Fisk University Implementation Award: Fostering STEM Engagement/Mastery with Integrating Case Studies in Teaching Developmental Mathematics Courses

Abstract (Excerpted)

The Fisk University HBCU-UP Implementation Project was conceived after a productive STEM discernment process identified our three key barriers to STEM participation, retention, on-time graduation, and selection of STEM careers:

1) Entry into Fisk with limited mathematics competence and confidence
2) Insufficient deep learning in Gatekeeper courses
3) Limited on-campus academic year research experiences

Our evidence-based strategies to achieve to address these barriers include:

1) Innovations in Developmental Mathematics
2) Required Supplementary Instruction [SI] to Gatekeeper Courses
3) Faculty Development in Student-Centered Pedagogies
4) Embeding authentic research into course-associated laboratories.

Challenges

The major causes for academically capable STEM students switched to non-STEM disciplines are:

- Poor teaching by STEM faculty without applications of content
- Loss of interest in STEM
- Inadequate Advising or help from academic faculty members

Case Study

Student Body: High school students or college students who are underprepared for their college-level math courses. These students are typically freshmen who have struggled in mathematics and did not meet prerequisites of college-level math courses.

Class Size: 18-20 students.

Classroom Management: 2 lectures/case
- 1st class: Analysis of the Case
- 2nd class: Student Poster Presentation
- Grading: Peer evaluation
- Peer mentors for tutoring

Impact of Innovation in Developmental Mathematics

Introducing case studies in Developmental Math Courses increased course retention & performance of A’s and B’s.

Variables: No Intervention, Pilot Study, With Case Interventions, Differences

Retention Rate

- No Intervention: 78%
- Pilot Study: 87%
- With Case Interventions: 92%
- Differences: 14%

Passing Rate (A’s & C’s)

- No Intervention: 50%
- Pilot Study: 75%
- With Case Interventions: 88%
- Differences: 12%

Grade: A’s

- No Intervention: 13.3%
- Pilot Study: 16.7%
- With Case Interventions: 25.5%
- Differences: 12.2%

Grade: B’s

- No Intervention: 13.3%
- Pilot Study: 25%
- With Case Interventions: 37%
- Differences: 37.7%

Grade: C’s

- No Intervention: 53.3%
- Pilot Study: 67%
- With Case Interventions: 85.5%
- Differences: 27.8%

Grade: D’s, F’s

- No Intervention: 20%
- Pilot Study: 25%
- With Case Interventions: 32%
- Differences: 13%

Future Work

- Case studies in teaching Bio-Statistics (Currently developing Case studies with Dr. Gollahon, Weisstain, and Yang).
- Collect data analysis for CAMEL case study in Cal II and Diff. Eq.

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