

Florida Student Success Center Policy Briefs: Mathematics Pathways Policy Brief for Institutional Leaders

By: Richard Kazis

Foreword

The Florida College System (FCS) has a strong record of being a national leader focused on innovations in policy and practice that result in increased levels of student success. Recent statewide policy actions in areas such as developmental education reform, performance funding, transfer and articulation, dual enrollment, and career and technical education continue to support student success by retaining the system's access mission, strengthening pathways to a degree, and removing cost barriers. Collectively, institutional, state and policy actions occur simultaneously to provide a coordinated and vibrant college ecosystem.

One of the key roles of the Florida Student Success Center (center) is to connect policy and practice by: 1) representing the collective voice of practitioners in state-level policy discussions; and 2) identifying and pursuing state and system policy changes that support the institutional changes necessary to increase student completion. To that end, the center is committed to producing policy and practice briefs on topics germane to policymakers and practitioners on innovative approaches. These papers provide a key vehicle to inform state and institutional policy development to promote student success.

The center commissioned this policy brief to highlight the work of the Florida Mathematics Re-Design Initiative and the resulting policy and practice recommendations. Authored by Richard Kazis, who has extensive expertise in policy development and advocacy in higher education (including mathematics reform) and workforce development, this brief provides advice and guidance to institutional leaders in reforming mathematics pathways.

About the Florida Student Success Center

In 2018, the Florida College System launched the Florida Student Success Center in partnership with Jobs for the Future, Helios Education Foundation, and the Florida College System Foundation. The Florida Student Success Center is part of the national Student Success Center Network and supports Florida's 28 state and community colleges' efforts to develop student-centered pathways and increase student completion rates. Mathematics pathways re-design and content alignment were the primary initiatives in the center's first year.

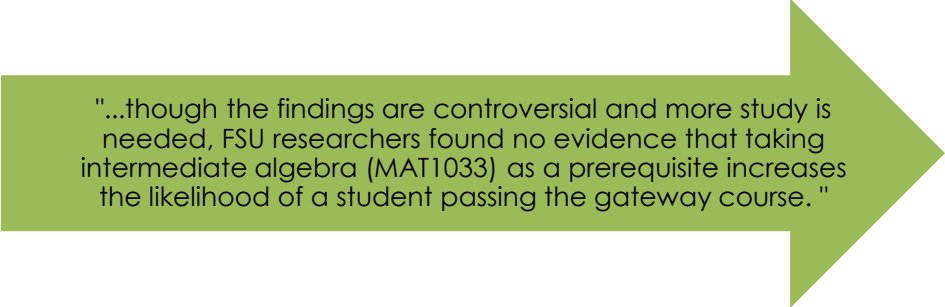
The center works collaboratively with colleges to create a coherent, statewide strategy so colleges can integrate their varied student success efforts, share best practices with one another and maximize resources. In addition, the center represents the collective voice of practitioners in state-level policy discussions.

Mathematics preparation is one of the most significant barriers to completion facing Florida state college students. This is a national problem, not one unique to Florida. According to a coalition created recently to address undergraduate mathematics, "Gateway and developmental mathematics courses pose the most significant academic barrier to postsecondary attainment for millions each year, particularly those from under-represented or non-traditional groups of college students."¹ Weaknesses in mathematics performance is particularly worrisome as mathematical literacy becomes essential in increasingly digital workplaces.²

Florida's college presidents, administrators and faculty are well aware of the challenge. The passage of Senate Bill 1720 in 2013 prodded all 28 Florida College System (FCS) institutions to expand and deepen their efforts to increase student success and improve persistence and graduation rates. SB 1720 exempted a significant proportion of the FCS first-time-in-college (FTIC) population from developmental education requirements. The bill also required colleges to offer developmental courses in mathematics and English that accelerate student progress into college-level courses. Institutional reform efforts have begun to bear fruit. Researchers from the Center for Postsecondary Success at Florida State University (FSU) have found that colleges that piloted accelerated models appear to be propelling more students to and through gateway mathematics and English courses while also narrowing equity gaps between racial/ethnic groups.³

