

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

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### 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 state 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.

According to *U.S. News and World Report*, Florida is the number one ranked state for higher education. Last year, 11 of the 50 community colleges cited as best in the country by College Choice were Florida institutions. Four of those were in the top ten.<sup>1</sup> Florida colleges and universities have a lot to be proud of.

At the same time, there is much more to be done. According to *Florida's Strategic Plan for Economic Development 2018-2023*, two-thirds of Florida jobs created between 2018 and 2025 will require a postsecondary degree or certificate. Yet fewer than half of the state's working age residents have earned one of those qualifications. Florida is the third most populous state, but it ranks 20<sup>th</sup> nationally in the rate of educational attainment beyond high school.<sup>2</sup>

Even with a low 3.3 percent unemployment rate, as the state continues to grow its economy, the mismatch between worker skills and employer demand is leaving too many jobs unfilled. According to the Florida Chamber of Commerce, while 344,000 Floridians were looking for work in August 2019, employers could not find qualified hires for over 285,000 jobs.<sup>3</sup> Without improvements in college completion rates and much better outcomes for low-income, first generation, and adult students, Florida's long-term economic well-being may be in jeopardy. As the Florida Higher Education Coordinating Council has concluded, "The most powerful indicator of economic development and healthy communities is the number of adults with a high-quality postsecondary credential."<sup>4</sup> Building on the work of the Higher Education Coordinating Council, in 2019, Governor Ron DeSantis and the Florida Legislature recognized Florida's urgent need for talent with the establishment of the Florida Talent Development Council, for which the Higher Education Coordinating Council was a precursor. The council established Florida's attainment goal as 60 percent by 2025.



"The most powerful indicator of economic development and healthy communities is the number of adults with a high-quality postsecondary credential."

- Florida Higher Education Coordinating Council

## Florida tackles the challenge of mathematics preparation

A serious obstacle to college completion for many Florida community college students is mathematics preparation. Florida is not unique: this is a national problem. According to a coalition created to address undergraduate mathematics, "gateway and developmental mathematics courses pose the most significant academic barrier to postsecondary attainment for millions of students each year, particularly those from underrepresented or non-traditional groups of college students."<sup>5</sup>

The traditional structure and delivery of mathematics courses have created two notable barriers to student persistence and completion. First, students who take a multi-semester developmental (formerly known as "remedial") mathematics course sequences have low probability of completing college mathematics requirements and earning their chosen credential. Second, students who must fulfill algebra-based mathematics requirements in order to graduate in their major often put off taking college-level mathematics or do not succeed in their required course, even though they may benefit more from—and succeed at higher rates in—courses that provide a solid foundation in statistics or quantitative reasoning.

In 2018, the Florida College System's newly created Florida Student Success Center (center) decided to take on the challenge of redesigning college mathematics as its first significant initiative. The Center launched an effort to support the development of clearer mathematics pathways across Florida's state colleges—so that mathematics functions as a support for, rather than a barrier to, student educational and economic success.

The effort is ambitious. It has been crafted to engage all the state colleges, mobilize both college leaders and faculty in mathematics and other disciplines, and involve key partners across K-12 and higher education. The ultimate goal is transformational: to modernize how mathematics is organized and learned in Florida colleges for all students, so that future Florida college students will be able to move more quickly and successfully to and through college-level mathematics courses aligned to their academic and career goals. Progress on mathematics pathways redesign by Florida's 28 public colleges should contribute significantly to helping the state meet its goals for improving college completion and transfer rates.

Making the curricular and other changes that can improve mathematics pathways is primarily an institutional responsibility, the work of each college, its leaders, personnel and partners. However, state leaders can play positive roles in support of Florida's community colleges as they work to build and sustain more effective mathematics pathways. As this brief describes, the state has already taken important steps in this direction. Moreover, a consensus is emerging on high leverage next steps for Florida's institutional and state-level leaders.

The Florida Student Success Center commissioned this brief to highlight what they should know about the state's mathematics pathways redesign and how state leaders can support its goals. The brief addresses the following:

- Why the mathematics pathways agenda matters
- Progress to date on mathematics pathways redesign in Florida
- Next steps at the state level to support mathematics pathways
- Advice for state leaders as they consider how they can be most supportive

## **Why the mathematics pathways agenda matters**

Nationally, the community college sector has played a leading role in rethinking the mathematics that postsecondary students need, when they need it, and why.<sup>6</sup> Florida is part of a national movement. At least twenty-four states are working to create and implement diversified mathematics pathways, typically adding a statistics and a quantitative reasoning pathway to the traditional algebra-based pathway.<sup>7</sup> As is Florida, these states are also taking a hard look at strategies for expanding mathematics options that can help more students move faster to and through gateway college-level mathematics.

