University of Memphis, TN
Four Year • 10,000–20,000 Students • MyMathLab

In 2008, the University of Memphis (UM) Department of Mathematical Sciences implemented a new teaching method in several sections of College Algebra, Foundations of Mathematics, and Elementary Calculus. The primary motivation of the new teaching method was to address low retention and success rates in these large-enrollment, lower-division general education courses.

Called the Memphis Mathematics Method (MMM), the new method was developed according to National Center for Academic Transformation guidelines and incorporates the effective use of technology in the teaching of mathematics. The MMM closely follows the approach used by both Louisiana State University and the University of Alabama and is delivered via MyMathLab.

During every class session, University of Memphis students are required to solve problems in a laboratory environment: they listen to a 20-minute, instructor-led lecture that introduces basic concepts and spend the remaining 65 minutes of class solving MyMathLab problems. Students also complete proctored tests and the final exam in the instructional lab by using MyMathLab. Instructors control access to MyMathLab's multimedia learning tools on an assignment-by-assignment basis. And tutors are always available to answer questions.

Study Methods
An MMM intervention was piloted at UM in spring 2008 in a specialized Developmental Studies Program in Mathematics (DSPM) College Algebra course, which combined a developmental Intermediate Algebra course with a regular College Algebra course. Students were eligible for the DSPM course only if their ACT scores would have required them to take remedial Intermediate Algebra. The university expanded MMM in 2008 to regular sections of College Algebra, regular and DSPM sections of Foundations of Mathematics, and regular sections of Elementary Calculus.

This study includes data from fall and spring semesters beginning with fall 2007 and through spring 2010. There were 11,970 enrollments in the sections across the three courses: 10,424 in regular sections, and 1,546 in DSPM sections. Passing and retention rates were used as measurements of success.

Results
An examination of the passing and retention rates in MMM and traditional classrooms indicates that overall, students in MMM classrooms withdrew less and performed better. Of the study's 11,970 enrolled students, 5,530 earned a passing grade, reflecting a combined 54 percent success rate for the three courses. Of the 11,970 enrollments, 1,596 withdrew from their courses.

For every course, the withdrawal rate in the MMM classes was lower than that in the traditional classes. For example, 17.9 percent of students in traditional Elementary Calculus withdrew, whereas only 8.4 percent withdrew from the equivalent MMM courses. In College Algebra, students in MMM classes dropped out at a rate of approximately 9 percent. The equivalent traditionally taught courses had dropout rates of 12.8 percent for regular students and 11.4 percent for DSPM students (an average of 12.1 percent). (See figure 1.)

More students passed in MMM classes than in traditionally taught classes. For example, approximately 49 percent of students in traditional courses passed, whereas about 72 percent passed when exposed to MMM teaching methodology. (See figure 2.)

Performance and dropout disparities between Black and White students were reduced in MMM-taught classes. For example, across all three regular courses, Black students passed at a rate of 39.9 percent when taught using traditional pedagogy compared with a rate of 56.2 percent when taught using MMM. Also, in DSPM courses, Black students dropped out at a rate of 10 percent from the MMM-taught classes compared

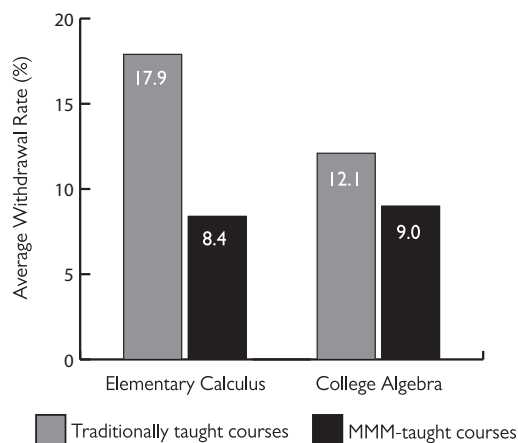| Course/Student Type	Total	Traditional Method	MMM
College Algebra	4,777	3,668	1,109
DSPM students		157	1,010
Regular students		3,511	99
Foundations of Mathematics	3,986	3,525	461
DSPM students		264	115
Regular students		3,261	346
Elementary Calculus	3,207	2,729	478
Regular students		2,729	478

Table 1. Pilot Enrollment by Course, Student Type, and Method

Figure 1. Comparison of Withdrawal Rates in Traditionally Taught and MMM-Taught Elementary Calculus and College Algebra Courses

Figure 2. Comparison of Pass Rates in All Three Traditionally Taught and MMM-Taught Courses

with a rate of 14 percent from those that were traditionally taught. (See figure 3.)

Within each course, the pattern of improvement persisted. For example, in traditional DSPM College Algebra, there was a 14.7 percent differential between Black and White students. In the equivalent MMM courses, the differential was 7.7 percent. In traditional Elementary Calculus, the racial disparity between Blacks and Whites was completely erased, with 75.7 percent of Black students and 68.9 percent of White students receiving passing grades.