At the same time, though, FCS leaders know that there is still much to do. The FSU researchers found that nearly one-fifth (19.2%) of the cohort of FTIC associate degree students they followed failed to enroll in *any* mathematics course in their first three years. Moreover, when these students did take a mathematics course, they commonly enrolled in developmental mathematics or intermediate algebra and then never enrolled in another mathematics course.⁴ Despite the progress being made, too many FCS students are still taking non-credit developmental courses that provide little momentum toward success in college-level mathematics. Additionally, many colleges require intermediate algebra as a prerequisite to enrolling in a gateway course. While intermediate algebra is a college credit class, it does not count toward general education requirements. Moreover, though the findings are controversial and more study is needed, FSU researchers found no evidence that taking intermediate algebra (MAT1033) as a prerequisite increases the likelihood of a student passing the gateway course.⁵ Overall pass rates in gateway mathematics courses remain very low.

Institutional leaders also know that long developmental education sequences are only one obstacle to mathematics success. Misalignment of mathematics requirements with student needs for their majors and their chosen careers is still widespread. Too many students across FCS are required to take algebra-based mathematics sequences to graduate in their major, even though they may benefit more from—and succeed at higher rates in—college-level courses that provide a solid foundation in statistics or quantitative reasoning.

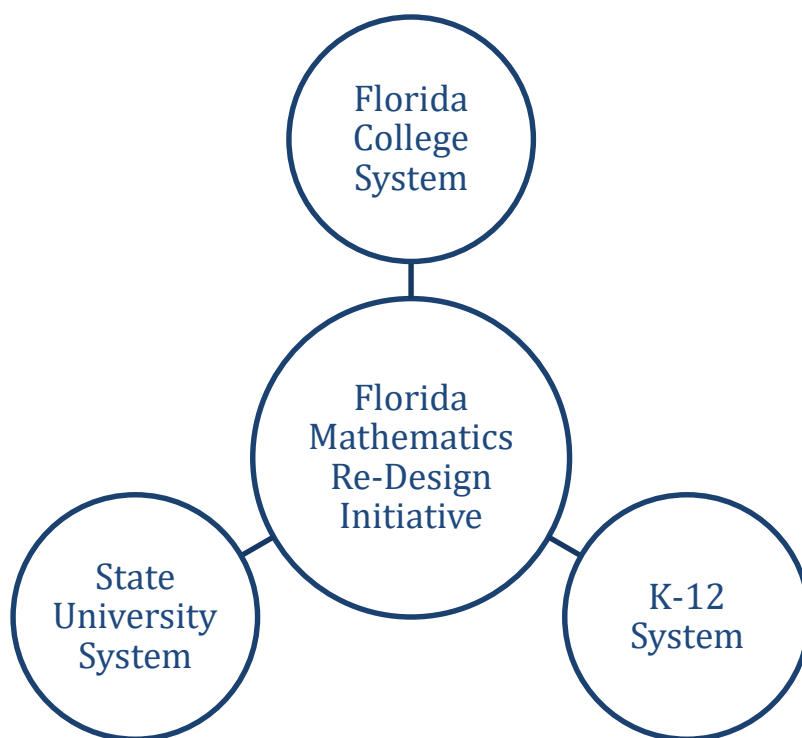


"...though the findings are controversial and more study is needed, FSU researchers found no evidence that taking intermediate algebra (MAT1033) as a prerequisite increases the likelihood of a student passing the gateway course. "

Florida colleges tackle mathematics preparation

In 2018, the Florida College System's newly created Florida Student Success Center (center) decided to make redesigning postsecondary mathematics its first significant initiative. The center launched an effort to support the development of clearer mathematics pathways across Florida's two-year degree-granting colleges—so that mathematics acts as a support for, rather than a barrier to, educational and economic success.

The effort is ambitious. It has been crafted to engage all 28 public colleges, mobilize both college leaders and faculty in mathematics and other disciplines, and involve key K-12 and state university system partners. The goal is transformational: to modernize how mathematics is organized and learned, so that all future Florida college students will be able to move more quickly and successfully to and through college-level mathematics courses aligned with their academic and career goals.



Why is this important? The Florida College System believes from both research and experience that significant progress on mathematics pathways redesign will help Florida colleges improve student completion and transfer rates—enabling more of the state's residents to advance and succeed.