Evidence is mounting that redesign of mathematics pathways can help more students succeed in mathematics and persist toward their credential. In 2014, 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 took statistics and quantitative reasoning courses to meet mathematics requirements, increasing the number of students taking the mathematics that best fit their program and career choice, the success rate in all three pathways increased.


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).<sup>8</sup> Given that many more students at most colleges take an algebra-based mathematics sequence than will use

algebra or calculus in their careers, providing students with mathematics options better aligned to their majors can lower one significant barrier to their progress in college.

In fact, it is likely to be difficult to achieve state completion goals *without* tackling mathematics-related obstacles. As the Florida legislature acknowledged when it passed Senate Bill 1720 in 2013, traditional remediation has largely failed, but accelerated models appear to help more students succeed in college-level mathematics before “life intervenes” and work, family or other responsibilities lead to stopping out.

A rigorous study conducted at four Texas community colleges compared outcomes for students enrolled in traditional developmental mathematics course sequences with those for students enrolled in the Dana Center Mathematics 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 who were enrolled in the traditional sequence.<sup>9</sup>

Tennessee, long a leader in statewide efforts to reform remediation, has documented impressive results of a large scale pilot testing the power of co-requisite models that enroll students directly in college-level mathematics, complemented by additional academic support for underprepared students: 61 percent of students in the pilot completed a college-level mathematics course in one semester compared to a 12 percent success rate after two years for students in the traditional remedial sequence. According to the state, the model is superior for students who typically have more academic difficulty, including adults, students of color, and those with very low academic readiness.<sup>10</sup>



Traditional remediation has largely failed, but accelerated models appear to help more students succeed in college-level math before “life intervenes” and work, family or other responsibilities lead to stopping out.

## Florida’s state-level progress to date

Most states pursuing redesign of their mathematics pathways are embedding these efforts in a broader student success agenda that aligns strategies to improve college-readiness, the college experience itself, career preparation, and transfer to further education. States vary greatly in terms of how they approach policy innovation, differing on whether and when to turn to legislation, administrative rules, data collection and reporting, support for professional development, or other available policy levers. However, states working on mathematics pathways redesign appear increasingly united in pursuit of a set of common policy targets designed to promote college preparation beginning as early as secondary education, adequately place and support students, and create an infrastructure that promotes common learning outcomes and clear pathways for students from K-12 through two- and four-year college. These include:

- College readiness policies that help high schools prepare their students for college-level work in mathematics *before* they earn their diploma;
- Placement policies that enable underprepared students to avoid long remedial sequences and advance quickly to college-level mathematics courses;
- Support for specification of the gateway mathematics course that is required by each program of study, so that students are advised to enroll in the mathematics course that best meets their needs and accelerate their progress and completion of their chosen course of study;
- Definition of learning outcomes for gateway and developmental mathematics courses that are consistent statewide;
- Support for evidence-based instructional approaches that help students master the mathematics they need more quickly (e.g. co-requisite or other accelerated models);
- Transfer policies that ensure that mathematics courses taken to meet major requirements in community college are applicable for credit in that major upon transfer to a four-year institution.

Florida has a rich history of state policy innovations that provide incentives and support for improved alignment and performance in public higher education. The state's governance structure for overseeing public education encourages K-12, district technical colleges, the Florida College System, and the state university system to collaborate (i.e., K-12, district technical colleges, and FCS under the same authority with the State University system independent but linked through 2+2 articulation agreements and other arrangements). Popular and widely available [dual enrollment](#) opportunities for high school students to earn college credit save families over \$17 million a year in college tuition and shorten students' time to degree completion. Florida was one of the first states in the nation to mandate [common course numbering](#) across its colleges and universities so that learning outcomes would be comparable in the same course taught at different institutions.

The redesign of developmental education in FCS colleges required by Senate Bill 1720 has reduced costly and inefficient developmental education placements while helping more students accelerate their progress to and through gateway college courses in mathematics and English, according to Florida State University researchers.<sup>11</sup> 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 of studies on their way to deciding on their actual major. Florida has also been a pioneer in making it easier for community college students to [transfer](#) smoothly to four-year institutions, through statewide and targeted [2+2 articulation agreements](#) and guaranteed transfer for students who complete an associate in arts at a Florida College System institution.

