

# Increasing Math Success

Accelerating Student Progress and Working  
with High Schools



**John Squires, Ph.D.**  
Professor Emeritus of Mathematics,  
Chattanooga State Community College



## About the Author

Dr. Squires currently serves as the Program Director of College and Career Readiness for the Southern Regional Education Board.

*Squires, J. (2019, February). Increasing math success: Accelerating student progress and working with high schools (Steps to Success series). Denver, CO: Strong Start to Finish, Education Commission of the States*

## Acknowledgements

This project involved support from Tennessee Governor Bill Haslam, the Tennessee Higher Education Commission, the Tennessee Board of Regents, the Tennessee College Access and Success Network, and the leadership and faculty at Cleveland State Community College and Chattanooga State Community College.

## About Strong Start to Finish

Right now, a first-year student sits in a college classroom being ill-served by remedial math.

And if we fail them, they mostly likely will not earn their degree. There is a persistent trend among students placed in remedial or developmental courses – particularly math and English. They are not completing the courses and, in most cases, should not be taking them in the first place. This should not be their path.

We are a network of like-minded individuals and organizations from the policy, research, and practice spaces who've come together for one reason – to help all students, not just the select few, find success in postsecondary education.

Strong Start to Finish was created to better the chances of low-income students, students of color and returning adult students, to create a fundamental shift in the outcome of their college journey. We have networked higher education leaders, policy entrepreneurs, institutions and technical assistance providers to drive towards an outcome where all students pass their first credit-bearing English and math courses during the first year of study.

[www.strongstart.org](http://www.strongstart.org) |  [@\\_strong\\_start](https://twitter.com/_strong_start) | Sign up for our Monthly Digest by email [info@strongstart.org](mailto:info@strongstart.org)

# Abstract

## Primary Audience:

The primary, though not sole, audience for this publication is a Chief Academic Officer of a system or institution.

## Problem statement:

Too many students were placing into developmental math classes, which suffered from low success and retention rates. Students placed into these classes had very low college completion rates.

## Action:

After redesigning developmental math classes into an accelerated format, the classes were then implemented in local high schools. The concept was successful and quickly spread throughout the state.

## Context:

The Tennessee Board of Regents A-100 guidelines were changed in 2010 after the redesign of the developmental studies (learning support) classes. This change included a mandate for colleges to work with high schools to increase student preparedness for college and reduce the need for remediation. The Tennessee Diploma Project (2009) called for the creation of a bridge math course to be taught during the senior year for students underprepared in mathematics. By embedding the learning support competencies into bridge math in an accelerated format, the Tennessee SAILS project has been able to significantly increase students graduating from high school who enroll directly in a college math class.

## Process:

Milestone Event 1: Developmental math courses are redesigned using an accelerated model.

Milestone Event 2: College math courses are redesigned using the same accelerated model.

Milestone Event 3: A continuous enrollment plan is implemented at both colleges.

Milestone Event 4: The new model of math remediation is piloted in local high schools.

Milestone Event 5: Support from key stakeholders and state officials is obtained.

Milestone Event 6: Permission to impact policy is given by state leaders.

Milestone Event 7: The Tennessee SAILS initiative becomes a recurring line item in the state appropriations.

## Outcomes:

A drastic reduction in students placing into developmental math classes was accompanied by a significant growth in college math enrollment. As a result, the number of students completing a gateway math course increased dramatically.

## Sources of Support:

A \$1.1 million grant from the TN Governor's office to TN Higher Education Commission allowed for the statewide implementation of the program, which included 20 field coordinators to work with community colleges and their local high schools.

## Summary

In 2009, Cleveland State Community College and Chattanooga State Community College implemented accelerated developmental math programs as part of the redesign of developmental studies at the Tennessee Board of Regents. In addition to boosting completion rates of both developmental and college math courses, studies have shown the programs close gender, race, and income achievement gaps. The model of instruction, which utilizes technology and incorporates mastery learning, focuses on providing individual assistance to students. In 2013, both colleges worked with their local high schools to introduce developmental math in the senior year of high school, laying the foundation for the Tennessee SAILS program. This initiative was spread statewide by 2015 and has resulted in a dramatic decrease in students needing remediation in mathematics after graduating from high school. This paper outlines the steps taken over a six-year period to implement the college redesign programs and the Tennessee SAILS program.

# Introduction

Students enrolled into developmental mathematics in the Tennessee Board of Regents (TBR) system suffered from extremely low graduation rates. Those placed at the lowest level were stuck in remediation for more than a year and had six-year graduation rates lower than 10 percent. As part of the TBR redesign of developmental studies, Cleveland State Community College and Chattanooga State Community College implemented accelerated developmental math courses, enabling students to complete their developmental math classes quickly and enroll in college math during their first year of college. In response to the new TBR A-100 Learning Support guidelines, both colleges introduced the program into high schools for underprepared students during their senior year, leading to the creation of the Tennessee SAILS program. Enrollment and success in college math courses has increased dramatically at both colleges, while the number of students needing remediation has been reduced. This Steps to Success brief was developed to share how this reform was brought to scale over a six-year period, so that states, systems, and institutions can benefit from the efforts to improve student outcomes in Tennessee.

## Context

### Enabling Conditions

#### Support for a New Approach

In the original TBR FIPSE grant, programs were given broad latitude in the pilots of the redesigned developmental studies courses. The pilots were specifically given permission to try different approaches to discover and share best practices. At Cleveland State, the math department expanded the redesign efforts to include the college math courses as well as the developmental math courses. As a result, a total of 10 courses were redesigned in a period of three years. At Chattanooga State, the original pilot was unsuccessful, but the initiative was relaunched in 2009 and a model similar to the Cleveland State program was implemented. Again, the math department at Chattanooga State redesigned

both developmental math and college math courses, redesigning a total of 12 courses in a three-year period.

