

MyLab Math/Statistics educator study measures student outcomes in corequisite courses at Pellissippi State Community College

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| <p>School name Pellissippi State Community College, Knoxville, TN</p> <p>Course names Elementary Probability & Statistics Corequisite: Statistics Principles with Lab</p> <p>Survey of Mathematics Corequisite: Survey of Mathematics Principles with Lab</p> <p>Course format Corequisite; hybrid</p> <p>Course materials MyLab Statistics with <i>Essential Stats</i> by Triola MyLab Math with <i>Using and Understanding Mathematics: A Quantitative Reasoning Approach</i> by Bennett and Briggs</p> | <p>Timeframe 2013–2016</p> <p>Educators Sue Ann Jones-Dobbyn, Associate Professor Kim Martin, Associate Professor Brittany Mosby, Associate Professor Nancy Pevey, Dean of Mathematics Claire Suddeth, Associate Professor</p> <p>Results reported by Traci Simons, Pearson Customer Outcomes Analytics Manager</p> |
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Key Findings

- College-level math course completion rates increased 14 percentage points when corequisite courses were implemented.
- 63 percent of student survey responders agreed or strongly agreed that the corequisite course helped them in the college-level course.
- 73 percent of students agreed or strongly agreed that completing work in MyLab Statistics allowed them to get a better grade in their course.

Setting

Pellissippi State Community College (PSCC) was founded in 1974 with 45 students in three associate's degree programs. Today, Pellissippi State is the largest of the Tennessee community colleges with a Fall 2015 enrollment of 10,325. The college supports career-path associate's degrees,

associate's degrees for transfer to four-year institutions, certificates, and continuing education opportunities to meet the needs of the community.

With five campuses located throughout Knox and Blount counties, the college employs around 1,000 full- and part-time faculty and staff, making it one of the largest employers in Knox and Blount counties.

Below are some quick facts about PSCC from Fall 2015:

- Enrollment status: 5,096 full-time students, 5,229 part-time students
- Gender: 52 percent female; 48 percent male
- Age: 64 percent between 18–24
- Ethnicity: 83 percent Caucasian, 7 percent African American, 4 percent Hispanic
- Average first-time freshman high school GPA: 2.92
- Students receiving aid:
 - Federal grant aid: 34 percent
 - State/local grant aid: 45 percent
 - Institutional grant aid: 4 percent
 - Loan: 19 percent

The school's [Office of Institutional Effectiveness, Assessment and Planning](#) has compiled numerous reports containing more information on the school's success and demographics.

About the Courses

Introductory Statistics | Corequisite: Principles of Statistics with Lab

A corequisite for the college-level Introductory Statistics course, the two-credit hour Principles of Statistics with Lab course consists of mastering prerequisite mathematics and the skills needed for success in the college-level course. A weekly supervised lab time in a designated academic support area allows developmental students to complete assignments covering topics from both courses.

Students who have Math ACT sub-scores of below 19 are placed into the Statistics Principles with Lab course and are concurrently enrolled in the three-credit hour Introductory Statistics course. They meet with the college-level course four days per week and spend an extra day per week with their Principles course classmates in the lab classroom. They are also required to spend two additional hours of tutoring outside of the classroom in one of the tutoring centers. Topics covered in that course include elementary probability theory, concepts of descriptive statistics, discrete and continuous distributions, hypothesis testing, confidence intervals, sample sizes, correlation, regression, multinomial and contingency tables. Noncalculus-based computer applications are also investigated.

Prerequisites for placing directly into the college-level Introductory Statistics course are high school algebra I and algebra II and ACT math and reading scores of at least 19.

Survey of Mathematics | Corequisite: Survey of Mathematical Principles with Lab

A corequisite for the college-level Survey of Mathematics course, the three-credit hour Survey of Mathematical Principles with Lab course consists of mastering prerequisite mathematics and the

skills needed for success in the college-level course. A weekly supervised lab time in a designated academic support area gives developmental students time to complete assignments covering topics from both the support course and the college-level course.