These policy innovations are indications of the state's desire for systemic improvement and alignment, a policy approach that sets a good foundation for mathematics pathways redesign at the state's colleges and universities. However, policy change alone is insufficient to ensure significant change at the institution level and in the student experience. Across Florida, implementation of SB 1720 and related policy guidance is varied. Some colleges are implementing changes rapidly while others are progressing gradually; some are focusing on one or a few innovations while others have taken a more comprehensive approach.

This is to be expected. Systemic change takes time. Often, college personnel lack the necessary resources to make the changes policymakers want to see and that they themselves want to implement. Sometimes, the college's current priorities for change need to be put into place before a next wave of reform can be launched.

Florida's state colleges are at different stages of awareness, understanding, and action related to mathematics pathways redesign. The Florida Student Success Center's statewide initiative was designed to engage all the colleges and to build a cadre of campus level advocates committed to experimenting with and learning from peers about what works (and what doesn't) to advance mathematics pathways. The center designed a bottom-up, inclusive process to identify the most

important changes that institutions can implement—and how state-level leadership can support and accelerate their efforts.

The Florida Student Success Center established working groups of mathematics teachers, professors and administrators from Florida's public high school system, the Florida College System and the State University System. Created to identify current challenges to mathematics pathways and to develop recommendations for both policy and practice, work group members were asked to address: 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, who was supported by a staff liaison from the Florida Department of Education or the Office of the Board of Governors for the State University System.

In September 2018, over 80 mathematics faculty, administrators and stakeholders convened to identify the most significant challenges associated with implementing mathematics pathways. Building on a pre-meeting survey that 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, each work group generated a small number of significant challenges to explore further in small groups.

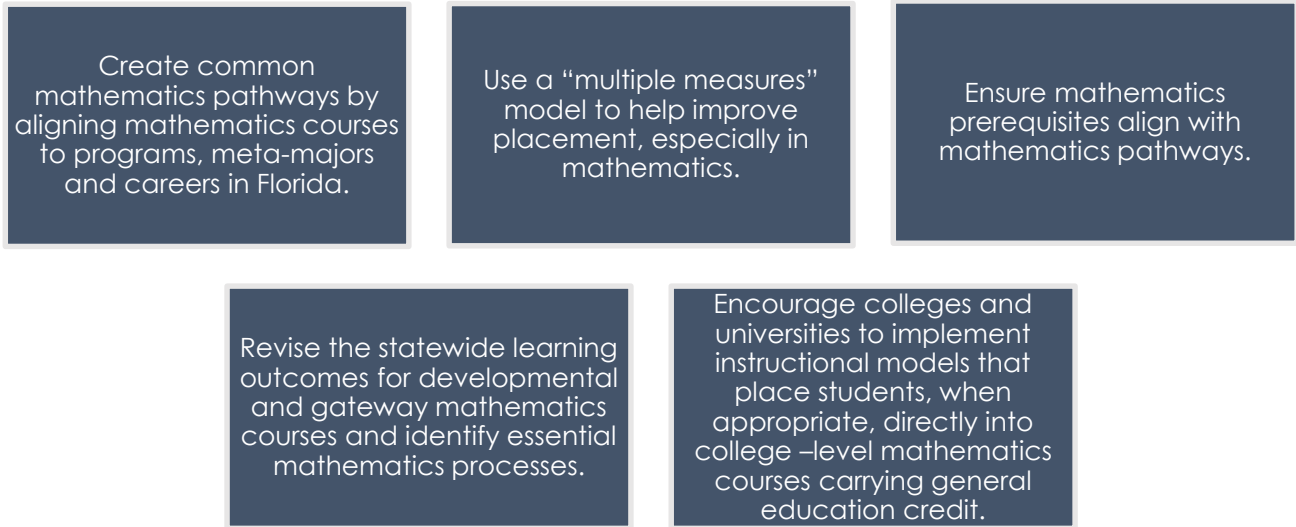
Early in 2019, the workgroups reconvened to begin to craft solutions they would bring forward as formal recommendations for action. The small groups within each work group—called “huddles”—were charged with brainstorming high impact recommendations that would be bold and visionary but also practical and achievable. For each, the huddles were to specify: what needs to change; who has the authority to make the change; and the process for implementing change. 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”). Policy recommendations were further differentiated by whether the authority to act lay with the state; a segment of the state education system; or at the institutional level.