#### Engagement of Key Stakeholders

In the case of the Tennessee SAILS program, key stakeholders were engaged to obtain support for the initiative. Meetings with leadership from the Tennessee Board of Regents, the Tennessee Higher Education Commission, the Tennessee Board of Education, and the Tennessee Department of Education were held in the spring of 2012, to obtain support for the launch of the statewide program in the 2012-13 school year. As a result, Chattanooga State was given a \$117,000 grant from TBR to start the program in 10 high schools in its service region, and Cleveland State was awarded a \$40,000 grant from the Tennessee College Access and Success Network (TCASN) to work with five high schools in its service region. At the same time, Northeast State Community College and Jackson State Community College were involved in the Tennessee SAILS program in 2012-13 as unfunded pilots, working with four high schools and one high school, respectively.

#### Funding for Expansion

After the launch of the statewide program in 2012-13 at Cleveland State and Chattanooga State, Governor Bill Haslam and the Tennessee Higher Education Commission (THEC) supported the expansion of the program through a \$1.1 million grant to Chattanooga State. In the fall of 2013, Chattanooga State oversaw the statewide implementation of the Tennessee SAILS program, which involved all 13 TBR community colleges, 120 high schools, and over 8,500 students during the 2013-14 school year. By 2015, the SAILS program had spread statewide and became a recurring line item in the annual appropriations of the Tennessee State Legislature.

### Location & Student Population

Cleveland State Community College and Chattanooga State Community College are located in southeast Tennessee. Cleveland State is a suburban/rural college that serves a diverse student population. At Cleveland State, 11 percent of the students are

minorities (African/American, Hispanic/Latino, Native American, Asian American and Other) and 42 percent of the students come from low-income households, which this paper will define as Pell-eligible. Chattanooga State is an urban college, and its student population is also diverse. At Chattanooga State, 23 percent of students are minorities and 43 percent come from low-income, Pell-eligible households. (See more information in Appendix A.)

## Policy Factors

For the redesign of the TBR Developmental Studies Program, the driving force was a grant from the Fund for the Improvement of Postsecondary Education (FIPSE). Under the grant, TBR worked with the National Center of Academic Transformation (NCAT, 2012) to redesign the developmental studies courses to increase student success. The course redesign projects at Cleveland State Community College and Chattanooga State Community College were two of the six funded pilots in the FIPSE grant. Upon the completion of the pilots, the TBR A-100 Learning Support guidelines were revised and officially adopted in 2010, with college required to fully implement the new remediation program by 2013.

As part of the revised TBR A-100 Learning Support Guidelines, community colleges were given a mandate to work with their high schools to implement the learning support competencies during the senior year of high school (TBR, 2016).<sup>1</sup> During this same period, the Tennessee Department of Education created a new math course, Bridge Math, as part of the 2010 Tennessee Diploma Project. This course, which was designated for underprepared seniors, was implemented statewide beginning in the 2012-13 school year. In the spring of 2012, the Tennessee SAILS program was launched through a partnership between Chattanooga State and Red Bank High School. The initiative embedded the competencies of the TBR learning support math program in the Bridge Math course, allowing students to complete the TBR learning support program while still in high school. The TBR A-100 policies stipulate that completion of the learning support at any of the 13 community colleges will be recognized statewide, ensuring that students successfully completing the SAILS math program will not need

remediation in math when enrolling at one of the TBR community colleges. Finally, successful completion of the SAILS math program during the fall semester signals eligibility for enrollment in a college math class during the spring semester of the senior year. Accordingly, students completing SAILS math became eligible for the dual enrollment grant, which helped them pay for the college math class. Eventually, the dual enrollment policies were changed to allow all students to take two dual enrollment classes at no cost, increasing access to dual enrollment classes for low-income students.

## The Change Process

### MILESTONE EVENT 1

#### **Developmental math courses are redesigned using an accelerated model.**

As part of the TBR initiative to redesign developmental studies, both Cleveland State and Chattanooga State implemented an accelerated model of instruction, which allowed students to complete the courses in a shortened time frame. The courses were modularized, and a mastery learning approach was utilized. Students displaying competency or mastery of the concepts in a module could proceed to the next module, which enabled them to complete the material in a timely manner. Students finishing a course early could begin work in the next course immediately rather than waiting until the next semester to keep working. The NCAT emporium model of instruction was utilized, with an emphasis on individual assistance to students. At both colleges, computer labs and classrooms were installed on each campus, and the labs were available day and night to students for them to work on math at their convenience. The students responded to the change with an amazing level of enthusiasm; the math labs at both colleges were busy throughout the week and served thousands of students each month. Software allowed students to receive instantaneous feedback while working at home, and the math faculty at both colleges created instructional resources for students to access as well. Faculty focused especially on providing individual assistance to struggling students, working with them to ensure mastery of the content and monitoring their progress in the courses.