The curricular and other changes needed to improve mathematics pathways are primarily an institutional responsibility, the work of every college, its leaders, personnel and partners. State policymakers in the legislature and the executive branch have an important supportive role as Florida colleges build and implement effective mathematics pathways. Ultimately, though, implementation depends upon the priorities and strategic choices of institutional leaders and their faculty and staff.

The Florida Student Success Center commissioned this brief for FCS presidents, administrators, faculty and other personnel to highlight what they should know about the state's mathematics pathways redesign and how the statewide initiative can support their institutional efforts. The brief addresses the following:

- Why the mathematics pathways agenda matters;
- Progress to date on mathematics pathways redesign in Florida;
- Next steps for institutions in the redesign of mathematics pathways; and
- Advice for college presidents and other leaders as they consider how to implement key mathematics pathways reforms.

A companion FSSC brief written for state policymakers can be found [here](#).

Why the mathematics pathways agenda matters

By committing to improve mathematics pathways, Florida has joined a national movement. At least 24 states are engaged in work to build out and strengthen diversified mathematics pathways, typically adding a statistics and a quantitative reasoning pathway to the traditional algebra-based sequence best suited for students majoring in STEM fields. Like Florida, these states are also testing ways to help academically underprepared students move more quickly to and through gateway college-level courses. According to the California-based organization Just Equations, "Preliminary research has found that initiatives to diversify mathematics pathways have yielded two, three, and four times the gateway course completion rates of traditional pathways, often in less time."⁶

Sustainable and large-scale progress in redesigning mathematics pathways depends upon colleges and state policymakers working in tandem, so that policy innovation supports and minimizes barriers to effective campus-level implementation. At the same time, a growing body of research demonstrates that individual colleges, large and small—as well as groups of colleges working together—can make changes that move the needle on helping more students succeed in mathematics and persist toward their credential.

In 2014, for example, the University of Texas at Arlington began shifting mathematics enrollment out of college algebra into quantitative reasoning and statistics courses, with the goal of a more balanced distribution of enrollments across the options. As more students met their mathematics requirements with courses that were not algebra-based but that were appropriate for their program and career choice, the success rate in all three pathways increased.⁷

A rigorous study at the City University of New York provides additional evidence: 56 percent of students taking college-level statistics (with instructional support) passed their course compared to only 45 percent of those enrolled in a developmental algebra course (also with instructional support).⁸ Given that, at most colleges, many more students take an algebra-based mathematics sequence than will use algebra or calculus in their careers, providing students with mathematics options more closely aligned to their majors can lower a significant barrier to progress.

A study conducted at four Texas community colleges compared outcomes for students enrolled in traditional developmental mathematics sequences with those for students enrolled in the Dana Center Math Pathways (DCMP) course, a one-semester accelerated model geared to help students succeed in their first college course. After three semesters, students assigned to DCMP were nearly fifty percent more likely to have passed college-level mathematics than those enrolled in the traditional sequence.⁹

At a June 2019 Mathematics Re-Design Institute convened by the Florida Student Success Center, Mike Sieve, who is a mathematics professor at Ridgewater College in Minnesota, described his institution's embrace of mathematics pathways—and how Ridgewater's success has spurred statewide activity. The small two-year college, serving 3000 students at two campuses, has only five mathematics faculty. The faculty took a close look at their mathematics data, which showed that only 25 percent of students needing developmental mathematics made it through remediation and completed an algebra-based mathematics sequence within two years. They decided that this weak performance was an institutional problem—and no longer acceptable. Seeking an alternative, they connected with the Carnegie Math Pathways network and began to develop a new quantitative reasoning pathway, using Carnegie's [Quantway](#) sequence. Their goal: to dramatically increase the percentage of students who complete their developmental and first college course within one year.

After a planning year, Quantway was introduced. In the first year, the success rate more than doubled to 55 percent. Today, more than half of the school's students enroll in quantitative reasoning rather than the algebra pathway. The success rate has reached 72 percent. Encouraged by the college's progress, the state community college system created a work group to replicate statewide the kind of developmental mathematics redesign initiative that Ridgewater had taken on independently, in the absence of a state or system-wide mandate.¹⁰