Students who have Math ACT sub-scores below 19 are placed into the Survey of Mathematics Principles with Lab course and are concurrently enrolled in the three-credit hour Survey of Mathematics course. Students enrolled in the Principles with Lab course meet three days per week with the college-level course and two extra days per week in the lab with their Principles course classmates. Topics covered in the college-level course include critical thinking skills, problem solving, logic, geometry, measurement, consumer math, probability and statistics.

Prerequisites for placing directly into the college-level Survey of Mathematics are high school algebra I and algebra II and ACT math and reading scores of at least 19 or the equivalent math and reading placement scores.

Challenges and Goals

When administrators and faculty at PSCC were presented with the innovation of changing the structure of learning support for students who entered college without requisite ACT scores, they decided to take matters into their own hands. The department dean decided to focus the redesign on one of PSCC's high enrollment general education courses, Introductory Statistics, and asked if any faculty were interested in redesigning in light of some of the changes that were happening at the state level. Three instructors volunteered: Sue Ann Jones-Dobbyn, Brittany Mosby, and Claire Suddeth. The Survey of Mathematics course redesign followed the successful rollout of the stats course.

When creating the courses, the three educators had several objectives:

1. To make sure the new corequisite course would cover students' math deficits in a way that would directly contribute to their success in the college-level course. In the existing structure, the learning support branch was completely separate from the college-level branch. While each was doing its separate job just fine, Jones-Dobbyn, Mosby, and Suddeth aimed to consolidate those units into a single course in order to better the whole.
2. To create a blended environment where each section included both co-req and college-level course students. The hope was that students who needed learning support, who had often felt excluded from students taking college-level courses, would now feel included and a part of the college environment.
3. To improve student retention/completion and success (ABC) rates of the college-level course for the population of students who would have previously taken the learning support modules as a prerequisite to the college-level course.

Implementation

Students who are in the corequisite courses sign in to two MyLab™ courses while students taking just the college-level course sign in to only one. Pellissippi State felt cohesion was important, so students in the support course have the same instructor in the credit course. "Many schools don't

have the luxury or the ability to have the same instructor, but we felt it was very important,” states Mosby. Students, in fact, agree: according to a Fall 2016 voluntary end-of-semester student survey (58 percent response rate), 81 percent of responders agreed or strongly agreed that having the same instructor in the support course and the credit course played an important role in their overall performance. Below is a breakdown of how each course uses MyLab.

Learning Support (Corequisite) course

In order to ensure students didn't feel as though they were taking two separate courses and instead could see and appreciate how the support course was helping them in the college-level course, Jones-Dobbyn, Mosby, and Suddeth mapped the TBR's [Learning Support Competencies for Mathematics](#) (referred to henceforth as A-100 guidelines) to the content for the two courses. While completing the mapping, they asked themselves, “What underlying skills would students need in order to be successful at the college-level course?” In addition, in order to satisfy the critical thinking component of the A-100 guidelines, a large data analysis project was conceived and implemented.

The team quickly found that algebra textbooks explain things algebraically, while statistics textbooks describe them statistically, so they decided to write most of the problems that would be covered/assigned in the support course themselves using MyLab's [custom exercise builder](#). For example, the A-100 guidelines require students to understand inequalities, which is necessary when studying probabilities in statistics, such as the problem, “What is the probability of a woman having a height greater than 54 inches?” They then wrote questions for students taking the support course that broke down the component knowledge:

1. Write the phrase “greater than 53” as an inequality;
2. Plot it on a number line; and
3. Identify what it would look like if it was on a bell-shaped curve.

Using this approach, Jones-Dobbyn, Mosby, and Suddeth wrote about 50–75 percent of all the problems that are in the corequisite course.