Racial withdrawal rate disparities decrease with the use of MMM. In traditional Elementary Calculus, 22.4 percent of Black students dropped out compared with 15.4 percent of White students; in the MMM calculus courses, 6.8 percent of Blacks withdrew compared with 9 percent of Whites. (See figure 4.)

Regression results indicate that the MyMathLab-enabled MMM model was significantly effective in increasing the odds of student success in Elementary Calculus: students exposed to the MMM had 78 percent higher odds of succeeding than those in traditional classes had.
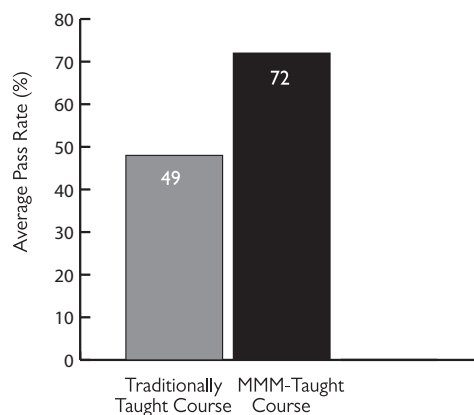
Similar to the regular students, Black DSPM students in College Algebra who were taught in MMM classes were more successful than Black students taught traditionally. Study data indicated a 45 percent increase in odds for success among Blacks taught with MMM.

Race differentials persisted in comparisons of the probabilities of dropping out. Black students in MyMathLab-enabled MMM College Algebra classes had 31 percent lower odds of dropping out compared with White students. The MMM model also showed positive and significant gains for students taking Calculus as well. Overall, Calculus students in the MMM had 48 percent lower odds of dropping out than traditionally taught students had.

Conclusion

Overall, the MyMathLab-enabled Memphis Mathematics Model resulted in increased success and decreased dropout rates for students in College Algebra, Foundations of Mathematics, and Elementary Calculus courses. The results point particularly to MMM as a vehicle for closing the achievement gap between Black and White students in Elementary Calculus. The positive results may be attributed to the structure

and interactive nature of the MMM, which forces a daily involvement on the part of the student. This type of active engagement along with the use of technology is in line with reform pedagogy.

Overall, MMM resulted in increased success rates and decreased drop rates in College Algebra, Foundations of Mathematics, and Elementary Calculus. Because students were required to work problems using MyMathLab, they were able to benefit from the program's many learning tools, and they better grasped the subject matter.

From an institutional cost standpoint—after the initial start-up costs of computer labs—the MyMathLab-enabled MMM model distributes department resources more cost-effectively than does the traditional instruction model.

Undergraduate students may be employed as lab assistants; advanced graduate students may be employed as course instructors; and MyMathLab's automated grading system enables instructors to spend less time on administrative tasks and more time monitoring and guiding students through the learning process.

Summarized by Michelle Speckler from "The Effectiveness of Blended Instruction in Postsecondary General Education Mathematics Courses," by Anna Bargagliotti, Fernanda Botelho, Jim Gleason, John Haddock, and Alistair Windsor
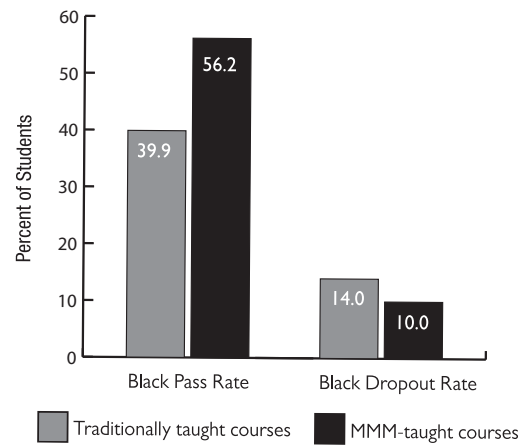

Figure 3. Comparison of Pass and Dropout Rate Disparity between Blacks and Whites in Traditionally Taught and MMM-Taught Courses
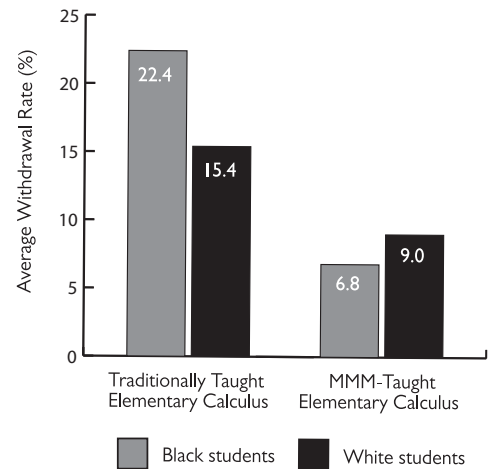

Figure 4. Comparison of Withdrawal Rates for Black and White Students in Traditionally Taught and MMM-Taught Elementary Calculus Courses