Redesign, Retention and ALEKS: A Three Year Study

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In 2009 the assistant to the department chair asked me to redesign Math 1100: Topics in Algebra, which is a prerequisite for College Algebra and Gen Ed Foundations of Math, into a hybrid course that covers skills ranging from pre-algebra to college algebra. This redesign would be for at-risk students in mathematics at the University of Memphis and make use of lecture and technology.

The redesign focused on improving three areas of student behavior: class attendance, class participation, and mastery and retention of skills. If the redesign improved these three areas, then the students who are successful in Math 1100 should have a much better success rate in the next required math class, which is College Algebra or Gen Ed Foundations of Math. In other words, the retention of the at-risk students will be improved.

The first step in the redesign was to select a course management program. Since most of the students' work must be completed on a computer, ALEKS, an adaptive online learning system, was chosen because its components encourage students to participate in class, master skills, and retain skills. The ALEKS placement assessment is also used by the University of Memphis to identify students who need to be placed into Math 1100.

The second step was to choose a textbook and select the skills that the students need to master. A custom McGraw-Hill textbook was chosen, which contains chapters 1, 2, 3, 5, 6, and 7 from Mark Dugapolski's *Algebra for College Students*.

The third step was to create the classroom environment. Since the students are at-risk in mathematics, the course was designed to meet four days per week. The instructor teaches the skills to be mastered two days per week, and the students work on the computer the other two days, using ALEKS in order to reinforce the skills taught.

The fourth step was to create an evaluation system that will support the goals of the redesign—improving class attendance, student participation, mastery of skills, and retention through the next required math class. In order to keep the students on task, five regularly scheduled tests are given, which count 60% of a student's final average. Mastery and retention of skills count 25% of the final average. This goal is accomplished by requiring the students to work in the ALEKS Pie in order to reinforce skills. Retention of these skills is accomplished by the ALEKS assessments. After students master about twenty new skills, ALEK will automatically assess the student in order to determine what skills the student has mastered and retained. ALEKS will identify the skills that a student needs to revisit.

Class attendance and participation count 15% of the final average. Class attendance is taken at each class meeting and participation is expected. Students should be taking notes, asking questions, or working in ALEKS. Points can be deducted from students who refuse to attend class and participate. ALEKS also provides several different detailed reports on each student, so that the instructor can monitor the participation and the progress of the student.

The final step was to enroll students, implement the program, and collect data on those who successfully completed Math 1100 with a grade of A, B, or C. The data was collected by the Institution Research at the University of Memphis over a three year period from fall 2010 through spring 2013, and shows the following:

I.   Student Success in Math 1100 and Retention in Subsequent Math Courses

Grade in Math 1100	# of Students	Grade in Next Level Math Course						Success Rate	Withdrawal Rate
		A	B	C	D	F	W		
A	35	25	8	1	0	1	0	97.14	0.00
B	66	30	19	10	1	4	2	89.39	4.55
C	107	25	44	20	6	11	1	83.17	0.00
Total	208	80	71	31	7	16	3	87.50	1.44

The data in Table I shows that 87.5% of the students who passed Math 1100 with a grade of A, B, or C passed their next required math class with a grade of A, B or C. That is, 87.5% of these students were retained (i.e. successful) through their next math course. The next required classes included in this study are College Algebra, Foundations of Mathematics, or Introduction to Statistics

II. Comparison of Success Rates for Caucasian Students to Minority Races

Race	# of Students	Grade in Next Level Math Course						Success Rate	Withdrawal Rate
		A	B	C	D	F	W		
Caucasian	85	37	27	14	2	5	0	91.76	0.00
Minority	123	43	44	17	5	11	3	84.55	2.44
Total	**208**	**80**	**71**	**31**	**7**	**16**	**3**		

Table II shows that the success rates of minority students' is nearly the same as the success rates for Caucasians. And, the withdrawal rates for both groups are very low.

Conclusion:

The data in the two tables suggests that a well-structured hybrid course (blended teaching) will help at-risk math students to develop into successful students at the university level, and it will improve the retention of the at-risk students. When the success rate of the at-risk students who took Math 1100 is compared to the success rate of my at-risk students who did not take Math 1100, the impact of Math 1100 and blended teaching is apparent. The success rate of my at-risk students in College Algebra and Foundations of Mathematics from fall 2008 through spring 2010 was less than 50%. 0ver the 3-year period from fall 2010 through spring 2013, the success rate improved to 87.5%. This study suggests that if a course like the redesigned Math 1100 is used as a prerequisite for College Algebra and Gen Ed Foundations of Mathematics, then the success rate and the retention rate of at-risk students in mathematics can be increased.