

Developmental Math Students Cross the Bridge to College-Level Courses

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Abstract

This article discusses strategies to help students who face challenges in pursuing college-level mathematics courses. Unfortunately, many students across the country pursue developmental mathematics courses when they enter college. There are many reasons for this occurrence, performance on the placement test, failure to take the placement test seriously, missing gaps in mathematical knowledge, failure to transfer previously learned skills, test anxiety, failure to adhere to time on task, and the list could go on and on. When colleges are faced with this situation, they must find a way to assist these students so they can be successful in college-level mathematics courses. At Coppin State University, this situation is addressed with first-time students during the summer bridge program, Student Academic Success Academy (SASA). This program has been successful in meeting the needs of incoming first-time students since its beginning. The study in this article is based on the success of MyFoundationsLab. MyFoundationsLab is a computer-based instructional intervention that meets students at their needs. “It has all the bells and whistles for

student success.” It is individualized learning based on student strengths and weaknesses. Coppin State University was privileged to participate in a study sponsored by the University of Maryland System. The results gave teachers and students high levels of confidence and motivation.

College-level Mathematics Courses Demand a Strong Conceptual Background

Corbishley and Truxaw (2010) state, “The National Council of Teachers of Mathematics has set ambitious goals for the teaching and learning of mathematics that include preparing students for both the workplace and higher education. While this suggests that it is important for students to develop strong mathematical competencies by the end of high school, there is evidence to indicate that overall this is not the case. Both national and international studies corroborate the concern that, on the whole, US 12th grade students do not demonstrate mathematical proficiency, suggesting that students making the transition from high school to college mathematics may not be ready for its rigors.”

As a seasoned mathematics educator, I agree with the veracity of the statement above. Many of our incoming freshmen do not have strong enough math skills to face the rigor of

college math courses. To help these students prepare, Coppin State University has developed a summer bridge program, Summer Academic Success Academy, which ensures they meet Maryland's College and Career Ready Standards. For the last five years (2010-2014), I have been the Summer Coordinator of Developmental Mathematics.

Our students are flagged for developmental math courses for a variety of reasons. Many students enter college with gaps in their skills. Many did not take our Accuplacer test seriously. Some students have met state requirements for math by 10th or 11th grade and do not take a math course during their senior year. When they don't take math courses for several years, they forget many concepts. These students do not perform as well as students who are actively engaged in mathematics courses throughout high school. I am glad the state of Maryland (College and Career Readiness and Completion Act of 2013, SB 740) now requires four years of high school mathematics for all students.

Guiding Students toward Success

Because developmental courses do not count toward general education requirements in mathematics, we schedule these classes during the summer. Otherwise students have to take both courses during the regular academic school year, and they will be a semester behind in credits towards a college degree. To help students be successful in these preparatory classes, our instructors provide a lot of encouragement and support. In my experience, developmental

mathematics students blossom with an appropriate support system that includes some of the following strategies.

1. They need to have instructors who believe that they can be successful.
2. They need to understand how to build on prior knowledge and transfer new information.
3. Individual and group tutoring supports their understanding of key concepts.
4. Asking questions and working independently does pay off.
5. Integrating technology enhances the learning process.
6. Ongoing feedback of student progress is beneficial to the instructor and student.
7. Experience in applying mathematical knowledge to real life applications is invaluable.
8. Creating a desire and passion in them to want to learn more and go to the next level is an investment in their future.

While we provide the support our students need, we also redesigned the Developmental Mathematics Program in 2005. Our further success has been attributed to these factors. All instructors teach from the same course syllabus; three-week test-out in Elementary Algebra option was installed; computer-aided instruction is aligned across all courses; ongoing progress updates are given to students when they complete tests, quizzes, and home assignments; implementation of office hours for one-on-one tutoring; face-to-face instruction occurs

according to the scheduled class; and instructors send student alerts when attendance problems or lack of student commitment arises.

Benefits of Computer-aided Instruction

My students benefit from face-to-face as well as computer-aided instruction through MyFoundationsLab, which is aligned with the common core standards. Computer-aided instruction is phenomenal; it asks students questions in a step-by-step manner so that they excel. However, if they have a problem, they can email their instructor. They can request a video where a teacher walks through a mathematics problem step by step. Or, they can request another problem to make sure they really understand. They can get help at the zone of proximal development. This enables instructors to meet students at their needs. Sometimes this is all it takes to refocus and get them engaged.

It would be advantageous for college bound students to get involved in an early intervention program. The 12th grade year of high school mathematics needs to be more meaningful so that the transition from high school mathematics to college level mathematics is achievable for all students. This challenge will dissipate with the rigor and attention to college-readiness standards.