Progress to date on mathematics pathways redesign in Florida

Florida has long been a national leader in state policy that supports innovation and improvements in public higher education. Florida's public education governance structure encourages collaboration across K-12, district technical colleges, and two- and four-year institutions. The state is a leader in providing access to dual enrollment courses and credit for college courses taken in high school. Florida was one of the first states to mandate common course numbering. The redesign of developmental education required by SB 1720 has reduced costly and ineffective placements into developmental education while helping more students accelerate their progress to gateway college courses in mathematics and English. SB 1720 also required the state to identify a set of broad ["meta-majors"](#) for colleges to adopt—a cluster of majors in the same general field, such as business or health sciences, that students select in their first year before selecting their major. Florida is also recognized as having pioneered 2+2 articulation and other policies that make it easier for community college students to transfer smoothly to four-year institutions.¹¹

These policies have established a policy environment supportive of student success and conducive to mathematics pathways redesign. They are part of the story behind Florida's *U.S. News and World Report* ranking as the top state for higher education.

However, policy change alone is insufficient. Significant upgrading of the student experience and improvement in student outcomes require widespread reform of institutional practice. Statewide, implementation of SB 1720 and related policy guidance has been varied. Some colleges are implementing changes rapidly, while others are progressing gradually.

This is to be expected. Florida's colleges are at different stages of awareness, understanding, and action related to math pathways redesign. Systemic change takes time. College personnel frequently lack the necessary resources to make changes that policymakers want to see and they themselves want to implement. Sometimes, new initiatives need to be put on hold while recently-launched campaigns get a chance to take hold.

To ensure that mathematics pathways efforts will get traction at all 28 FCS institutions, the Florida Student Success Center designed a statewide initiative to create a cadre of campus level advocates committed to experimenting with and learning from peers about what works (and what doesn't) in implementing mathematics pathways. The center quite consciously designed a bottom-up, inclusive process to identify the most important mathematics-related changes that institutions can implement—and to surface additional support that colleges might need from state-level leadership.

The Florida Student Success Center worked to ensure that leaders and staff from across the state's public institutions were involved from the outset. The center established working groups of mathematics teachers, professors and administrators from Florida's public high schools, FCS institutions and the State University System. To identify current challenges to mathematics pathways and to develop recommendations for institutions and policymakers, work group members were asked to address issues related to: high school to college alignment; FCS mathematics sequences; and FCS to university alignment. Each work group was led by a college faculty member or administrator, supported by a staff liaison from the Florida Department of Education or the university system's Office of the Board of Governors.

In September 2018, over 80 mathematics faculty, administrators and stakeholders convened to identify the most significant challenges associated with implementing mathematics pathways. A pre-meeting survey identified advising, placement in mathematics and English, misalignment between education sectors, no alternatives to algebra, course sequencing, gateway course prerequisites and miscommunication as common challenges related to mathematics pathways. At the convening, each work group worked with this list and generated a few high priority challenges that they wanted to explore in small groups.

Early in 2019, the work groups reconvened to begin to craft solutions they would bring forward as formal recommendations for action. Small groups within each work group—called “huddles”—were charged with brainstorming high impact recommendations that would combine boldness and vision with practicality and achievability. Participants were asked to determine whether a recommendation would require a change in policy (“rules and regulations that shape the environment”) or practice (“the actions or activities of individuals or groups designed to execute or implement a plan”)—and whether policy recommendations were best addressed at the state level, by a single sector of the education system, or at the institution level.

Center staff collated the most popular ideas and distilled them into 11 recommendations for high leverage, actionable policy and practice.¹² At the end of the year-long process, over 200 individuals convened in Gainesville to review the recommendations that would be presented to institutions and to state-level policymakers.

The mathematics pathways redesign initiative recommendations can be found [here](#).

Next steps for college leaders and personnel

The center has identified six building blocks for any institution-wide mathematics pathways initiative—institutional innovations that FCS colleges can plan for, prioritize, and implement, independent of what policymakers do to support mathematics pathways statewide. These focus areas were derived from the mathematics re-design initiative workgroup recommendations.

Mathematics Pathways

- Create mathematics pathways by aligning mathematics courses to educational and career pathways and identifying appropriate course sequencing and curriculum mapping.

Curriculum and Course Re-design

- Implement re-design of mathematics curriculum, courses, or instructional methods.

Advising and Placement

- Advise and counsel students into mathematics sequences that are aligned to their academic/career pathway.

Student Learning

- Examine institutional student learning outcomes for alignment with statewide learning outcomes, determine prerequisite skills and courses required for student success and implement innovative pedagogical practices to support students in mastering those skills.