## MILESTONE EVENT 2

### **College math courses are redesigned using the same accelerated model.**

An important aspect of the projects at both Cleveland State and Chattanooga State is the inclusion of college math courses in the redesign process. The rationale for doing so is straightforward – students who become engaged and take ownership of their learning in the emporium model should not be returned to the traditional classroom. In fact, students completing the developmental sequence were requesting that the colleges offer college math courses in the same format. Beginning at Basic Math and going through Precalculus and Business Calculus, the math faculty at Cleveland State redesigned 10 courses in a period of just three years. The remaining college math courses were not redesigned due to their low enrollment and high success rates. At Chattanooga State, the math faculty redesigned a total of 12 courses in three years, starting with Basic Math and including Calculus II. The impact of including the college math courses in the initiative cannot be understated; student success in college math courses increased at both colleges. Students finishing college math courses early were given the option to start on their next course, similar to students completing developmental math courses early, and many students chose to take advantage of this option.

## MILESTONE EVENT 3

### **A continuous enrollment plan is implemented at both colleges.**

Giving students the ability to accelerate their learning and completion of math courses necessitated a structural change to enrollment procedures at both Cleveland State Community College and Chattanooga State Community College. Students who completed a course in the middle of a semester were given the opportunity to immediately begin working in their next course. Because Cleveland State and Chattanooga State had redesigned both developmental math and college math courses, students finishing the developmental math sequence were able to start in a college math class during the same semester. At both institutions, many of these early completers were able to finish a college math class in the same semester they finished their developmental math sequence.

Because of the accelerated courses, innovative approaches to the scheduling of classes had to be created. Teamwork between the financial aid office, the registrar's office, and the math department was required and solutions that benefited students had to be found. Ultimately, systems evolved to scheduling and registration that allowed students to move seamlessly through their coursework. Students completing multiple courses in the same semester were rewarded by having no additional costs for the second course. This occurred by letting students who finished a math course early begin working in the next course at no charge. Students completing the next course could then add it to their schedule during the same semester, while students not completing the next course would simply register for it the following semester and keep working where they left off. Students were able to complete two, three, and even four courses in one semester, and many students completed three courses in two semesters under this approach. The textbook company selected by the math departments at both colleges utilized a semester fee approach to access the software, meaning students that completed a course early in the semester could begin working in the next math course with no additional textbook fee. By adopting a seat-time philosophy instead of a course-based approach to registration fees, both institutions were able to save students a significant amount of money, as they did not incur additional costs for completing multiple courses in the same semester. This approach is especially beneficial to low-income students, for whom finding additional financial resources in the middle of a semester represented a major challenge. The continuous enrollment plans at Cleveland State and Chattanooga State allowed students to move quickly through developmental math and into college math, moving them closer to degree completion.

## MILESTONE EVENT 4

### **The new model of math remediation is piloted in local high schools.**

In spring 2012, the Seamless Alignment and Integration of Learning Support (SAILS) math program was launched by Chattanooga State Community College and Red Bank High School. The program embedded the TBR Learning Support math competencies in the TN DOE Bridge Math course, giving students the opportunity to complete any math remediation before they graduated from high school. During this time, classroom visits were made by college faculty and a campus visit was made by the first

SAILS students to Chattanooga State. It should be noted that the features of the math redesign at Chattanooga State were incorporated; students met in a computer classroom at least three days a week and the instructor provided individual assistance to students. Students could work at their own pace and had the option of completing the SAILS math course early. Students finishing the SAILS program before the end of the semester could start a college math course during the same semester and could dual enroll in the following semester. The first SAILS class consisted of 23 students, and the pilot was very successful, with approximately 80 percent of the students completing the learning support competencies. The following year, the Chattanooga State math department worked with TBR institutions around the state, including four-year universities, to ensure proper placement of these students into college math classes. During this pilot phase, discussions were held with state leaders to gain support for the SAILS math program, including officials from the Tennessee Board of Regents, the Tennessee Higher Education Commission, the Tennessee Department of Education, and the Tennessee Board of Education.

## MILESTONE EVENT 5

### **Support from key stakeholders and state officials is obtained.**

In spring 2012, state leaders were engaged in discussions to gain support for the SAILS initiative. A key meeting was held at the Tennessee Higher Education Commission, and this involved leaders from the Tennessee Board of Regents (TBR), Chattanooga State Community College, the Tennessee Board of Education, the Tennessee Department of Education, and the Tennessee College Access and Success Network (TCASN). After discussing the concept, leaders expressed support for the initiative and agreed to work together in support of the SAILS program.

During the 2012-13 school year, Chattanooga State and Cleveland State launched the SAILS program in local high schools. Chattanooga State received a two-year TBR grant of \$117,000, while Cleveland State was awarded a one-year TCASN grant of \$40,000. Although unfunded, TBR institutions Northeast State Community College and Jackson State Community College also joined the initiative, working with four high schools and one high school, respectively. Math department heads from the four colleges kept in touch with each other and

TBR Academic Affairs throughout the year and arranged an informal meeting during a state conference. Results from the initial year were promising. Chattanooga State had an impressive 83% success rate, while Cleveland State's completion rate was 67%. Also, Chattanooga State had several students who completed the SAILS program in the fall of 2012 and then enrolled in a dual enrollment college math class in spring 2013. These dual enrollment students succeeded at a very high rate that was comparable to students who did not need remediation in math.

In the spring of 2013, one of Governor Bill Haslam's aides made a site visit to a SAILS classroom at one of Cleveland State's local high schools. After witnessing the program in action and talking with students, support from Governor Haslam was obtained for the implementation of the project statewide. As a result, a \$1.1 million grant from THEC to Chattanooga State was inserted into the state's budget in April, which was then approved in May 2013. A statewide meeting was held in Nashville, Tennessee, for leaders from the 13 community colleges, and this meeting include officials from the key stakeholders such as the Tennessee Board of Regents, the Tennessee Department of Education, and the Tennessee Higher Education Commission. Three months later, in August 2013, the Tennessee SAILS math program involved the 13 TBR community colleges, 120 high schools, and 6,500 students. In the 2013-14 school year, the project impacted over 8,000 students with a 67 percent completion rate.