The Statistics corequisite course is organized into nine labs, or homework assignments, (the Survey of Math support course has eight labs) that are mapped to the A-100 guidelines. Students must do the lab work and then take periodic proficiency exams in MyLab. Within the labs, all learning aids are available to students, with the exception of custom-created questions. When the custom exercise builder is used, the available learning aids are lost, so Jones-Dobbyn, Mosby, and Suddeth created videos for those questions and inserted them where the learning aids would typically be.

Students in the learning support course must attend each scheduled weekly class hour and complete two additional hours per week in the computer lab at their convenience. They are allowed to work ahead independently, and two students reported in the survey that they finished all of their support course work before the first exam in the credit course. Although students are allowed to work ahead, they are penalized if they fall behind: students who take the proficiency exam after the deadline get 30 percent deducted from their exam score.

Proctored proficiency exams are made up of pooled problems from the labs that have been covered. Every time a student takes a proficiency exam, they must earn 80 percent or higher to move on. If they have to retake the exam, it's not exactly the same as the previous exam because of the algorithmically generated problems and question pooling features in MyLab. While there is no limit to the number of times students can retake the proficiency exams, the team reports that the

maximum so far has been about four times. Before students can retake the exam, their instructor goes over the test with them and reminds them that the next test will be different.

In addition, students in the Statistics support course also complete a capstone project which requires them to analyze large, real data sets and complete an analysis that spans the entirety of the course content. Mosby states, “We tried to pick topics that would be of interest to our students or in some other way valid in the college community. For example, we created one topic that uses data from Appalachian Regional Commission because the English courses all read a common book about Appalachia.” Suddeth adds, “We also have some about hiring and promotion bias, youth smoking, police-involved deaths, etc. These are typically topics that are in the news that our students will be hearing a lot about.”

College-level course

The Introductory Statistics course uses MyLab mostly for homework. All sections meet in a computer classroom and start with a lecture that includes group and individual in-class practice.

Lead instructors put together a homework set and create a course that others can copy. Most adjuncts copy the coordinator course; however, each instructor is allowed to choose from MyLab Statistics, TI-84 calculator, tables, or a combination of the three as their preference for instruction.

The same is largely true for the Survey of Math course except that not all sections meet in a computer classroom; however, all of its support courses do meet in the computer classroom.

Assessments

Learning Support (Corequisite) course:

- 60% MyLab proficiency exams (5 tests; must score at least 80% on each assessment to pass the course)
- 25% Capstone project (a minimum score of 80% is required to pass the course)
- 15% Laboratory assignments

Grading Scale: A=94–100%, B=87–93%, C=80–86%, F=Below 80% or too many absences

College-level course:

- 65% Testing
- 10–20% Laboratory assignments
- 0–10% Field work

Grading Scale: A=93–100%, B+=88–92%, B=83–87%, C+=78–82%, C=70–77%, D=60–69%, F=Below 60%

“The power of the corequisite model is that we’re talking about would-be developmental students completing college-level math in a single semester.”

—Sue Ann Jones-Dobbyn, Pellissippi State Community College

Results and Data

According to Dr. Tristan Denley, former Vice Chancellor for Academic Affairs at the Tennessee Board of Regents, the most important factor to student retention is the amount of time it takes to complete the learning support classes. Therefore, it wasn't just higher success rates that Pellissippi was seeking, but also an accelerated course completion rate. If this could happen, students would also save money because they would be paying for fewer credit hours. Instead of up to eight hours for the developmental modules (five hours) plus the stats course (three hours), they would pay for three fewer credit hours and take one less semester to finish with the corequisite course.

Between 2014 and 2016, nearly two-thirds of first-time freshmen at PSCC required a developmental math course: 63 percent in Fall 2014–2015 and 60 percent in Fall 2015–2016. Prior to co-req implementation, 41 percent of students in the Fall 2014 cohort completed a college-level math course in three consecutive semesters. Once co-reqs courses were implemented (Fall 2015–2016), the Fall 2015 cohort saw a college-level math course completion rate of 55 percent, a 14 percentage point jump from the prior year (figure 1).

