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The State University of New York (SUNY) is committed to ensuring that every student graduates with a meaningful degree or credential. Key to this goal is strengthening and accelerating student learning in mathematics. The SUNY-Carnegie Math Pathways partnership is designed to help support colleges and students in this effort while laying the groundwork for increased graduation and completion rates, particularly at community colleges.

In the five years since its launch, this partnership has created a vibrant community of SUNY educators focused on improving outcomes, faculty have transformed their instructional approach, and students have demonstrated greater confidence and success. This partnership has generated valuable insights and practices, making it a model for successfully scaling other initiatives at SUNY, and at colleges and systems across the nation.
SUNY data show that historically, mathematics, and developmental mathematics in particular, has been a primary gatekeeper to college completion for thousands of their students. The SUNY-Carnegie Math Pathways approach to this challenge has not only transformed gateway mathematics at the system, but has set the course for other large-scale SUNY initiatives in developmental English and guided pathways.

In 2012, SUNY formed a task force responsible for identifying and recommending strategies to address this challenge. The task force investigated implementation models and outcomes across the system and studied innovations in the field broadly. Impressed by the evidence of the Carnegie Math Pathways’ impact in other systems and states, the system launched the SUNY-Carnegie Math Pathways partnership.

The Carnegie Math Pathways, launched in 2010, is a national network of educators and experts dedicated to improving student success in gateway mathematics. Together, this network developed Quantway and Statway, quantitative and statistical reasoning pathways that align with students’ studies and career paths and use evidence-based practices for improving student outcomes. Centered on active, collaborative learning around relevant and authentic contexts and with a focus on social-emotional learning including growth mindset and sense of belonging, these courses have demonstrated powerful student success outcomes.

Beginning with just two SUNY pilot colleges, adoption of these math pathways has since expanded to scale across the SUNY system.

With funding from the Bill and Melinda Gates Foundation and SUNY System, the SUNY initiative “Scale Up of Quantway/Statway” was launched in 2015. This three-year $3.3 million investment established the infrastructure to ensure long-term sustainability and impact of math pathways implementation for SUNY students. This included building a system-wide network of faculty, administrators, and advisors committed to institutionalizing math pathways and supporting ongoing faculty professional development. The result is a transformation in teaching and learning at 28 SUNY institutions that is impacting more than 20,000 students. Additionally, SUNY leveraged this work into additional funding with a $2.1 million grant from Education Commission of the States’ Strong Start to Finish effort focused on expanding the work to include other evidence-based practices to support students completing gateway courses in their first year of study.

This faculty-led, administratively supported effort has provided a framework for scale-up that SUNY has leveraged for both its Developmental English and guided pathways efforts.

As Johanna Duncan-Poitier, SUNY Senior Vice Chancellor for Community Colleges and the Education Pipeline notes, “The Carnegie Math Pathways scale-up led the way for SUNY’s other student success efforts resulting in increased graduation rates over the past ten years for two-, three- and four-year rates. Additionally, this effort helped us develop a culture of student success across SUNY.”
Critical to the success of the SUNY-Carnegie Math Pathways collaboration is SUNY’s commitment to faculty leadership and development.

SUNY recognizes the importance of ensuring student success by investing in faculty. Faculty’s experience, knowledge, and ability to enact change impacts students’ experiences in the classroom and their identities as learners.

At the heart of the SUNY-Carnegie Math Pathways collaboration is a robust professional learning community. Faculty across SUNY support each other in improving their pedagogical practice and in implementing instructional and curricular innovations. From large bi-annual forums to one-on-one faculty mentorship, SUNY has established a structure that makes this community thrive.

SUNY’s bi-annual learning forums provide opportunities for institutions to share strategies, to showcase faculty best practices, and to access the latest math education research.

Statewide and regional institutes and local events bring additional support closer to home, with lunch-and-learns, classroom visits, and local trainings. SUNY’s faculty liaisons and mentors provide peer-to-peer support, particularly for faculty teaching math pathways for the first time.

Professor Rachel Rojas of Nassau notes the impact of this community, “Faculty love it because they feel relief that they’re not alone. Faculty are sharing positive experiences and then other faculty are learning from that, and they’re taking away new techniques that they can bring into their classroom.”

The SUNY-Carnegie Math Pathways collaboration provides faculty with the support they need when they need it. Over the past year, the partners worked together to support faculty in their transition to distance learning and to support multiple campuses in transitioning to corequisite remediation.