Professional Development

- Provide professional development opportunities to support instructors and advisors on areas such as active learning, critical thinking, problem solving, pathways and placement into appropriate mathematics courses and pathways.

Communication and Engagement

- Engage and communicate with stakeholders both within and external to the institution, including educational partners (high school, state college or university) about mathematics curriculum, content alignment, and/or student preparedness.

Mathematics Pathways: *Create mathematics pathways by aligning mathematics courses to educational and career pathways and identifying appropriate course sequencing and curriculum mapping.*

The starting point for re-designing mathematics pathways is the specification of the limited number of mathematics pathways that will be available to students in the college—and the alignment of these courses and sequences with meta-majors and specific majors that students will select as their path to a credential. Are the pathways through particular meta-majors and into specific academic and occupational majors clearly identified and mapped? Has each discipline identified which gateway mathematics course its enrollees should take and what if any prerequisites are required for that course? Specifying the mathematics pathway for each major and making the decisions visible and easily accessible to students is foundational. Doing so should also strengthen efforts to build out Guided Pathways that many FCS colleges are already implementing through their involvement in the American Association of Community

Colleges Guided Pathways Project and/or the Florida Pathways Institute spearheaded by the center.

Curriculum and Course Re-design: *Implement re-design of mathematics curriculum, courses, or instructional methods.*

An expanded set of mathematics pathways requires that each gateway mathematics course (quantitative reasoning, statistics, college algebra/STEM) has a curriculum that meets expectations and standards as determined collaboratively by two- and four-year faculty. Ultimately, statewide student learning outcomes should be debated and adopted at the state level, so that courses are comparable and transferable in a student's major across public institutions. However, colleges can make significant progress on their own, through well-designed convenings of mathematics and discipline faculty and adoption of institution-specific student learning outcomes that acknowledge both cognitive and noncognitive goals, such as student mindsets associated with math. Institutions can also organize regionally, working with local feeder and receiving institutions to make sure that curricula and course sequences align. Diffusion of evidence-based curricular strategies should be a high priority. For example, there is increasing evidence of success with co-requisite models of providing developmental mathematics education, which enables underprepared students to enroll in a college-level gateway course linked to a concurrent course that covers relevant mathematics fundamentals.

Advising and Placement: *Advise and counsel students into mathematics sequences that are aligned to their academic/career pathway.*

Advisors play a key role in helping students select courses and plan their course schedule from first semester to credential completion. The workgroups learned that advisors are frequently hesitant to counsel new students to enroll in a statistics or quantitative reasoning course, believing that the traditional algebra sequence is a "safer choice," particularly for students who are not sure of their eventual major. Given advisors' influence on student decisions, it is important that faculty and advisors share information on the value of different mathematics pathways, discuss common perceptions and misperceptions of mathematics pathways redesign, and develop a common approach to supporting student decisions about mathematics. Aligning internal messaging and support so that students better understand their options can help an institution change student course selection behavior and move the needle on progress to and through the appropriate mathematics course or sequence.

Student Learning: *Examine institutional student learning outcomes for alignment with statewide learning outcomes, determine prerequisite skills and courses required for student success and implement innovative pedagogical practices to support students in mastering those skills.*

Learning happens in classrooms and through assignments and supports aligned with classroom activity. Faculty have the primary responsibility for ensuring that students learn what they need to succeed. As mathematics pathways and new mathematics courses are implemented and refined, colleges need to make sure that learning outcomes specified for developmental and gateway courses are appropriate, aligned with state learning outcomes, and clearly spelled out for students. Faculty also need to take the lead in ensuring that classroom instructional practices help students engage with the material and master the mathematics skills they will be expected to know and use later in college or career.

Professional Development: *Provide professional development opportunities to support instructors and advisors on areas such as active learning, critical thinking, problem solving, pathways and placement into appropriate mathematics courses and pathways.*

Math pathways redesign requires instructors and advisors to alter what for some is longstanding classroom behavior. They will need help and support as they learn to use student performance data more effectively, make classroom learning more engaging and interactive, and help students stay on course to their ultimate educational and career goals. College and division/department leaders will need to think creatively about how professional development time and resources at their disposal can best be used to support faculty and advisors as they take risks in teaching method, instructional materials, and interactions with students around mathematics skills and thinking. State resources can be helpful in creating opportunities for professional development, but so too can existing institutional professional development and training activities.