In spring 2014, Governor Haslam expanded SAILS funding to \$2.5 million, and additional high schools were selected to join the initiative. During the 2014-15 school year, the program involved approximately 150 high schools and served 12,000 students. As colleges improved the program, the success rate rose to 92 percent statewide.

## MILESTONE EVENT 6

### **Permission to impact policy is given by state leaders.**

During the initial statewide expansion of SAILS during the 2012-13 school year, a critical communication came from the Governor's office and the Tennessee Higher Education Commission. Members of the SAILS program leadership team were told they had permission to ignore policies that represented barriers to successful implementation of the program. Specifically, state leaders promised to change policies based on lessons

learned during the expansion of the program. This section will examine three areas where policies were changed because of SAILS.

## Tennessee Scholars Program

The Tennessee Scholars program, which was run by the state's Chamber of Commerce, initially did not recognize the Bridge Math course as a legitimate option for seniors who wanted to become Tennessee Scholars. Given that successful students in the SAILS program would not need remediation when entering college, the Chamber of Commerce was faced with the dilemma that a student could still need remediation after graduating from high school as a Tennessee Scholar. After the exchange of information, the Chamber of Commerce decided to change its stance and allow successful SAILS students to be eligible for recognition as Tennessee Scholars.

## Dual Enrollment Policies

Tennessee policies and statutes did not allow students to be dual-enrolled in developmental studies classes. However, students in the SAILS program who completed the course were essentially receiving credit for the developmental studies classes. Also, students in SAILS who successfully completed the program in the fall semester were deemed eligible for dual enrollment grant funds, putting them in the same class as students who were identified as college-ready. Previously, these underprepared students were not eligible to take dual enrollment classes and they could not receive funds from the dual enrollment grant to take college classes

## Dual Enrollment Funding

In the spring of 2013, many of the students in the Chattanooga State program who completed the program in fall 2012 enrolled in a dual enrollment math class. However, approximately 30 percent of these students dropped out of their college math classes that spring. Further investigation revealed that the reason for the withdrawals was mostly financial, as students from low-income households could not afford the \$150 gap between the funds from the dual enrollment grant and the cost of the class. This finding was reported to THEC, and upon further examination it was discovered that the vast majority of students in dual enrollment classes were from high-income households. As a result, the Tennessee Governor's office and state legislature

worked together in the 2014 session to change the dual enrollment policies to provide two college classes to eligible students free of charge, lowering the barriers for low-income students to take dual-enrollment college math courses. This change was informally known as the 10 percent promise, as it provided all students the opportunity to complete 10 percent of a two-year degree while still in high school.

## MILESTONE EVENT 7

### The Tennessee SAILS initiative becomes a recurring line item in the state appropriations.

By 2015, the Tennessee SAILS program had spread statewide, reaching approximately 200 high schools and serving over 15,000 students each year. Tennessee Governor Bill Haslam maintained strong support of the program since its inception and included it in the Drive to 55 cadre of programs meant to meet the state's education and workforce needs. In 2015, the Tennessee State Legislature signaled its support for the program by inserting it into the state appropriations for higher education as a recurring line-item in the annual budget. Today, the program has been moved from Chattanooga State Community College to the Tennessee Board of Regents office in Nashville, Tennessee. TBR oversees the program, which involves the 13 community colleges and over 200 high schools throughout the state of Tennessee. Funding for SAILS field coordinators has ensured the sustainability of the project into the foreseeable future. Finally, the SAILS initiative has expanded in recent years to include SAILS English, providing students the opportunity to better prepare for college English during their senior year of high school. Since 2013, several states have undertaken initiatives based on the SAILS model of community college and high school partnerships to better prepare students for college during their senior year.

# Outcomes from Change in Practice

## Overall Changes

### Cleveland State Community College

The success rate in Elementary Algebra increased from 50 percent to 68 percent, and the success rate in Intermediate Algebra increased from 57 percent to 74 percent. Success in college math courses also increased from 70 percent to 76 percent (Graph 1, see appendix B). As a result of the redesign of both developmental and college math classes, enrollment in college math increased by 89 percent and the number of students passing a college math class increased by 92 percent during the five-year period from 2007-2008 to 2011-2012 (Graph 2). In 2010, the Tennessee Board of Regents studied the math redesign project at Cleveland State and concluded, "A student enrolled after Cleveland State implemented the redesign initiative is twice as likely to complete his or her pre-college math course as a student who was enrolled before the redesign initiative. A similarly strong effect is observed for students enrolling in a follow-up math course regardless of whether the second math course was a second pre-college course or an entry-level college course" (Schutz & Tingle, 2010). Additionally, a study by Columbia University in 2012 found that, "Among those enrolled in a developmental math course, however, students completed an average of 3.3 credits (or an average of one course) more of their attempted credits than their peers assigned to college level math" (Boatman, 2012)<sup>2</sup>. Finally, an internal audit of the math department at Cleveland State determined that instructional costs per student credit hour had been significantly reduced, going from \$105 before the redesign project to \$54 after the redesign project, a cost savings of over 48 percent (Cleveland State, 2011) (Graph 3).

