

Preparing for math success: Brevard Community College preparatory math courses

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Whether for financial reasons, family obligations, or lack of academic ability, community colleges allow access to higher education for many who would have otherwise not been able to go to college. Brevard Community College brings educational opportunity to the people of Brevard county, playing an important role of training a future labor force, re-training the current labor force, and providing an academic foundation for students who choose to further their education. While community colleges provide the educational groundwork to students so that they can move on towards higher degrees, another part of the mission is to improve students' basic skills so that they have a strong foundation in which to build upon. While the basics may include English communication skills and critical thinking, students, faculty, and staff have expressed their concern with BCC students' mathematics skills.

During April and May of 2011 a three-question survey was available to BCC students, faculty, staff, and other stakeholders within the community that asked: what should BCC do to help students be more successful; what have you experienced at BCC, or another institution that has helped you succeed as a student; and what obstacles to your success as a student have you encountered at BCC? It was clear from the responses that math an obstacle for BCC students and a concern of the faculty. Students consistently said that they struggle in math, that math was preventing them from succeeding, and that BCC could do more to help them succeed in math. A small sample of student responses referring to math skills is included in *Appendix A*. While there were some positive responses, most of the responses reflected the need to improve academic support for students in math, especially within the preparatory class sequence. The community (faculty, staff, other stakeholders) responses also had a reoccurring concern with student math skills. Many indicated a need for increased support for students in math and some indicated a

need for more clear policies and goals for the math programs. A small sample of faculty, staff, and other stakeholder responses referring to math skills is included in *Appendix B*.

The survey conducted shed light on a number of areas in which BCC could improve services to help students succeed. The focus of this research will be to look into ways in which BCC could help students build a stronger foundation of basic math skills and increase the number of students that successfully pass the math preparatory courses. The following section will briefly cover the historical context of preparatory courses within the community college and a closer look how BCC students perform in the Math preparatory sequence, followed by an examination of what is being done at other institutions that has lead to success.

Historical Context and Institutional Data

Community colleges have been around for more than a hundred years and are an essential part of the American higher education system. The role of these institutions has gradually broadened from an initial focus in the early 20th century on preparing students to advance to four year institutions to include students that are more career oriented in the mid 20th century, which prompted most institutions to change from Junior Colleges to Community Colleges (Arendale, 2010). Along with training students for the labor force, there is a sort of dual identity that community colleges have today; the junior college identity that prepares students to transfer on to the university, and the secondary school extension offering courses that have similar content to what is offered in high school (Bueschel, 2009). College preparatory classes may have initially been intended to offer a refresher to returning students, have now become a tool to help those students that did not learn the basic skills in high school to catch up to their peers. Among the forces pushing the need for remedial education include the overall increase in student population aspiring to bachelor's degrees but underprepared for the university setting. Though

students may not be able to start out at the university level, community colleges have communicated clearly that they are institutions that welcome anyone and students know they have access to these institutions (Bueschel, 2009). However, in order to advance they still need to prove academic aptitude, which very likely means going through preparatory classes. At community colleges in the state of Florida, 65% of all students need to remediate in at least one subject (reading, writing, or math) in order to advance to general education college credit coursework (Florida Department of Education, 2005). The percentages are similar for BCC students and institutional data on math reveals that more than half of all students pursuing Associates degrees are required to take at least one preparatory class.

Institutional Data

To examine how BCC students fare in math, data on placement testing and performance in classes was collected. The sample collected includes students from fall 2008 through summer 2011 that are in programs that require placement testing in mathematics, which includes the Associate in Arts, Associate in Science, Associate in Applied Sciences, and some college credit certificates. The sample does not include students that transferred to BCC with college credits in math, nor does it include the Dual enrollment population. The sample also does not include students who have taken a placement test and have yet to enroll in the math courses that they are placed into, however, this is estimated to be a small proportion of the total students in these programs. The total number of students that met these parameters was 10,909. The data clearly show the need that was expressed by BCC students, faculty, and staff; students are placed into preparatory classes at a high rate, and once they are in the courses they struggle to get through them.

At BCC, if students do not have transfer coursework equivalent to college level math and English, they are required to take one of three tests to determine placement into courses. These three tests include the ACT, the SAT and the Accuplacer CPT. Based on the results of these three tests students can place into one of five courses. The courses, in ascending order from lowest to highest placement are: Pre-Algebra Prep MATV 0012; Developmental Math Combined MATV 0020; Introductory Algebra Prep MATV 0024; Intermediate Algebra MAT 1033; and College Algebra MAC 1105. Over half of all students place into at least one level of preparatory math classes, and over 25% are placed at the lowest level. Table 1 shows BCC math placements by level for the sample data of students in programs that require math.