SUNY faculty are also deeply involved in the national Carnegie Math Pathways network, collaborating with peers across the country on innovations related to curriculum and instruction. Their involvement with this broader community provides them with unique opportunities for cross-institutional learning and engagement with national experts, strengthening their leadership in the SUNY math pathways community.
SUNY’s math pathways community cultivates rich connections among educators and meaningful professional learning, empowering faculty to chart a path to improved student learning. The community has been carefully designed to do this through:

Professional learning opportunities that are grounded in emerging research and incorporate national expertise while also elevating and reflecting faculty interests, experiences, and accomplishments. Leading scholars in education reform, mathematics education and equity, and social psychology including Jim Stigler, Danny Martin, Ilana Horn, Lauren Eskreis-Winkler, Claude Steele, Tom Bailey, David Yeager, and Carol Dweck helped propel our work forward through SUNY system events and national Pathways events. Importantly these events have also featured the local expertise and experiences of SUNY faculty themselves. Professor Jennifer Braun, math faculty at SUNY Morrisville, reflects on the cross-campus dialogue and learning at the 2018 Morrisville regional event, “It was also great to hear about campus updates and future plans. To know that we are all in this together...helped to make attendees at the forum comfortable in sharing their own successes and failures, which ultimately allowed for more sharing and gaining of information.”

Multiple opportunities and modalities for learning. From large in-person system-level events, to peer mentoring and coaching, to discussion forums, to classroom observations, SUNY educators are provided with rich and varied opportunities to engage in professional learning meaningful to their practice, both locally and across campuses. These various opportunities help reinforce what faculty learn in their initial Pathways training and build faculty’s confidence in applying a new approach. Professor Marilyn Webb, of Tompkins Cortland Community College, was invited to observe her Faculty Mentor’s Quantway class at Onondaga Community College on the first day and was so impressed. She recalls how that observation “was actually worth all the training that [I’d] had. It was so amazing to see it live and to see how the students got into groups and began talking to each other and engaging with the topic of the day.”

Cultivating leadership within the network. Being able to connect with peers and be part of a larger shared initiative provides a professionally motivating and rewarding opportunity to faculty in what is traditionally a very isolating profession. Increasingly, SUNY faculty have taken on the role of coaching each other, hosting regional forums, and guiding professional development opportunities. Three SUNY math faculty, Professor Mary Crawford-Mohat (SUNY-Onondaga), Associate Professor Bridget Dart (SUNY-Suffolk), and Professor Brenda White (SUNY-Morrisville), serve as Faculty Mentors to new Pathways instructors across the SUNY system. And several SUNY faculty have taken initiative to be involved in the development of curricula and professional learning supports including critical Pathways fundamental lessons that build prerequisite knowledge, contextualized social justice lessons, and instructional reflection tools and peer coaching models designed to help faculty improve on key aspects of Pathways instruction. These innovations are benefiting not only SUNY students, but Pathways students nationally.
With the Pathways' unique approach to curriculum and pedagogy, SUNY faculty's perceptions about student learning are evolving, leading to a change in their instruction as a result. Survey data show an increased belief among faculty that students can navigate challenging concepts and problems, are willing to work hard, and can learn what faculty aim to teach. Faculty also report feeling more comfortable trying new instructional methods and incorporating collaborative learning even beyond their math pathways classes.

Bridget Dart, math faculty at SUNY Suffolk and Pathways Faculty Mentor, noticed that she’s gained richer insights into her students' learning. “I know what they know better, not just by their tests, but by my interactions with them in the classroom.” This has pushed her to adjust her instructional approach in ways that better support students' engagement and learning.

Because Pathways courses prompt students to collaboratively work through math concepts and problems, faculty play a greater role facilitating and guiding students to think through challenges rather than simply correcting wrong answers. As Dart notes, “You have to find a different way to help them struggle through it so they can figure out for themselves where they're going.” Being part of this community has expanded Dart's professional knowledge and skills. “It’s been such a rewarding experience as a teacher to learn about student learning and to really learn about how students learn mathematics.”

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Bridget Dart
SUNY Suffolk Community College
Adjusting one's teaching approach can feel daunting, as Professor Eric Magaram, faculty and Mathematics Department Chair at Rockland Community College, can attest. Yet, he credits the professional community nurtured by SUNY as being essential to his persistence and overall success with teaching Quantway. “The success has come from the faculty themselves talking every week about the course. They debrief once a week with each other: ‘How did things go? How did this lesson go?’”

His instructional transformation has paid off in the validation he gets from knowing that more of his students—for whom math has traditionally been a barrier—are completing and advancing in their studies. “When I see them at graduation and they come over and they say ‘that math’s been what’s holding me back and now that’s not the case,’ that’s great for everybody.”

Believing that there is a better way to help students succeed in math was just what motivated Professor Joseph Bernat, math faculty at Nassau Community College, to adopt Quantway for his students. Since beginning teaching the course, Bernat states, “I’ve learned so much about how to better engage students with each other.”

