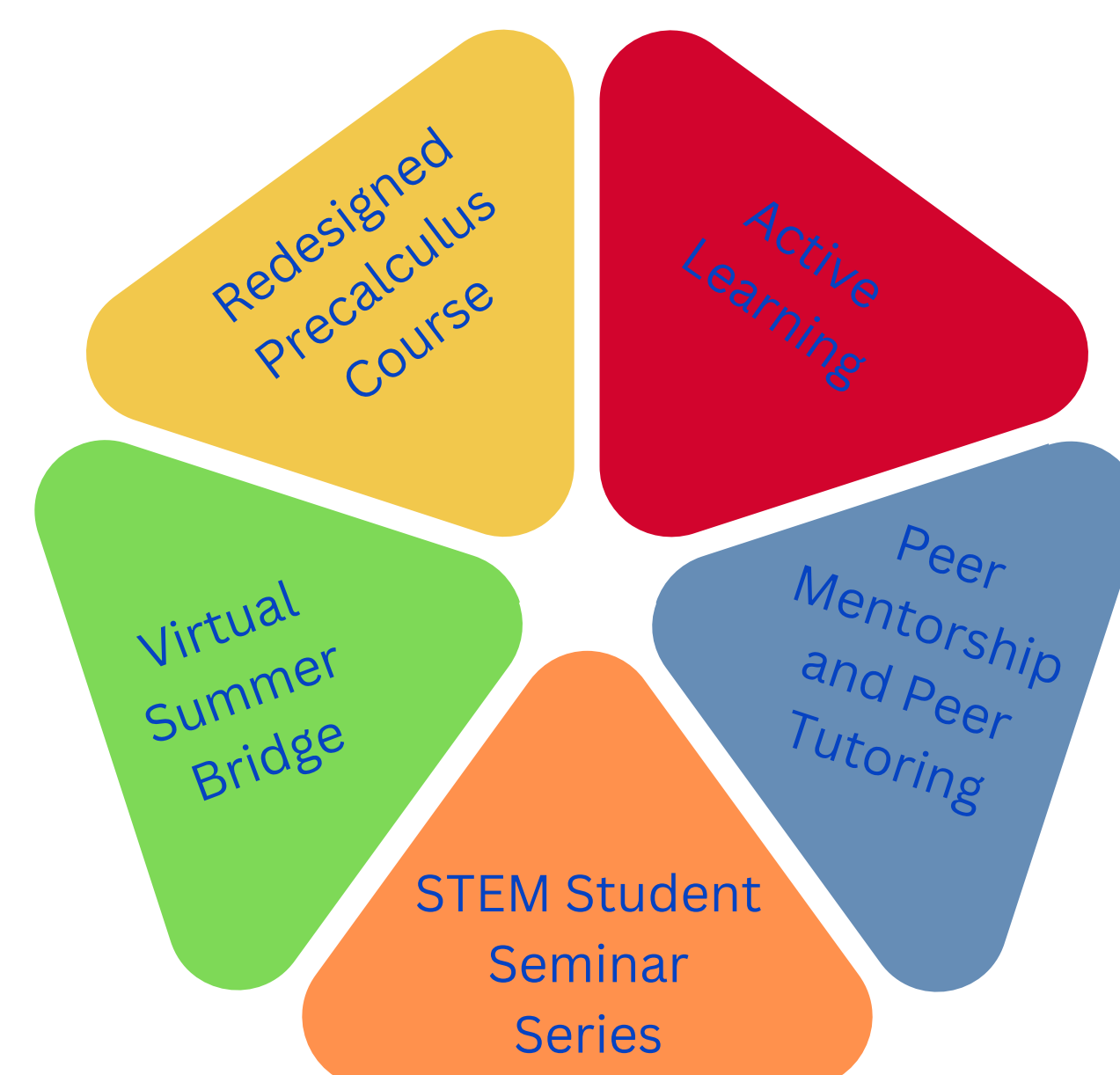
INTRODUCTION

Increasing
Mathematics
Achievement
Gains by
Engaging
Students
of STEM
at Tennessee State University

IMAGES of STEM at TSU is designed to produce the overall goals of

- increasing STEM student learning and engagement in first-year mathematics courses;
- retaining more underrepresented students in the STEM disciplines; and
- improving the graduation rate of STEM students.

Project Components



Research Question

Do the cohort model and professional development activities impact STEM student motivation and level of commitment to persist in the academic major?

KEY STRATEGIES

Cohort Learning

O'NEILL ET AL., 2019

A *cohort* shares five characteristics:

- defined, long-term membership
- common goal
- common series of learning experiences
- structured meeting schedule
- network of synergistic learning relationships.

HANSEN ET AL., 2023

Cohort-based interventions have been effective in helping low-income and underrepresented students buffer against feelings of low sense of belonging, isolation, and alienation in competitive STEM majors.