Table 1

Placement percentages of students in math courses

	Number	Percentage
MAC 1105	3,004	27.54%
MAT 1033	2,277	20.87%
MATV 0024	1,831	16.78%
MATV 0020	990	9.08%
MATV 0012	2,807	25.73%
Cumulative	10,909	100.00%

Students placed into prep courses are having difficulty passing, as nearly half of the students will need more than one attempt to pass their first attempt at the math course. Table 2 shows the passing rate of students in the first attempt at each level of prep math courses at BCC.

Table 2

First attempt success rates for prep courses

	MATV 0012	MATV 0020	MATV 0024	Total
Number of first attempts	3,041	787	3,434	7,262
Percentage passed	58.20%	41.80%	48.22%	51.69%
Percentage not passed	41.80%	58.20%	51.78%	48.31%

This highlights a trend that is not good for BCC students. Students place into MATV 0012, eventually move on to MATV 0024 and may be unsuccessful in the second level. Students may be taking each course multiple times in order to get through the prep sequence. Looking at data from all students enrolled in the fall of 2010 reflects this trend. Table 3 shows the number of students that needed three or more attempts in order to pass each level of math. The numbers reflect the survey results; students are having trouble with their math courses and need additional help to get through them.

Table 3

Of the students enrolled in Fall 2010, number that took three or more attempts to complete each math course

Course	Number of students
MATV 0012	125
MATV 0024	254
MAT 1033	171
MAC 1105	153

Modes of instruction.

Currently BCC has three modes of classroom instruction for Math prep courses including standard face-to-face courses, courses with online support or hybrid courses, and courses that are entirely online. There are some sections of math prep courses that are entirely on campus with no online support, however many of the courses on campus include online support. BCC uses *MathXL* computer software to supplement on campus instruction and online classes, which is capable of producing diagnostic tests that can be used to develop customized lesson plans. No information on how many math faculty members utilize these functions was available.

Responses to the spring survey were mixed in terms of the use of technology within math classes; some students expressed frustration with the software programs while others felt the

programs were great. By looking into what has worked at other colleges, there seems to be an increased dependency on the use of technology in developmental courses. If used effectively these tools can really improve learning and increase the collection of data in order to continue to assess learning outcomes. As BCC increases the use of technology within classes there must also be an increase in support for those students that are not comfortable with the software. The section that follows is an overview of some efforts to improve student success in math at colleges across the country.

What Can Be Done?

It is important is that if an institution sees a program is not working well, they will take time to think about what can be done to help improve the situation for the students. While continuous assessment of programs is a necessity, going through the reaffirmation process is a way of publicly addressing issues that are important to all the stakeholders of an institution. We have identified a need to improve academic support for students taking math preparatory classes at BCC and by looking at some examples of what other institutions have done to improve student success in math, BCC can generate ideas on how to improve our math preparatory program. Some initiatives that have helped improve passing rates at other schools include paired courses, compression, and curriculum redesign through increased use of technology.

Paired courses.

The use of paired courses gives institutions the ability to create a learning cohort and can be effective in increasing retention and student success. With paired courses institutions can link preparatory courses with college credit courses to provide students the opportunity to earn college credit courses with developmental courses (Edgecombe, 2011). This is something that

could work well for English preparatory courses as they would be paired something with similar content, however, it may be a little more difficult to combine similar content with math courses. This could be an opportunity to have students enroll in courses that can help improve time management and study skills. BCC has experimented with this in the past with some degree of success (<http://www.oncourseworkshop.com/Miscellaneous008.htm>) but this experiment was discontinued shortly after it started. BCC paired prep course with a course called *Success Strategies for College and Life* and results indicated that there was an increase in student success. Considering that basic knowledge of technology is vital for today's graduates and is utilized in many math classes, a good course to pair a math class with would be an introduction to computers or a computer applications class.

A different approach to pairing a course would be mainstreaming with supplemental support (Edgecombe, 2011). This is when you take a student who has placed into a preparatory class and put them directly into the college level course but provide additional dedicated support for those students. This may seem a little risky, but perhaps for students who score close to college ready it can be a viable option. This may also reduce some negative implications that go with the prep courses by giving them the opportunity to get college credit (Edgecombe, 2011).

Compression.

