



# 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) Embedding authentic research into course- associated laboratories.

## Faculty Development in Student-Centered Learning Pedagogies

- Three day stipended Faculty Development workshop, May 2014, led by Patricia Marsteller, PhD, Director of the Center for STEM Education, Emory University
- 25 faculty participated ( 56% participation rate)
  - 44% of faculty participants modified their syllabi based on workshop (95% of these in Natural Sci.)
  - Currently analyzing differential student outcomes upon course modification, with intention to continually modify pedagogies as needed.

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## 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

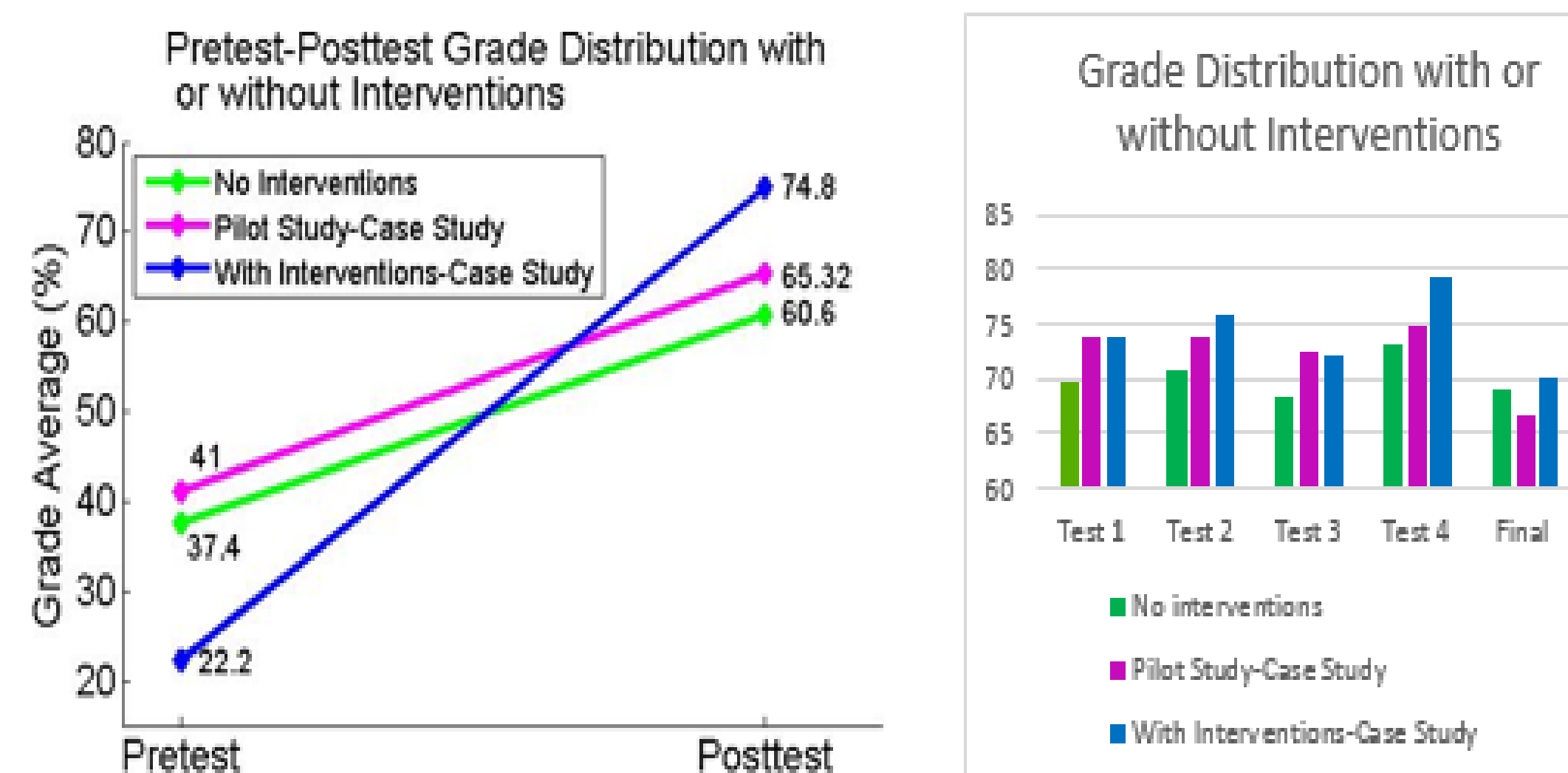
**Case type:** Directed Case Study.

**Class Size:** 18-20 students.

**Classroom Management:** 2 lectures/case

- 1<sup>st</sup> class: Analysis of the Case
- 2<sup>nd</sup> 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	78%	87%	92%	↑14%
Passing Rate (A's-C's)	80%	75%	68%	↓12%
Grade: A's	13.3%	16.7%	25.5%	↑12.2%
Grade: B's	13.3%	25%	17%	↑3.7%
Grade: C's	53.3%	16.7%	25.5%	↓27.8%
Grade: D's, F's	20%	25%	32%	↑12%

\*Passing rate is defined as a C or higher; students can only enter College Algebra with at least a C in the Developmental Math Course.

## Short Term Goals for Continual Improvement

- Use student-focused strategies beyond Case-based intervention
- Define impact of Pedagogical changes on retention of content in subsequence College Algebra Course

## 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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