Center staff collated the top three recommendations from each “huddle”. Looking for areas of commonality and recommendations that could be actionable, Center staff identified 11 recommendations.

By the end of the year-long process, nearly 200 individuals convened in Gainesville to review all the recommendations that would form the next steps agenda for institutions and state-level policymakers. Some were clearly recommendations for state policymakers, others for faculty or for individuals working in institutions. Many were framed as guidance for multiple stakeholders, including the legislature, the Department of Education or one or more of its systems, individual colleges, or even specific departments within a school. Five were categorized as recommendations for policy and the other six for practice. Both sets of proposals are critically important next steps.

The policy recommendations are summarized below. The practice recommendations are designed to promote collaboration across institutions and education sectors and to support faculty, advisors, students, and parents as mathematics pathways become more widely available. For more information on all 11 recommendations, go [here](#).

## Policy recommendations for supporting the redesign of Florida’s mathematics pathways



The five policy recommendations are:

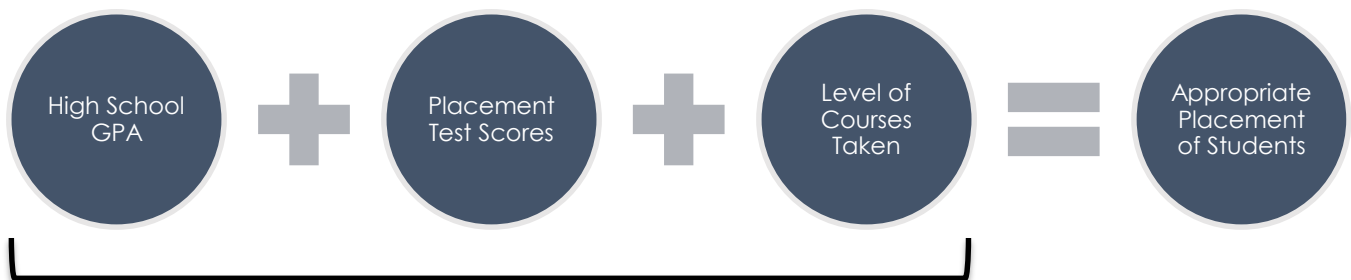
### 1. Create common mathematics pathways by aligning mathematics courses to programs, meta-majors and careers in Florida.

Citing research that shows that many students are not well-served by traditional algebra-based calculus sequences, including research from Florida, the redesign team recommended a set of activities to create clear, evidence-based default mathematics requirements for three mathematical pathways, such as algebra/calculus, statistics and quantitative reasoning.

To accomplish this, the team recommended identifying top transfer degrees and working across education sectors to identify the mathematics skills and concepts needed in each of those programs to successfully complete the degree and be prepared for postgraduate goals. Existing policies that need to be reviewed in this context were identified, including general education mathematics requirements, the Gordon Rule, and advising policies that advise too many students to take college algebra as their first college-level course. The team recommended professional development for advisors and faculty and a stakeholder engagement process so that misinformation about the reform would be limited. As the team emphasized: “The ultimate goal...is to increase graduation and success rates and to make sure students graduate without excess credits.”

### 2. Use a “multiple measures” model to help improve placement, especially in mathematics.

Research shows that more community college students pass college-level courses in mathematics and English when multiple measures are used to appropriately place students. These include high school grade point average (GPA), placement test scores and level of courses taken in high school or other institutions.



Given the stronger predictive power of multiple measures, the team recommended allowing institutions statewide to use multiple measures—but also emphasized the need to track student success so that formulas can be adjusted to enhance success over time. To the extent possible, digital tools should be used to make tracking and improvement easier.

### **3. Ensure mathematics prerequisites align with mathematics pathways.**

According to an FCS analysis, 92 percent of FCS students enrolled in a prerequisite mathematics course in 2016-17 were enrolled in Intermediate Algebra (MAT 1033). Only 57 percent passed. Taking Intermediate Algebra can be an unnecessary barrier to mathematics success for students whose ultimate goal is to take and pass Statistics (STA 2023) or whose program of study is better aligned with quantitative reasoning or statistics than algebra.