Although it may not seem intuitive to put students who struggle in math through a faster paced version of the same class, offering compressed courses may be a way to help students proceed through their preparatory coursework. Edgecombe (2011) stated that “[a]dvocates of compressed courses believe that longer instructional blocks provide opportunities for teachers to diversify classroom activities and to encourage the development of stronger student–instructor relationships—both of which are assumed to benefit student learning,” (p. 8). If a student were

to place in the first of two math courses, they could proceed through the entire math sequence needed to get to college credits in one semester instead of two. Students could focus on one less class at any given time during the semester to continue full-time enrollment. Although the courses would meet longer and more often throughout the week, it would be the same time demand as taking two classes over the length of the semester. Compressed courses may facilitate less need for review and can reduce redundancy by having no time off between courses (as cited in Edgecombe, 2011). In the past there have been a few examples of compressed courses at BCC with mixed results as far as improved completion of the courses. Table 4 shows the completion percentage of the compressed coursework and the sample size of the classes.

Table 4

<i>Completion percentage and sample sizes of compressed courses by semester</i>				
	201020	201040	201110	201120
Passing rate	53.33%	50.00%	60.00%	62.50%
Sample size	15	18	16	9

Although the sample sizes are small there is some indication that students in the compressed courses do at least as good as standard length classes. In addition, these sections were not necessarily set up intentionally as the compressed course model in that not all students registered for both classes and the instructors were not the same for successive courses. Some students were successful in the first class but did not take the second. Likewise, some students did not take the first class but registered for the second. These passing rates may improve if courses at BCC are offered in the compressed model and for students progressing from the lowest prep math course. This is an area in which BCC should experiment; aside from scheduling there is little that would need to be done to see if this would work.

Curriculum redesign.

Curriculum redesign employs technology to provide a format that is unlike traditional classroom courses. This option would be the most extensive and most difficult to move forward with. Two examples of how curriculum can be redesigned take two different approaches: one that asks what is important for the students to understand for their chosen major; and the other that allows a student to focus only on areas of math that they are deficient in rather than going through every lesson within a course and thus allowing the student more time to master skills they do not have. Modularization is a way to approach curriculum redesign. Jackson State Community College has explored the idea of giving students only the math they need for their chosen major. JSCC modularized their prep math sequence into 12 modules and discovered that if a student did all 12 levels, nearly 80% of the students would have mastered math skills not necessary for their chosen major (Bassett & Frost, 2010). This allows a customization and the creation of math curriculum roadmaps, which that can be done efficiently though computer software. The idea behind the re-design was to allow students to master skills that they need for their chosen major.

Cleveland State Community College has taken the other approach and allows for students to complete math modules at their own pace giving student more time to master the skills that they do not have. Their modular approach allows students that only need a refresher to complete the coursework rapidly while the continuous enrollment aspect allows students that need more time to take the course at a slower pace over multiple semesters if necessary (Squires, Faulkner, & Hite, 2009). To continue on to the next module students must prove mastery of the subjects, which the department set at 70% on every aspect of the course requirements – homework, quizzes, tests, and attendance (Squires et al., 2009). The modular approach will only work if

there is an increased dependency on technology, as students will need to be able to work independently through the coursework. This will necessitate a different approach to classroom instruction with more focus on lab work with guidance from instructor. It could allow for the instructor to design short lecture/tutorials if they see that a number of students are struggling with a certain aspect of the material.

Discussion

All the options to improve student success in preparatory classes reviewed for this research involve technology in some way. From data analysis to content delivery, it is the way the math discipline seems to be headed. BCC has the resources to explore some of these options already including a software program that can make math coursework more unique to the individual students, and faculty who are willing to explore format options of classes. In the long term an over hall of the math program may be warranted as today's learners become more comfortable with technology. Although there was some indication of student frustration with technology in math courses, if faculty and academic support staff are trained and dedicated to helping students utilize the technology, Brevard Community College will ultimately produce more well-rounded graduates ready for the challenges of today's economy. As a Quality Enhancement Plan topic, improving math success in preparatory classes would be something that BCC should consider as it would help a large portion of BCC students. This plan is something that could be implemented and accomplished within a time frame suitable for a five-year report following reaffirmation.

Appendix A

Student feedback from QEP survey

1. What should Brevard Community College do to help you be more successful as a student?

In math class, assign bookwork, not the MathXL work.

More tutors in science and math lab and more workshops.

Provide more assistance in the math lab. It is like a fast-paced assembly line with tutors only having a few minutes with each student then they move on to the next one. The room is crowded and many times you wait until they have circled the room before you can get help with "one" more problem, then you wait again. There is a lot of wasted time rather than tutoring time. It's a very frustrating experience.

2. What have you experienced at Brevard Community College or another institution that you feel has helped you succeed as a student?