Case Study

In the summer of 2013, Coppin State University's Summer Academic Success Academy (SASA) along with two other universities (University of Maryland

Baltimore County and University of Baltimore) from the University of Maryland System implemented MyFoundationsLab to improve student achievement in mathematics. SASA is a comprehensive, four-week, residential program designed to help incoming first-year students make the transition from high school to college while earning college credits. The state of Maryland requires that students take the College Board's Accuplacer test to establish their placement in college math courses.¹ The majority of SASA students test into Elementary Algebra. However, many of the students come with gaps in their knowledge. Courses differ greatly at the high school level, and students' exposure to math concepts varies, so when they arrive at college they're often not ready for college-level work. We adopted MyFoundationsLab for this course because we wanted a computer-based instructional tool that could be customized to target each student's specific needs.

Implementation

Students work in MyFoundationsLab in a computer lab for three-hours a day for five-days over a four-week period of time. A teacher and teaching assistant are available in the computer lab to provide extra help or one-on-one assistance as needed. Students begin by taking the MyFoundationsLab Path Builder assessment, which creates a Learning Path tailored to each student's individual needs. This is differentiated instruction tailored to meet the needs of every student working in the computer lab. This allowed the teacher and teaching

assistant to be facilitators of learning. High schools that make sure students leave well-prepared with mathematical skills tend to have an easier transition to college-level mathematics than students who had a limited exposure to mathematical concepts and skills.

Students complete the designated modules in the Learning Path to demonstrate mastery of the material. The modules range from basic mathematics to pre-calculus skills. Students are placed in a module based on the Path Builder score. As the teaching assistant and I circulated throughout the lab, when we saw a need for additional instruction it was provided. I taught targeted lessons to the whole group, when I saw a need among students. If students were making the same mistake over and over, then I addressed that particular concern. For example, step by step illustration of the distributive property was necessary and order of operations. I felt students were not following the distributive law and hierarchy of operations. Students today are digital natives. I find that they prefer doing their work in MyFoundationsLab to watching me teach on the whiteboard. Students were able to monitor their own progress daily. They watched the Path Builder Line get thicker and thicker and move to the right indicating their conceptual and procedural knowledge was growing and getting better. They also discovered for themselves that the more time they spent in MyFoundationsLab, the more knowledgeable they were of mathematical concepts and skills.

Benefits

MyFoundationsLab supports students with a variety of resources. The program thoroughly scaffolds their learning, guiding students through problems step-by-step, delivering carefully targeted help as needed, presenting related examples for additional practice, and providing instructional videos for greater understanding. The math modules in MyFoundationsLab are excellent. If a student graduates from high school with mastery of those modules, that student is ready for college-level mathematics.

I encourage students to work in MyFoundationsLab outside of class time. Students know these developmental courses do not count towards their degrees, and they want to work through them as quickly as possible. MyFoundationsLab helps students develop self-discipline and a personal commitment to improve their skills by working diligently every day of the course. Many students are pleasantly surprised at the significant progress they make in such a short time.

Assessment

The Mathematics department of Coppin State University prepares a departmental exam for all developmental mathematics students. The students pursuing Math 97 Elementary Algebra must score 70% or better to be awarded the 5 credits for this course. This assessment is not given on the computer. It is a paper-and pencil test. During the summer of 2013, 100% of the MyFoundationsLab students scored 70% or better.

Results and Data

Students who used MyFoundationsLab achieved greater success when retaking their Accuplacer test compared to students in the traditional section. An impressive 93% of students in the MyFoundationsLab pilot section increased their Accuplacer scores, by up to 56 points. Only 80% of students in the section without MyFoundationsLab saw improved Accuplacer scores with a 43 point increase at most. Students using MyFoundationsLab increased their Accuplacer scores by more than twice as much as those in the sections without MyFoundationsLab.

Table 1. Average First and Second Accuplacer Scores

	Score 1	Score 2	Average Increase
Elementary Algebra Without MyFoundationsLab	47.10	58.47	11.37
Elementary Algebra With MyFoundationsLab	52.46	77.00	24.54

The Student Experience

Students appreciate the instructional support provided by MyFoundationsLab.

- “I’m not very good at math, so to have made such substantial progress in a matter of four weeks is amazing. I think what helped me most were the instructor and the easy-to-understand online help in MyFoundationsLab.”

-Student (Improved 42 points on Accuplacer retest)

- “MyFoundationsLab showed me my areas of strength and of weakness and gave me problems targeted to where I lacked skills. It helped me understand problems that I was unable to understand in my previous math classes. I would definitely say that MyFoundationsLab is a good way to help students improve their skills.”

-Student (Improved 26 points on Accuplacer retest)

Conclusion

Every student in the MyFoundationsLab pilot passed Math 97 Elementary Algebra, which, of course, is always our main goal. Six of those students tested into College Math for the fall, and the remaining students progressed to Math 98 Intermediate Algebra. MyFoundationsLab plays a valuable role in the university’s effort to help students stay on track toward credit courses and graduation. These students made great strides in only four weeks. Also, once they see that they really can improve their skills, they gain confidence and the desire to do better.