### Chattanooga State Community College

The college implemented the new streamlined Learning Support Math courses in fall 2010 and experienced a significant increase in student success of 63 percent, whereas previous success rates hovered just below 50 percent. Because of the increased success rate, combined with the opportunity to accelerate through

the program, the number of students completing the developmental math sequence increased dramatically by over 50 percent. College math success rates also improved from 66 percent to 72 percent (Graph 4). Due to the redesign of developmental and college math and the implementation of the SAILS program, college math enrollment increased by 31 percent and the number of students passing a college math class increased by 43 percent (Graph 5). In the developmental math courses (now learning support math), instructional costs per student at Chattanooga State were reduced from \$191 per student to \$145 per student, a cost savings of 24 percent resulting from the math redesign project (Chattanooga State, 2012) (Graph 6).

### Tennessee SAILS

In 2013-2014, the Tennessee SAILS program served over 8,500 students and had a 67 percent success rate. A \$1.1 million grant to THEC and Chattanooga State saved students in the program over \$6.5 million in tuition and books in college. During the subsequent years, the program expanded to over 276 high schools and over 13,000 students in 2016-17, and the completion rate of students in the program also continued to rise over time. To date, the program has served over 50,000 students with an overall completion rate of 89 percent (THEC, 2018). Since the inception of the program, the percentage of students needing math remediation in the TBR community colleges has fallen significantly, from 71 percent in 2011 to 56 percent in 2017 (Graph 7). Initial findings from a joint study of the SAILS program by Vanderbilt University and Harvard University included increased high school graduation rates, increased college entrance rates, and decreased remediation rates for students in SAILS (Boatman, 2016). SAILS participants enrolled in college at a 42 percent rate, compared to a 37 percent rate for underprepared students not in the SAILS program. Only 16 percent of the SAILS participants needed math remediation in college, significantly lower than the 46 percent of underprepared students not in SAILS. Moreover, 62 percent of the early SAILS participants enrolled in a college-level math course

during their first year of college (Boatman, 2016). Similarly, Kane (2018) found that SAILS students were 29 percent more likely to enroll in college math than their counterparts not in SAILS, and that approximately 50 percent of the students passed the college math class. Additionally, SAILS graduates completed an average of 29.5 college credits by the end of their second year in college, significantly more than the 25 credits accumulated by their underprepared counterparts who did not participate in SAILS (Kane, 2018). This impact has been mitigated by the introduction of the co-requisite model of remediation (TBR, 2016) in Tennessee (Kane, 2018), which has similarly boosted the number of students passing a college math class in their first year of college (THEC, 2018).

## Equity-focused Changes

---

### Cleveland State Community College

The Tennessee Board of Regents examined the math redesign project at Cleveland State and concluded, “A student enrolled after Cleveland State implemented the redesign initiative is twice as likely to complete his or her pre-college math course as a student who was enrolled before the redesign initiative. A similarly strong effect is observed for students enrolling in a follow-up math course regardless of whether the second math course was a second pre-college course or an entry-level college course” (Schutz & Tingle, 2010). Included in this study was an examination of performance by minority students in developmental math courses. The data indicate that the math redesign project at Cleveland State had increased the success of the minority students more than the non-minority students. In the redesigned developmental math courses, minorities had a 78 percent success rate, while non-minorities had a 64 percent success rate. Enrollment in subsequent courses for minority students was 72 percent, compared with 70 percent for non-minority students. Minority students had a 71 percent success rate in their next course (including college math), while non-minority students had a 72 percent success rate in their subsequent course. This data demonstrates that in the Cleveland State math redesign initiative, minority students succeed at rates better than or comparable to their non-minority peers (Schutz & Tingle, 2010). Finally, analysis before and after the math redesign initiative at Cleveland State Community College revealed that the number of

minority students passing a college math class increased by 122 percent during the five-year period after 2007-08 (Graph 8). It should be noted during this same period the college headcount increased by 21 percent.

### Chattanooga State Community College

As part of the Next Generation Learning Challenges Do the Math grant, low-income students in developmental math were tracked in terms of course success rates, fall to spring retention rates, and acceleration by completing multiple courses in the same semester. No significant gaps were found in any area, as the low-income, Pell-eligible students performed within 1-2 percent of the other students in each of these areas. In the DSPM 0850 course during the 2011-12 academic year, the success rate for Pell-eligible students was 60 percent, compared with 62 percent for the students who were not eligible for Pell grants; the fall-to-spring retention rate for both Pell-eligible students was 71 percent, compared to the retention rate of 72 percent for students not eligible for Pell grants; and the percentage of Pell-eligible students completing multiple courses in one semester was 13 percent, while 14 percent of students not eligible for Pell grants completed more than one course in the same semester. These data demonstrate that Pell-eligible students benefited from the math redesign similarly to their counterparts who were not from low-income households (NGLC, 2012). Finally, analysis before and after the math redesign initiative at Chattanooga State Community College revealed that the number of low-income students passing a college math class increased by 78 percent during the five-year period after 2008-09 (Graph 9). It should be noted during this same period the college headcount increased by 19 percent.

### Tennessee SAILS

Initial findings from a joint study by Vanderbilt University and Harvard University included increased high school graduation rates, increased college entrance rates, and decreased remediation rates for students in SAILS, 26 percent of which are African-American/Black or Hispanic/Latino (Boatman, 2016). Boatman reports that “SAILS students report being more empowered by, and comfortable in their learning environment than their peers,” while Kane (2018) finds that the program “improved students’ perceptions of the usefulness and enjoyment of math,” noting that the impact was particularly large for African-American/black students. The co-requisite model of remediation in Tennessee has reported success rates of 47 percent for minority

students and 52 percent for Pell-eligible students, which are very similar to the 50 percent success rates of SAILS students (Kane, 2018). The Tennessee Governor's office and state legislature worked together in the 2014 session to change the dual enrollment policies to provide two college classes to eligible students free of charge. This change, combined with the SAILS program, increased opportunities for students from low-income, Pell-eligible households to take dual enrollment college math classes while still in high school.