The team recommended that Intermediate Algebra be removed as a prerequisite for several gateway statistics and Mathematics of Liberal Arts courses. In addition, the state should make prerequisite requirements consistent across institutions, particularly in business/statistics and liberal arts courses, so that obstacles to transfer are minimized.

### **4. Revise the statewide learning outcomes for developmental and gateway mathematics courses and identify essential mathematics processes.**

Statewide learning outcomes for mathematics courses have not changed since SB 1720 went into effect. For mathematics pathways redesign to be successful—and mathematics courses to be aligned across K-12, two- and four-year institutions—the learning outcomes expected of students who complete each developmental and gateway mathematics course need to be revisited.

To this end, the team recommended that the Statewide Course Numbering System mathematics discipline committee survey colleges and universities regarding learning outcomes for key mathematics gateway courses and standardize the learning outcomes for the courses. In addition, the committee should review and revise all developmental mathematics and gateway course standards to identify essential learning processes that the state wants students to master, such as problem solving, reasoning and proving, selecting tools and computational strategies, representing, and communicating. Once the work is completed, outreach and professional development for colleges and universities and for K-12 partners should be provided so that the new learning outcomes can be implemented well.

### **5. Encourage colleges and universities to implement instructional models (such as the co-requisite model) that place students, when appropriate, directly into college –level mathematics courses carrying general education credit.**

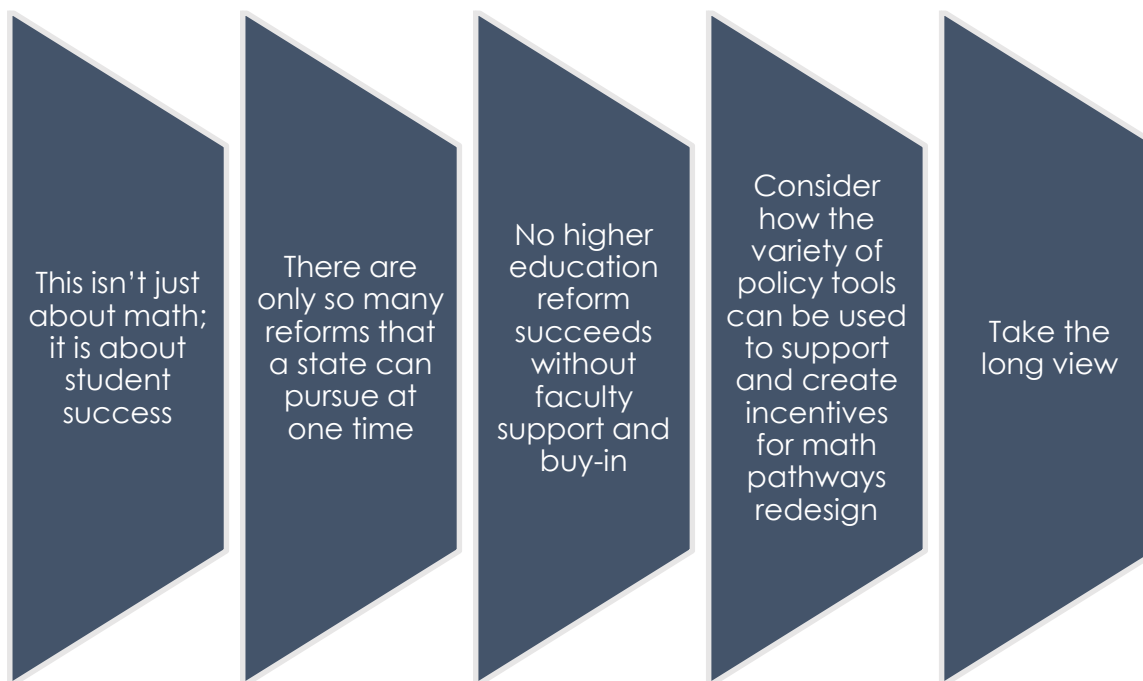
After passage of SB 1720, Florida College System institutions created and now offer nearly two dozen developmental education courses. This is too many, is confusing to students, and can complicate transfer within FCS and into the university system. This recommendation, like the others, is based upon a growing body of research that finds that accelerated approaches to supporting student mastery of foundational skills can provide students with momentum for successful completion of their gateway mathematics course. In particular, research points to the effectiveness of the co-requisite model incorporating developmental education skills in credit-bearing courses. The co-requisite model shortens time and credits to degree or certificate completion. It is becoming the national model as a best practice.