Communication and engagement: *Engage and communicate with stakeholders both within and external to the institution, including educational partners (high school, state college or university) about mathematics curriculum, content alignment, and/or student preparedness.*

An important finding of the center's work group process was the realization that students are frequently confused about choosing and navigating their path through college—far more so than college personnel believe. Mixed messages, conflicting advice, and many different choices and decision points can leave students bewildered and ill-equipped for good decisions. Communications and messaging to students needs to be clear, visually engaging, and shared across departments, divisions, and different offices at the college. Clear and aligned communication is equally important externally, as the college explains its strategy and negotiates with other FCS institutions and partners in the K-12 the four-year sectors. The messaging has to be short, clear, easy to understand—and it needs to be communicated early and often.

One College's Journey: Math Pathways Progress at Valencia College

FCS institutions are in different stages of developing, implementing, and refining their mathematics pathways redesign efforts. One college that has been making steady progress is Valencia College, serving Central Florida at seven different campuses in and around Orlando.

Valencia's mathematics pathways work ramped up significantly after a 2017 statewide Florida College System meeting to discuss the challenges of mathematics performance across the system's institutions. The college's mathematics faculty, who had already committed to a strategic assessment of existing mathematics pathways and begun a year of data-informed conversations, left the meeting determined to break with the status quo.

Valencia serves over 68,000 students, has a nationally recognized guaranteed transfer relationship with the University of Central Florida called DirectConnect, and has won many awards for its work to improve student success, including the inaugural Aspen Prize for Community College Excellence. But math faculty were not happy with the statewide and institutional data presented at the convening or with the institutional data they had been reviewing. They decided they needed something different. According to Al Groccia, a mathematics professor at Valencia's Osceola campus, "We decided to start with a careful look at the data about our pathways and only then to begin to discuss what to do to improve student outcomes."

In fall 2018, after the all-faculty "welcome back" assembly, the mathematics department leadership invited all interested mathematics faculty members to a lunch and then an open meeting about the college's mathematics pathways and how they could be strengthened.

Valencia had already taken steps toward creating distinct mathematics pathways and aligning them with the college's meta-majors. The school offered a STEM /algebra pathway, a liberal arts pathway and a statistics pathway. A map of mathematics sequences in each pathway was readily available to students; the map specified which mathematics pathways and gateway courses were appropriate for which meta-major. Valencia and University of Central Florida had already worked through course level student learning outcomes so that there was agreement on what Valencia students should be able to know and do after completing gateway mathematics courses.

But there were still problems: too many students not taking a gateway mathematics course early in their college career; too many students undecided about their majors and advised into algebra courses, whether or not they needed it; and too many students not following any pathway and trying to set their schedule without help.

The mathematics leadership asked interested faculty to pick one of three groups—each devoted to looking at student data for a single pathway. Each group of about 20 met for three Friday afternoons in the fall to review course success data disaggregated by race and gender, data about student course-taking patterns, and analyses of student trajectories from their first time in math (including Developmental Education courses and failed first attempts) through completion of the Gordon-rule courses. Advisors, data researchers, and professional development staff joined in. The overarching questions: When a student begins the academic journey, what is their actual path through mathematic? And do these experiences vary for students based on gender or race?

By the end of these meetings, the group had come to a decision about changing the prerequisite for the gateway statistics course.

The work continued in spring 2019 with the development of working theories about the timing of mathematics course-taking and new pedagogies that would elevate active learning and make learning more relevant to students' academic and career paths. These theories were informed by qualitative and quantitative research and an assessment of the feasibility of their implementation.