## Sources of Support

### Technical Assistance Support

Cleveland State Community College and Chattanooga State Community College both utilized Pearson Education's MyMathLab software prior to the redesign of the developmental math programs. To support the implementation of the continuous enrollment plan at each college, Pearson Education offered a course fee model for textbook fees. Under this approach, students paid a fee each semester of less than \$100 to access the Pearson software. Students completing multiple courses in a semester did not have to purchase an additional textbook or pay an additional software fee, saving them money as compared to the traditional textbook model.

Prior to the implementation of the Tennessee SAILS program, 12 of the 13 TBR community colleges used Pearson Education's MyMathLab software. To support the SAILS initiative, Pearson Education assisted in the creation of a reporting system that created weekly spreadsheets showing the program outcomes for each participating high school. Results from the community college that did not utilize the MyMathLab software were collected manually and submitted for inclusion in the weekly report. These spreadsheets were sent statewide to the TBR community colleges, TN DOE officials, THEC leadership, and the TN Governor's Office on a weekly basis to create an atmosphere of accountability, transparency, and support.

### Grant Support

Cleveland State: \$30,000 TBR Course Redesign Grant & \$40,000 TCASN Grant 2012-2013

Chattanooga State: \$249,700 NGLC Do the Math Grant & \$117,000 TBR Grant 2012-2014

THEC and Chattanooga State: \$1.1 million from TN State Legislature in 2013-14, \$2.5 million in 2014-15

Tennessee Board of Regents: \$2.5 million annually from TN State Legislature beginning in 2015-16

### Reallocation of Resources

Cleveland State: \$238,000 additional resources from college's Technology Access Fee

Chattanooga State: Over \$500,000 of college resources channeled to math redesign efforts 2009-2012

### Other Resources

Instructional costs for developmental math courses (now learning support math) per student credit hour at Cleveland State were reduced by over 48 percent due to the math redesign project (Cleveland State, 2011). Instructional costs per student for developmental math courses (now learning support math) at Chattanooga State were reduced from \$191 per student to \$145 per student, a cost savings of 24 percent as a result of the math redesign project (NCAT, 2011). By reducing the need for remediation, the SAILS program lessens the cost of college attendance; the \$1.1 million grant in 2013 from the Tennessee Higher Education Commission yielded potential savings of more than \$6.4 million in tuition and books for the program participants. Kane (2018) notes that shifting the timing of remediation from college to high school reduced the expenditures on college remediation, and since Tennessee requires four years of high school math, the SAILS program did not introduce an additional burden or expense on students before they graduated from high school.

# Moving Forward

## Lessons Learned

In both the course redesign process and the implementation of the Tennessee SAILS program, there are two critical components that colleges or systems should consider when implementing similar initiatives. First, both colleges were given great latitude in the creation and implementation of these initiatives and told specifically to not let existing policy barriers stand in the way of student success. In both cases, policies were changed or amended after the fact to reflect the lessons learned in the implementation of the program. Second, both initiatives required a commitment to continuous improvement and patience by the system and state leadership. The results presented in this paper were achieved over a period of several years, and both the program and state leadership teams had to work to address problems that arose throughout the implementation period. The problems that had to be addressed to successfully implement the math redesign and SAILS programs included legislation and policy barriers regarding dual enrollment, systems at colleges for student registration and enrollment, the creation of a statewide reporting system, providing training for teachers, and developing a support system for participating high schools and colleges. Of particular import was the statewide reporting system, which shared results at the participating schools on a weekly basis. Weekly reports were sent to officials involved in the project at all levels, creating a culture of transparency, accountability, and support.

## Next Steps

Since the implementation of the course redesign projects at Cleveland State and Chattanooga State, TBR has adopted a co-requisite model of remediation. However, the emporium model is still in use and the math lab is still a highly utilized resource at each of the colleges. The implementation of the SAILS project has resulted in a significant decrease in students needing math remediation in the TBR community colleges, and a SAILS English course is under way and being implemented throughout the state as well.

# Notes

1. TBR A100 Guidelines: "All TBR institutions will form partnerships with the high school districts' Local Education Agency (LEA) in order to develop early intervention systems, provide learning support for at-risk students identified through assessments taken prior to the senior year of high school, including ACT, SAT, PSAT, etc."
2. Study by Dr. Angela Boatman of Harvard University was funded by the Community College Research Center at Teachers College, Columbia University. Dr. Boatman is now a professor at Vanderbilt University.

## References

- Boatman, A. (2012). Evaluating institutional efforts to streamline postsecondary remediation: The causal effects of the Tennessee developmental studies redesign initiative on early student academic success. National Center for Postsecondary Research: Columbia University, New York.
- Boatman, A. (2016). Pre-college math remediation in high school: Examining the SAILS program. Retrieved December 12, 2018, from [www.learningworksca.org/wp-content/uploads/2012/02/QL-Webinar-4-Powerpoint.pdf](http://www.learningworksca.org/wp-content/uploads/2012/02/QL-Webinar-4-Powerpoint.pdf).
- Cleveland State Community College (2011). Review of math redesign. Cleveland State Community College: Cleveland, TN.
- Kane, T., Boatman, A. Kozakowski, W., Bennett, C., Hitch, R., & Weisenfeld, D. (2018). Remedial math goes to high school: The impact of the Tennessee SAILS program. Policy Brief. Center for Education Policy Research, Harvard University: Cambridge, MA.
- National Center for Academic Transformation (NCAT) (2012). How to redesign a developmental math program using the emporium model. Retrieved November 6, 2018, from [www.thencat.org/Guides/DevMath/DMChapter1.html](http://www.thencat.org/Guides/DevMath/DMChapter1.html).