The team recommends that a small number of developmental courses be created that can replace the current dozens of offerings. In addition, a co-requisite model should be created as an additional option available to students who are underprepared for college-level work. Recognizing that institutions and their faculty will need support to implement these new courses and models, the team recommends a professional development strategy that might include statewide or regional institutes or state appointed experts to travel to individual institutions to help with the change process.



## Advice to Florida's state leaders, policymakers

As Florida's public officials and legislative leaders consider how best to support institutions and their personnel as they pursue mathematics pathways redesign, they would do well to consider the following lessons from other states and from Florida's own experience. These may seem obvious, but they have been central to the Florida College System's efforts so far—and are likely to lead to strong planning and action—from policymakers, state agencies and administrators, and institutional leaders across the state.



**This isn't just about mathematics; it is about student success:** It is easy for state policy activity to be designed and implemented in silos: one particular reform strategy rises on the agenda—and efforts to craft sound policy start to take on a life of its own. Mathematics pathways redesign is important in its own right, but leaders should always see it is one piece of a student success agenda for the state. It is one point of leverage that can enable students to move more quickly and efficiently to completion and readiness for post-graduate plans. However, only if it is designed and implemented in the context of the broader success agenda—which links it to college readiness, developmental education reform, guided pathways implementation, and transfer policy—will the potential power of mathematics pathways redesign be realized.

**There are only so many reforms that a state can pursue at one time:** A common concern from institutional leaders and personnel is the problem of initiative fatigue. Change is difficult and typically requires individuals to take on responsibilities and work over and above their job as defined. Similarly, state policymakers and officials face many different challenges and obligations. They, too, cannot be expected to dive deep into a broad range of issues and plan thoughtfully for change. For these reasons, state leaders should be strategic in the way they think about moving the mathematics pathways agenda. To the extent that the policy agenda can be aligned with efforts already underway in K-12 or transfer or other related issues, officials will find more bandwidth and energy for tackling the mathematics pathways recommendations from the center work group process. Take advantage of the efforts that are already moving and align and sequence the mathematics pathways work so that they are compatible and aligned.

**No higher education reform succeeds without faculty support and buy-in:** The center's strategy for tackling mathematics preparation in community colleges was a bottom-up one. Significant attention was paid to how faculty, advisors, and other personnel could be engaged in the process of identifying problems, solutions, and specific recommendations. This approach pays huge dividends. Advocates and champions are mobilized across the institutions, which can only help in the implementation phase. Interactions with peers in other institutions and across education sectors helps identify how interests and incentives might be different in different institutions and regions. Moreover, tapping the wisdom and experience of those on the front lines of education make for better solutions and reform recommendations. As state and institutional leaders pursue the mathematics pathways agenda, they should continue to encourage faculty engagement and buy-in, through support for professional development and peer exchange and through state-supported opportunities to share implementation lessons and advise on how policy can be best designed to address institutional challenges. Top down intervention needs to leave room for ongoing bottom up innovation.

**Consider how the variety of policy tools can be used to support and create incentives for mathematics pathways redesign:** New processes, courses, advising approaches and other innovations typically require new resources for development, implementation and improvement. Resource allocation and prioritization is a critical state function. But there are many other levers available to state and system officials. These include the power to convene key stakeholders and decision-makers; to create opportunities for peer interaction or cross-institution learning; to collect new data and use it for both accountability and program improvement; to support change processes by making toolkits and playbooks available to those on the frontline. The center recommendations do an excellent job of suggesting a variety of state and system level policy levers that can be used and combined. These should be kept in mind so that state leaders understand that in this complex effort to effect significant change and improvement, money is not the only thing practitioners—and students—need.

**Take the long view:** Charge that is statewide, ambitious, comprehensive, and effective requires time and consistent incremental steps toward the ultimate goal. While the center 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. Although it can be difficult to take the long view when one must be responsive to short-term political cycles, it is critically important to do so. State and system-level commitment needs to be steady and stable. Institutional leaders and personnel need to feel that they understand what is being asked of them and how they are being supported, given other responsibilities and demands. The mathematics pathways agenda, like the guided pathways and 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; but then 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 along the way. Policymakers at the state, system and institutional level need to be prepared to address unanticipated challenges as they emerge—so that Florida's students can be prepared to succeed in career or further education and contribute productively to Florida's economy and its community vitality.

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## NOTES

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