College-level math course completers

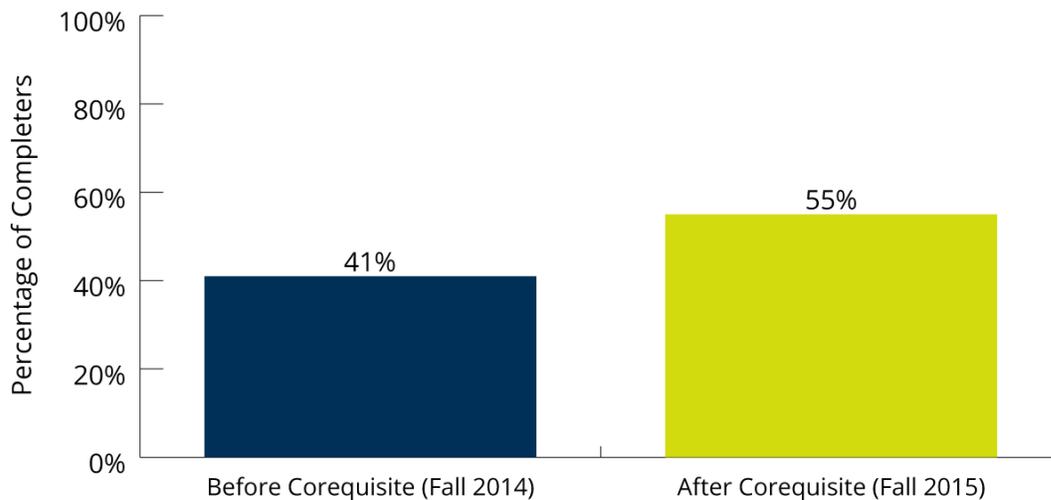


Figure 1. Percentage of Students Completing College-level Math Course; Fall 2014 ($n=1,332$); Fall 2015 ($n=1,470$)

In addition, PSCC saw an increase in college-level math course completion rates for different groups of the population (figure 2). Minorities saw a 19 percentage point increase in completion rates, adults (those older than 24 years) saw a 13 percentage point increase, and first-generation college students (self identified) also saw a 13 percentage point increase.