National Center for Academic Transformation (NCAT) (2011). Chattanooga State Technical Community College. Retrieved December 12, 2018, from [www.thencat.org/States/TN/Abstracts/CSTCC%20Algebra\\_Abtract.htm](http://www.thencat.org/States/TN/Abstracts/CSTCC%20Algebra_Abtract.htm).

Next Generation Learning Challenges (NGLC) 2011. Do the Math Final Report. Chattanooga State Community College: Chattanooga Tennessee.

Schutz, G. & Tingle, C. (2010). Cleveland State pre-college math course redesign study. Tennessee Board of Regents: Nashville, Tennessee.

Tennessee Higher Education Commission (THEC) (2018). 2017-18 Tennessee Higher Education Commission Fact Book. Retrieved December 12, 2018, from <https://www.tn.gov/thec/research/redirect-research/fact-book.html>.

Tennessee Board of Regents (TBR) (2016). Learning Support: A-100. Retrieved November 6, 2018 from <https://policies.tbr.edu/guidelines/learning-support>

## Resources

---

### National Center for Academic Transformation

---

Information regarding the Emporium Model can be retrieved from the National Center for Academic Transformation at [www.thencat.org](http://www.thencat.org).

### Tennessee SAILS Program

---

Information regarding the Tennessee SAILS program can be found at <https://www.tbr.edu/initiatives/sails>

# Appendix A:

## Site Context

### What is the name of the institution(s), and if appropriate system, where the changes in practice took place?

Chattanooga State Community College and Cleveland State Community College Tennessee Board of Regents and Tennessee Higher Education Commission

### In which state(s) is/are your institution/system located?

Tennessee

### At which type of institution(s) did this change in practice take place?

2-year public

### What is the total, undergraduate (headcount) enrollment for the institution(s) where the change in practice took place?

Cleveland State Community College: 3016  
Chattanooga State Community College: 8504

### What percentage of full-time, beginning undergraduate students received a Pell Grant?

Cleveland State Community College: 42% Chattanooga State Community College: 43%

### What percentage of students are African American/Black?

Cleveland State Community College: 5% Chattanooga State Community College: 12%

### What percentage of students are American Indian/Alaskan Native?

Cleveland State Community College: <1% Chattanooga State Community College: <1%

### What percentage of students are Asian/Pacific Islander?

Cleveland State Community College: <1% Chattanooga State Community College: <1%

### What percentage of students are Hispanic or Latino?

Cleveland State Community College: 4% Chattanooga State Community College: 6%

### What percentage of students are More than One Race?

Cleveland State Community College: 1% Chattanooga State Community College: 4%

### What percentage of students are White?

Cleveland State Community College: 87%  
Chattanooga State Community College: 77%

### What percentage of students are aged 24 or under?

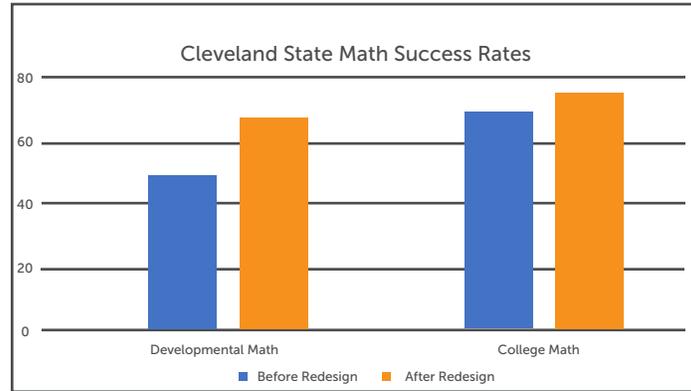
Cleveland State Community College: 78% Chattanooga State Community College: 71%

### What percentage of students are aged 25 or older?

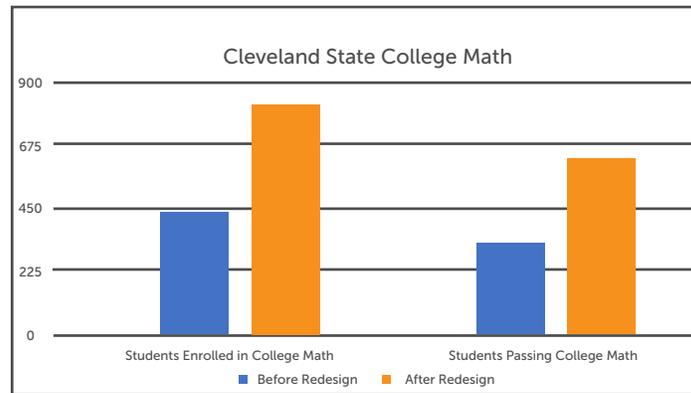
Cleveland State Community College: 22% Chattanooga State Community College: 29%