Professional Development

BLUSTEIN ET AL., 2022

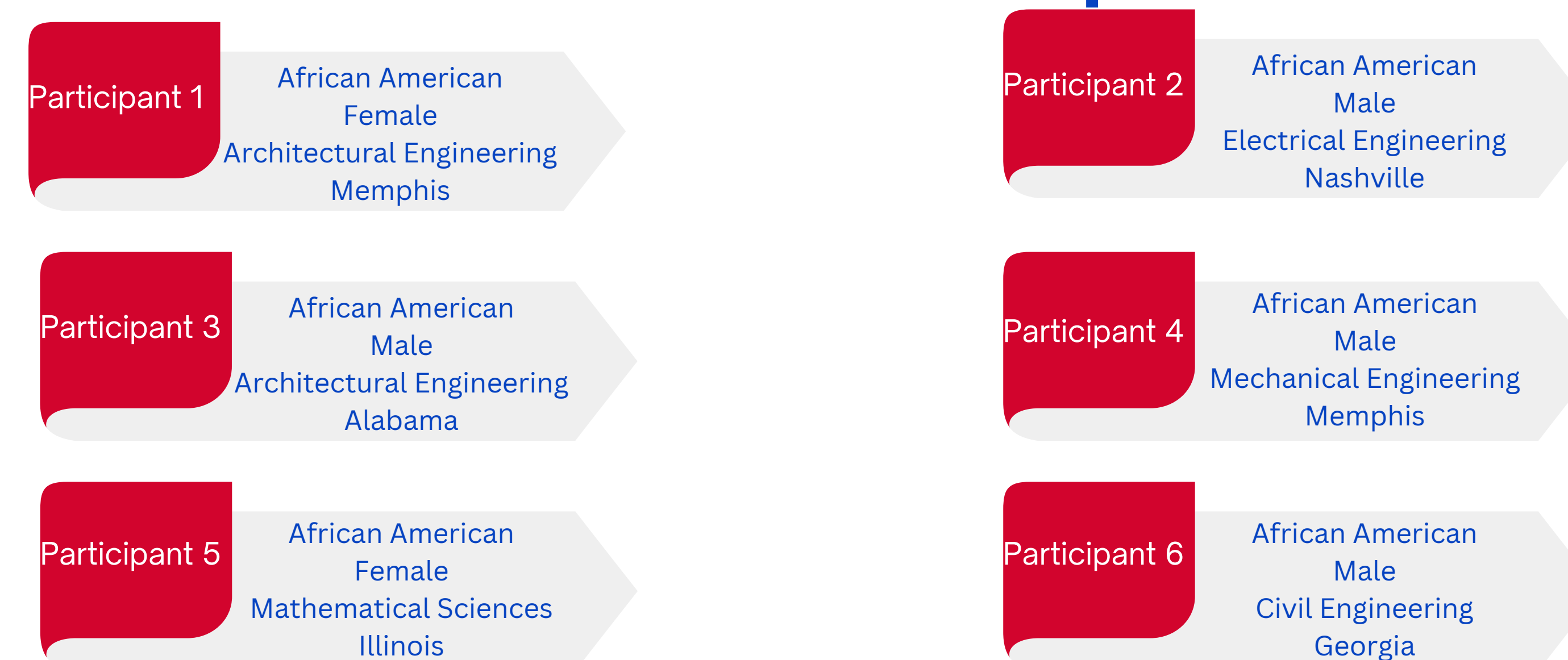
STEM student *professional development* refers to specific interventions, programs, research, and other efforts designed to enhance STEM students' interest, self-efficacy, identity exploration, STEM skills, and their intention to pursue STEM careers.

BELSER ET AL., 2018

Career development activities have shown efficacy with general undergraduate populations but have been studied less commonly with STEM-specific undergraduate populations.

METHODOLOGY

Research Participants



Data Collection Methods

This study used a triangulated approach by collecting data through multiple techniques. Data were collected using structured interviews, surveys, and observations to explore experiences, opinions, characteristics, and preferences of participants.

OUTCOMES ACHIEVED

- Establishing a culture of excellence/achievement in first-year engineering students through a cohort learning model
 - After the first year, the IMAGES of STEM Scholars who successfully completed all of the components of the project were on-track in their academic majors.
 - After completing two years, these scholars have an average GPA of 3.391.
- Identifying and offering a pathway for on-time progression through core/first year mathematics courses for engineering students
 - The scholars credit their participation in the IMAGES of STEM Project with helping them progress through challenging mathematics courses and persist in their majors.
- Developing a sense of belonging in engineering disciplines as students and in engineering careers as professionals
 - The most engaging and well-attended activity outside of class was the STEM Student Seminar Series.

CONCLUSIONS

- Through enhancements in instruction and the implementation of retention initiatives, this project is helping meet the nation's accelerating demands for STEM graduates by increasing the number of underrepresented minority students who are on-track for completing a STEM degree and informing on best practices for STEM student success at an HBCU.
- Due to the IMAGES of STEM cohort learning model:
 - The Scholars had a common goal, shared learning experiences, and the opportunity to participate in academic and professional development activities together.
 - Community was being built as the Scholars completed their coursework in mathematics and received peer tutoring.
 - This cohort model exhibits the characteristics outlined by O'Neill et al. (2019).
- This study provides qualitative data on the positive impact of strategies which support STEM students and adds to the emerging body of knowledge on the effectiveness of cohort-based interventions on underrepresented students majoring in STEM disciplines.
 - The STEM Student Seminar Series bolstered the Scholars' intentions to pursue STEM careers by enhancing their interests and giving them the opportunity to explore their identity as STEM professionals.

- This study provides a number of implications for future research on theory development in effective strategies for increasing STEM student learning and determination to progress and graduate, specifically for underrepresented minority students majoring in STEM disciplines