College-level math completers by group

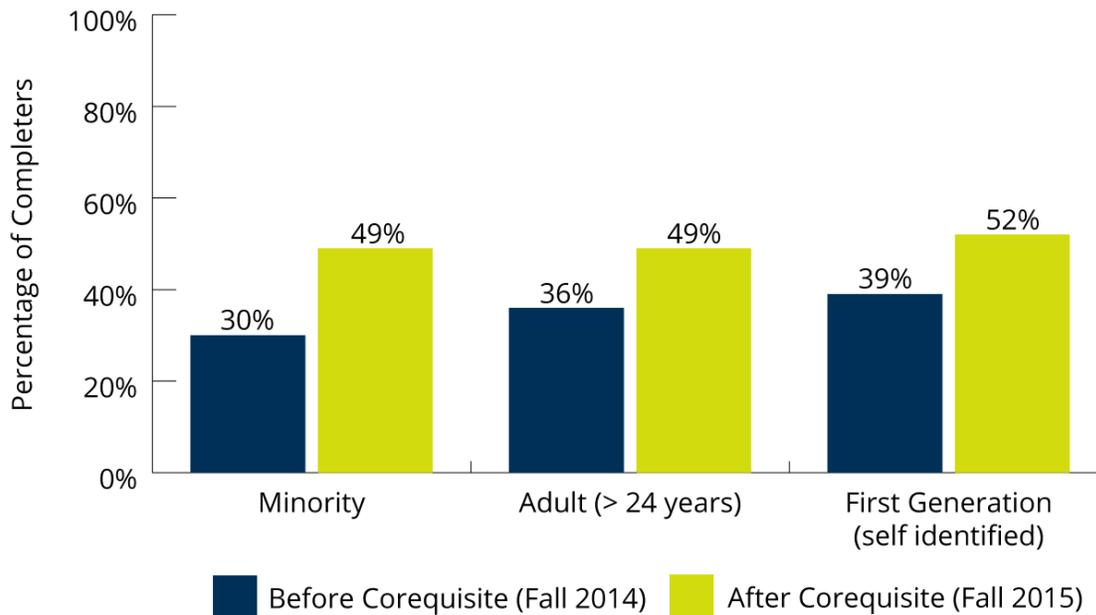


Figure 2. Percentage of Students Completing College-level Math Course Based on Population Group, Fall 2014 and Fall 2015 cohorts

Finally, would-be developmental students also increased their college-level course success rates upon implementation of the corequisite model (figure 3). In other words, students who took the support course (who would have previously had to take developmental math modules) saw success (ABC) rates of 57 percent and 61 percent for Survey of Mathematics students and 56 percent and 57 percent for Statistics students in Fall 2015 and Fall 2016, respectively.

College-level course success for support course students

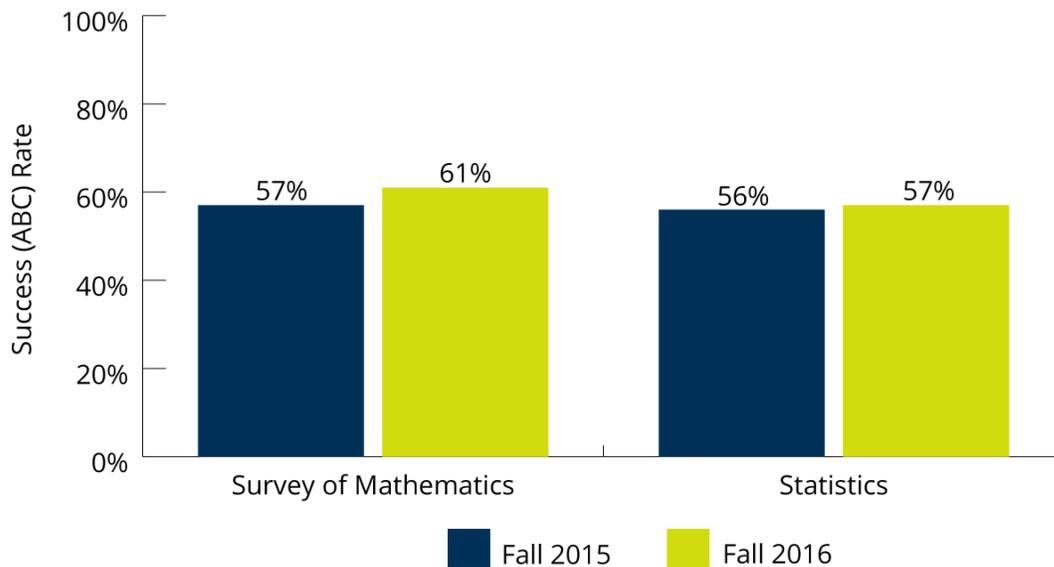


Figure 3. College-level Course Success (ABC) Rates for Students Taking Corequisite Course, Fall 2015 ($n=633$) and Fall 2016 ($n=626$)

The increased number of students who persist to college-level mathematics has encouraged faculty. Jones-Dobbyn states, “While student success rates in the college-level course did increase for that group of would-be learning support students, the retention of those same students is what we are focused on.” She continues, “The key is that, before this model, the college-level course only saw about 70 percent of the students who started in learning support. Those students who did finish were mostly ready for the college-level course, so the learning support course did, in fact, prepare them for college-level math; however, the issue was the number of students who dropped out of the program altogether. The power of the corequisite model is that we’re talking would-be developmental students completing college-level math in a single semester—60 percent of our incoming freshmen need remediation, and because of the co-req model, they are getting college-level math credit within a year, saving them an entire year of time and money. That’s a big deal when the state pays for two years of community college.”