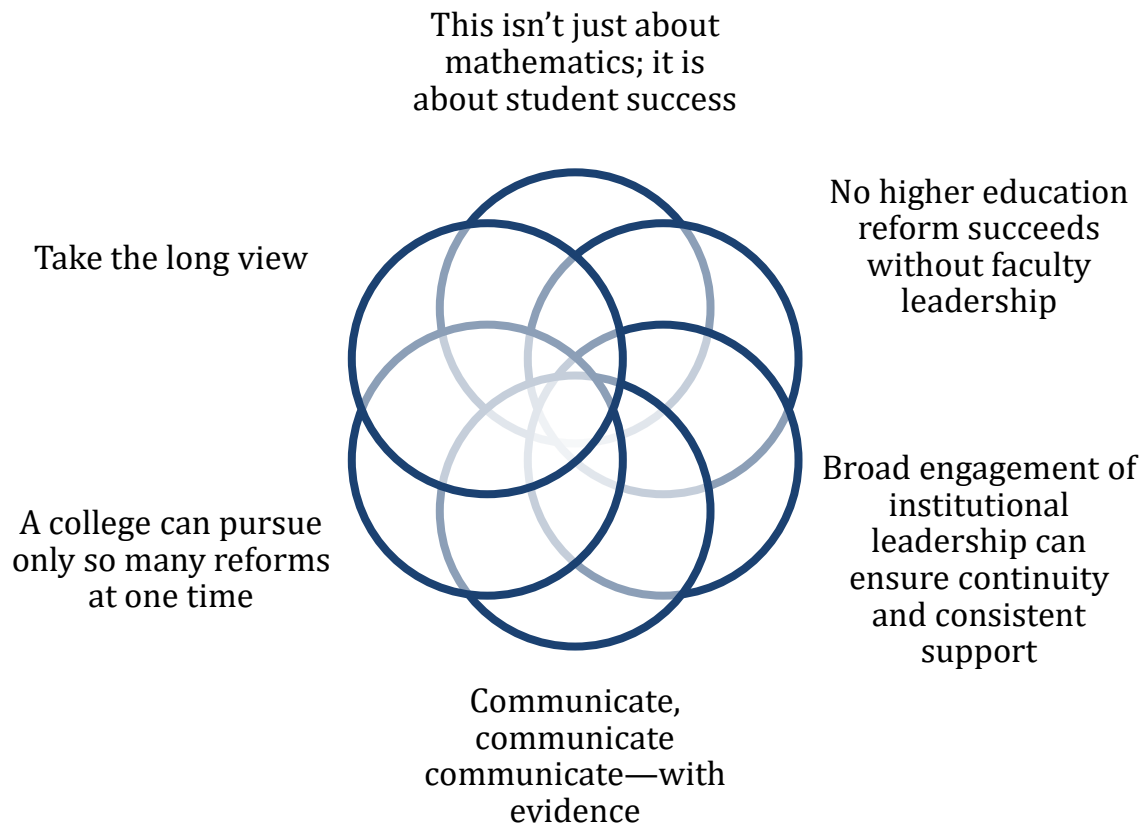
A third year of mathematics pathways work kicked off after the fall 2019 all-faculty "welcome back" with a lunch provided by the president's office. Teams of 25-30 faculty each adopted one of the working theories. Led by two faculty members, a dean, and an advisor, each team has created implementation plans to begin in spring 2020.

For Al Groccia, the college is on a path to shared understanding and evidence-based action. "At Valencia, our motto is that we don't do buy-in; we do ownership. And the mathematics faculty own this process." Joe Richardson, Valencia's Vice President for Student Affairs, acknowledges that "[t]his is difficult and hard work. But at Valencia we believe that anyone can learn anything under the right conditions. We just need to keep asking ourselves, 'How do we create better conditions for learning?'"

Advice to Florida's college leaders

As Florida College System leaders and personnel push ahead on the redesign of mathematics pathways and the integration of mathematics redesign work with other student success reforms, they would do well to be both realistic about the challenge and optimistic about the

opportunity for better outcomes. The following lessons may seem obvious, but they have been central to the Florida College System's efforts so far and can serve as a kind of roadmap or guidebook for institutional leaders.



This isn't just about mathematics; it is about student success: Math pathways redesign is important in its own right, but it is one piece of a complicated and multi-faceted student success agenda. It is one point of leverage that can enable students to move more quickly and efficiently to completion. However, mathematics pathways need to be designed and implemented so that they align with other reform targets, including college readiness, developmental education reform, guided pathways implementation, and transfer.¹³ Similarly, mathematics pathways is not just about curricular updating. It is also about helping to make the student experience more coherent and the route from enrollment to completion easier to navigate.