# Appendix B: Graphs

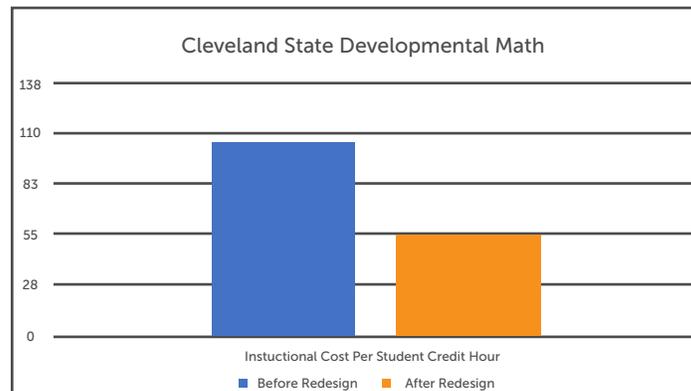
## Graph 1



## Graph 2

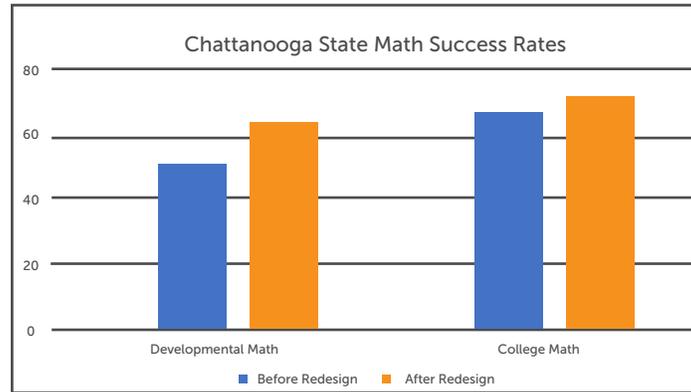


## Graph 3



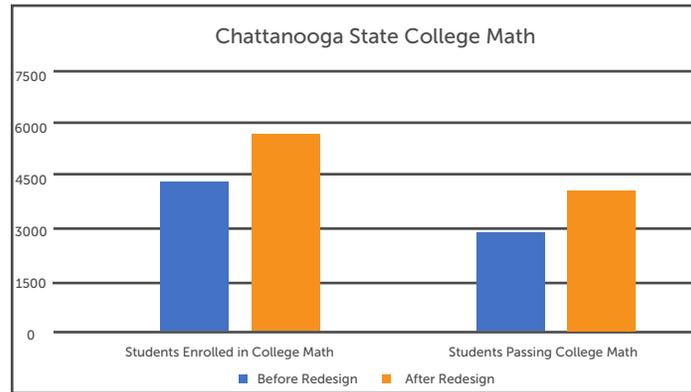
## Graph 4

---



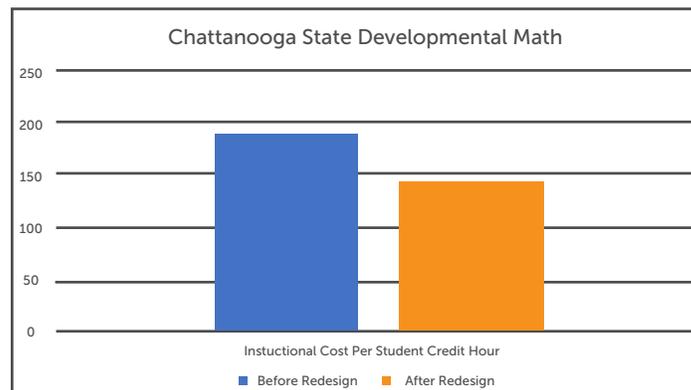
## Graph 5

---



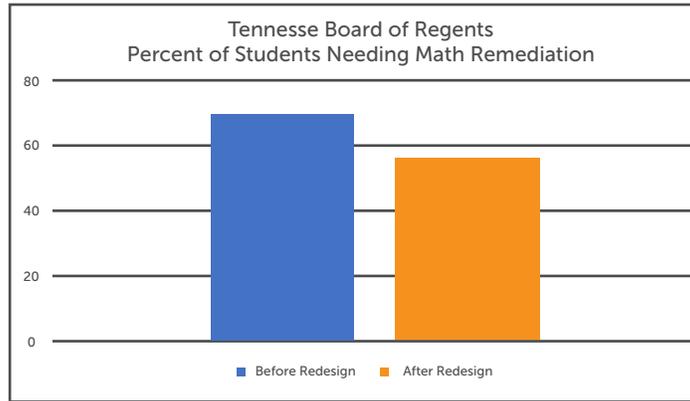
## Graph 6

---



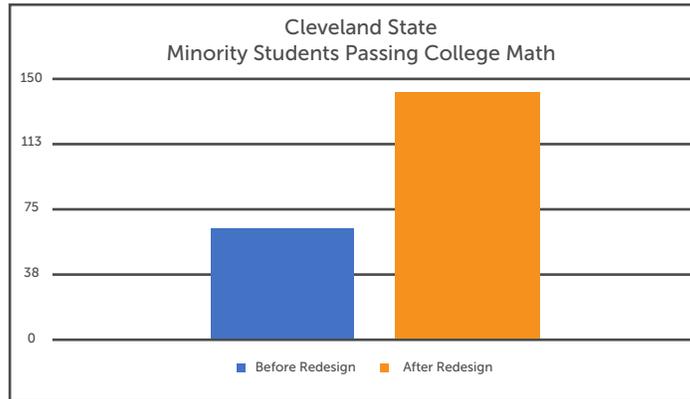
## Graph 7

---



## Graph 8

---



## Graph 9

---