Thus, not only did PSCC’s students experience more success in the support courses and, subsequently, their college-level courses upon corequisite completion than ever before, but they also did so in a much faster timeframe (half the time), saving at least [\\$156/credit hour](#) in the process.

The Student Experience

In Fall 2016, Statistics students at Pellissippi State completed a voluntary survey about the course and MyLab Statistics (58 percent response rate). Of those who completed the survey, 49 percent were enrolled in the support course for Statistics.

The following represent student responses from the corequisite portion of the course:

- 63 percent agreed or strongly agreed that the corequisite course helped them in the college-level course.
- 71 percent agreed or strongly agreed that the material covered in the corequisite course was closely tied to what they needed to know for the college-level course.
- 43 percent agreed or strongly agreed that being enrolled in the college-level course with others who weren’t in the corequisite course helped them feel more included in the college; 39 percent of responders were neutral

Below are some comments from students regarding what impact the support course had on them:

- *“It helped me better understand the basics of math, which helps me understand more complex math as well.”*
- *“The tools and resources from the corequisite helped me succeed in statistics.”*
- *“It forced me to go to tutoring which overall helped me succeed in the college level course.”*
- *“[The support course] helped me a lot with the 1530 class. I think I did better than some of the students not taking both the 1530 and 0530.”*
- *“I think it really humbled me, in the respect of I thought I would never need any extra help, but I really did. I grew closer bonds with the people I see all week and with the teacher.”*

One of PSCC's goals was to create a blended course where students did not know who was in the support course and who wasn't. Students in the support course were asked if students in the college-level course knew if they were in the support course. Figure 4 shows their responses.

Did other students know you were in the support course?

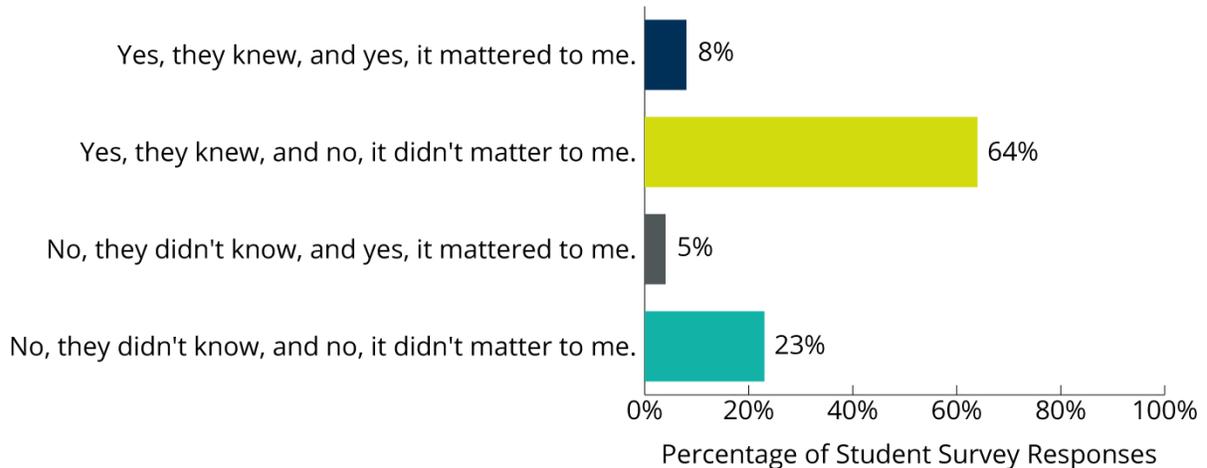


Figure 4. Survey Responses to the Question, "Did Other Students Know You Were In the Support Course and Did it Matter to You?" Fall 2016 ($n=77$)

Interestingly, 71 percent of students said their peers knew they were in the support course, but 64 percent of them said it didn't matter to them whether they knew or not. Students were asked to explain their answer, and below are some of their comments:

- *"It didn't matter to me that some of my classmates knew. I even helped a couple of them with work they didn't understand and they were in the corequisite course."*
- *"Some were aware because our corequisite was immediately followed by our credit course, and they wondered why we were all in here so early. It did not matter to me if they knew or not because most wished they had the extra help too."*
- *"None of the students seem to be judgmental about whether or not someone is in a corequisite class. It is also fairly common for students to be enrolled in corequisite classes."*
- *"I didn't want them to know because I feared they would think less of me."*
- *"It kind of did matter to me that other people knew I was in the 0530 class because the way that class got explained to me by an adviser was that it's because I didn't do well on my ACT. I was embarrassed to tell my friends about that class, too, because I felt like it was a "these people are not smart" class. But overall it did help me."*
- *"It did not matter to me that anyone to knew I was in the corequisite course. I have not been in school for a while and enjoyed not having to just take the pre-algebra before I took statistics. It was nice to get it all done at the same time."*

In regards to MyLab Statistics, students responded affirmatively to the following statements:

Percentage of respondents answering agree or strongly agree to the following statements

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| 74% | MyLab provided adequate practice to understand the concepts. |
| 73% | Completing work MyLab has allowed me to get a better grade in my course. |
| 69% | Completing work in MyLab helped my confidence in math. |
| 68% | MyLab adequately prepared me for exams. |
| 67% | MyLab made me more confident in my ability to understand the concepts. |
| 63% | MyLab provided a positive learning experience. |
| 59% | Completing work in MyLab prepared me for future courses. |
| 58% | MyLab provided different ways for me to learn through videos, examples, textbook, etc. |

Table 1. Percentage of Student Respondents Answering Agree or Strongly Agree to Survey Statements, Fall 2016 ($n=156$)

Conclusion

Pellissippi State had three goals when they began implementation of their corequisite Statistics course, and they met all three successfully:

1. Create a support course that ties directly to skills students will need in the Statistics course.
 - By creating custom questions in MyLab that tied directly to the objectives covered in the college credit course, instructors were able to deliver a support course where 71 percent of student survey responders agreed or strongly agreed that the material covered in the corequisite course was closely tied to what they needed to know for the college-level course.
2. Create a blended learning environment in the college-level course where students in the corequisite course felt included.
 - Forty-three percent of student survey responders agreed or strongly agreed that being enrolled in the college-level course with others who weren't in the corequisite course helped them feel more included in the college
 - Sixty-four percent of student survey responders said that while their classmates in the college-level course knew they were in the co-req course, it didn't matter to them. Many students even noted that they appreciated the extra help the co-req course gave them, were able to help other students who weren't in the co-req course, and even earned higher grades than some of them.
3. Improve student retention/completion and success (ABC) rates for the population of students who would have previously taken the learning support modules as a prerequisite to taking the college credit course.
 - College-level math course completion rates rose 14 percentage points when students who would have previously had to complete the prerequisite developmental math modules were able to take the corequisite course.

Kim Martin, Associate Professor, notes that making the transition to a corequisite model helps if there is a blend of instructors who have taught both developmental math and the college-level course. "I came from learning support and to combine [the two courses] didn't seem that difficult other than the different range of students, but I knew that going in. For those instructors who are used to teaching only higher-level courses, getting down to the lower level and explaining the concepts in simple, understandable terms may be challenging, thus leading to resistance to teach the co-req portion."

In the end, faculty at PSCC believe their success boils down to five key elements: instructional continuity, mandatory tutoring, competencies in context, customized support text, and project-based learning. "Does it address all students?" posits Jones-Dobbyn. "No, but I've ordered enough muumuus in my life to know that one size fits all will never be true." She continues, "Some students come through where it just won't work for them. This co-req model has been very good for a lot of people. The numbers have been uniformly better, and that was the goal. We all have the same goal to get students to graduate or transfer successfully, and I think on that level, it's been good."