No higher education reform succeeds without faculty leadership: The FCS strategy for tackling mathematics preparation has emphasized bottom-up engagement. Faculty, administrators, advisors, and other personnel participated from the beginning of the initiative in identifying problems, solutions, and action steps. In the process, advocates and champions have been mobilized across the state's institutions, and many are eager to be active campus-level reform implementers. College leaders should take advantage of this mobilization and tap the wisdom and experience of those on the front lines. As state and institutional leaders pursue the mathematics pathways agenda, they should continue to encourage faculty engagement and ownership.

Broad engagement of institutional leadership can ensure continuity and consistent support: As with any complex institutional reform effort that is likely to require long-term commitment and activity, leadership of mathematics pathways redesign needs to be distributed and not concentrated in one champion, even if that champion is the college CEO. A leadership team representing different divisions and functions within the college should guide the effort, even as much of the heavy lifting will remain the responsibility of faculty. In this way, changes in college or division leadership will be less likely to derail momentum.

Communicate, communicate communicate—with evidence: One of the most important roles of institutional leadership is to send the signal from the top that this effort matters. College presidents and provosts can make the institutional commitment clear to the frontline workforce by showing up at certain events, allocating resources, and providing positive feedback and recognition to engaged faculty and staff. Whenever possible, what gets communicated should be based in data—data on student outcome challenges and gaps, on the effect of redesign on enrollment and outcomes in particular courses and pathways, and on student success.

A college can pursue only so many reforms at one time: A common complaint from institutional leaders and personnel is initiative fatigue. Change is difficult. Wave after wave of reform can be overwhelming. Institutional leaders should be strategic in the way they think about moving the mathematics pathways agenda. The more that pathways reforms can be aligned with efforts already underway, the more likely that those involved in implementation will have the bandwidth and energy to make progress on mathematics pathways. Institutional leaders should take advantage of large-scale reform efforts that are already moving and that have faculty and staff support, aligning and sequencing the mathematics pathways work so that these student success efforts are compatible and moving in the same direction.

Take the long view: Change that is statewide, ambitious, comprehensive, and effective requires time and consistent incremental steps toward the ultimate goal. While the FCS recommendations are built upon a strong evidence base from both national and Florida institutions and their students, there is much more to be learned about some of the key building blocks of mathematics pathways redesign, from developmental education models to learning outcome specification and identification of the right mathematics for each high enrollment major. This is certainly true for understanding how reform efforts increase students' mathematical understanding and their access to the range of opportunities that come with mathematical knowledge and ability.

Taking the long view can bump up against short-term political cycles, but it is necessary. Administrators, faculty and other personnel need to feel that they understand what is being asked of them and the kinds of support they can expect. The mathematics pathways agenda, like the student success agenda more broadly, has to be pursued in the spirit of continuous improvement. Goals and significant changes should be clearly articulated and publicized to key stakeholders; the effects should be monitored and analyzed, and corrections made, based on evidence of what is working and what needs to be rethought. New challenges will inevitably emerge. Institutional leaders should be ready to address unanticipated challenges—so that Florida's students can be prepared to succeed in career or further education and contribute productively to the state's economy and civic vitality.

NOTES

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¹⁰ Florida Student Success Center. 2019. *6/27/19 Math Re-Design Institute Part 2*. Presentation at June 27, 2019 Convening. Accessed at <https://thefloridachannel.org/videos/6-27-19-mathematics-re-design-institute-part-2>.

¹¹ Florida College Access Network. 2018. *From Transfer to Targeted Pathways: Florida's Efforts to Get Transfer Students to the Finish Line*. Tampa: FCAN. Accessed at <http://floridacollegeaccess.org/wp-content/uploads/2018/04/FCAN-Transfer-Student-Pathways-in-Florida-Brief-final.pdf>.

¹² Florida Student Success Center. 2019. *Mathematics Re-design: A Vision for Florida's Future*. Tallahassee: Florida Student Success Center.

¹³ For example, see Ohio Mathematics Initiative *Fiscal Year 2018 Progress Report*, accessible at <https://www.ohiohighered.org/math>; also, Dana Center, *Mathematics Pathways: Scaling and Sustaining*. Accessible at https://dcmathpathways.org/sites/default/files/resources/2018-09/Mathematics%20Pathways_Scaling%20and%20Sustaining_WEDNESDAY%20August%2029%5B4%5D.pdf.