I feel that the writing, math, and reading tutors are very helpful. Going to the instructor office hours for understanding are also very helpful in college.

I love the math lab, they have helped me tremendously [and] I tell them often how much they have helped me.

I think that MathXL is extremely helpful, it shows you step-by-step how to do the problems and at your own pace.

I feel the learning labs helped me succeed as a student, especially the Math Lab. I received in depth tutoring at the Math Lab and I relied on them to get through some tough classes. I don't believe I would have successfully passed my math classes without their help.

I feel the learning lab math lab and computer lab help the students at BCC as a whole. Always having access to help makes a huge difference in the learning experience.

3. What obstacles to your success as a student have you encountered at Brevard Community College?

Math. I am horrible at math. I still have to take 2 more classes of it in order to get me AA degree but I'm not a math person, AT ALL!

Math XL. Aggravating hard to use and there is no other option. Prior to enrolling in the class you do not know how the system works until you are committed to the program.

I have trouble in math and I have had such a hard time passing the prep math. I think that students should be able to re take the CPT after taking a prep math for the second time. Just to see where their skills are at before spending out of state tuition for a class you don't even get a college credit for.

I have come to realize that math is not my major.

My math class was such a difficult obstacle for me at BCC, but the free math tutors really helped me to become successful in my algebra class!

One obstacle that I am experiencing is that I am struggling in my prep math. The class is set up as an in class online class and the instructor is available if you get caught on a math problem. I feel somewhat intimidated and embarrassed to ask questions to my instructor.

I struggle with Math. The math classes at BCC are tough. I would rather go over less material, and become proficient in each chapter covered. It just seems you are presented a large amount of material to be completed in one semester.

Not enough help in math learning lab.

Limited access to great Math Professors! The nighttime math teachers are mediocre at best and since this is the hardest class to me to pass it is imperative that I have a really really awesome math teacher! I have taken each math class at least three times and my pass/fail ratio depended largely on the professor that taught the class!

I would like to see more help in the math lab. I have been there all different hours and haven't been able to get much help because there are so many students. It would be beneficial to be able to make an appointment.

There needs to be more programs like TRIO that offer personal tutors. It's hard going to the Math Lab when you get a different tutor each time and they show you a different way.

Appendix B

Faculty, staff, and stakeholder feedback from OEP survey

1. What do you think BCC should do to improve student learning?

The way math is taught makes it difficult for many students to graduate. That is the one subject that holds many back. There are major problems in the math department. They need to understand their learners.

Establish clear standards for excellence across the college, and minimum expectations for student performance in the areas of writing, reading, mathematics, and conduct

2. What have you experienced at Brevard Community College or another institution that you felt resulted in improved student learning?

There should be a common final exam for all groups of the same math course; the same standard will be fair to students, keep instructors responsible for material covered, show the quality of instruction. That should be applied to all courses lower than Calculus.

Learning Labs were a great help to me while I was a student at BCC, especially for Math and Languages.

At Brevard Community College, I had my first experience with Math XL. I think using Math XL helped me do my homework and study for extras more than I could have ever done if I had to stick with the book.

3. What do you see as current obstacles to student learning at BCC?

THE MATH PROGRAM

There is no clear institutional support for quality education in the most fundamental sense. A college-wide emphasis on writing, reading and mathematics if tied to clear expectations for student performance would be helpful.

References

- Arendale, D. R. (2010). Special issue: Access at the crossroads – learning assistance in higher education. *ASHE Higher Education Report*, 35(6), 1-145. doi.org/10.1002/aehe.3506
- Bassett, M. J., & Frost, B. (2010). Smart math: Removing roadblocks to college success. *Community College Journal of Research and Practice*, 34(11), 869-873.
doi:10.1080/10668926.2010.509232
- Bueschel, A. C. (2009). The landscape of policies and practices that support student preparation and success. *New Directions for Community Colleges*, (145), 1-10. doi: 10.1002/cc.351
- Edgecombe, N. (2011). *Accelerating the academic achievement of students referred to developmental education: CCRC working paper number 55*. Community College Research Center, Columbia University. Retrieved from
<http://ccrc.tc.columbia.edu/Publication.asp?UID=867>
- Florida Department of Education (2005). *Developmental education in Florida community colleges*. Retrieved from <http://www.fldoe.org/cc/OSAS/APTP/dep.asp>
- Squires, J., Faulkner, J., & Hite, C. (2009). Do the math: Course redesign's impact on learning and scheduling. *Community College Journal of Research and Practice*, 33(11), 883-886.
doi: 10.1080/10668920903149723