Bernat’s enthusiasm for Quantway extends beyond the classroom. He has played a critical faculty leadership role in his campus’s scaling of their Quantway offerings. Together with his colleague, Rachel Rojas, they have revitalized engagement among faculty and worked to build a local learning community. Reflecting on leading his institution, Bernat says, “This course is something I strongly believe in. And that’s why I took the initiative.”
From improved and more equitable outcomes to increased confidence to apply math in their other courses and their lives, SUNY students are transforming their relationship with mathematics. More than 20,000 students at 28 SUNY institutions have participated in Carnegie Math Pathways, gaining a new appreciation for mathematics and greater confidence as math learners.

The majority of institutions have demonstrated a marked improvement in student outcomes compared to students in their traditional course sequences. Three in particular, which enroll a large number of students, are Corning Community College, Fashion Institute of Technology, and Suffolk County Community College.

**IMPACT FOR STUDENTS**

With support from SUNY-system, Corning launched Quantway in fall 2017. Since then, their Quantway offerings have served over 360 students, and they have experienced a 77% total success rate.

Designed to give their students more math options better aligned with their areas of study and career path, Quantway is enabling Corning students to more effectively meet their developmental and college math requirements. Quantway Core, which serves primarily non-STEM students not requiring advanced algebra for their degree, has seen a 16% higher success rate compared to the outcomes in the previous algebra-based course.

Professor Kathleen Speicher, math faculty and Developmental Math Coordinator, notes that the relevant curriculum has made a difference to students. “Quantway is a class where students really feel like they see a purpose in the math course.” Additionally, the collaborative approach and the embedded social-emotional supports are incredibly valuable. Speicher has seen improved attendance, engagement, and success in her classes. Speicher says that as more students take the course and other faculty observe the impacts, that their math faculty have really “changed attitudes among students, faculty, and administrators about what a math class can entail.”
Fashion Institute of Technology began implementing Quantway Core in fall 2016 as an alternative to their self-paced algebra and arithmetic-based math course. Since then, they have served over 370 students and achieved an 85% success rate—a 16% improvement from their traditional math course.

For their faculty, utilizing a math pedagogy informed by the neuroscience of learning and mindsets was very appealing. Additionally, the contextualized lessons that feature topics relevant to their students including topics of environmental sustainability have proven highly engaging.

Assistant Vice President for Academic Affairs, Dr. Yasemin Jones, reflects on their Pathways implementation and notes “FIT has a majority female student population, many of whom tend to have a fixed mindset about their mathematics abilities. Yet, because of Quantway we have seen our students make dramatic changes in how they think about their capacity to think and do math.” Jones attributes much of the success of the courses to the dedication of the faculty champions who, through their review, implementation, and continued effort to grow their math pathways course section, have demonstrated their commitment and dedication to this approach.

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Dr. Yasemin Jones
Assistant Vice President for Academic Affairs
Fashion Institute of Technology
Suffolk County Community College launched their math pathways courses in fall 2015 with Quantway Core. A part of a system-level effort to improve student completion, Suffolks' coordinated adoption of math pathways resulted in increased enrollment in this developmental math option and high success rates. Quantway Core offers an alternative math pathway option, replacing the basic algebra development courses, to prepare non-STEM students for math for the liberal arts or college-level statistics.

In the view of Suffolk’s Vice President of Academic and Student Affairs, Dr. Paul Beaudin, the embedded social-emotional supports, emphasis on growth mindset, and contextualized curriculum have been critical to the success of these courses. He notes that “Quantway has helped students, for whom math has traditionally been a challenge, really see value in the math they're learning.”

Beaudin also emphasizes how the math pathways initiative has energized math faculty, who he reports have formed a professional learning community across their three campuses. “Math faculty involved in Quantway are talking about teaching and more about the affective domain of learning.” Quantway faculty continue to be enthused about the teaching of the course and have actually contributed units that they have developed locally. Both Beaudin and math professors at Suffolk have been recognized with national awards related to this program.

To date, Suffolk has served 1,690 students in the Quantway Core pathway and students have received a 67% success rate in the course across the past five years.
A number of institutions are now implementing Quantway Corequisite courses, in which students simultaneously enroll in college-level Quantway and its corresponding support course. Roughly 80% of these students are earning college credit in a single semester, accelerating their time to graduation. That’s more than triple the rate of students in the traditional sequence in less than half the time.\(^2\)

Several SUNY schools have also made important advances in addressing equity gaps in success rates. Nassau Community College, Suffolk County Community College, Fashion Institute of Technology, and Westchester Community College, all have success rates with an equity gap of 10% or less when comparing Black and Hispanic students to White students.\(^3\)

In fact, across more than 1,800 enrollments at Nassau Community College, Black and Hispanic students had a success rate within 3.1% compared to White students in the same Quantway courses. Similarly, across more than 1,200 enrollments at Suffolk County Community College, Black and Hispanic students had a success rate within 3.3% compared to White students in the same Quantway courses.\(^4\)

Carnegie Math Pathways do more than improve student success rates. They change students’ identities as math learners, giving them the confidence and skills they need to successfully apply mathematics in their lives and in the world around them. They cultivate a growth mindset and resilience in students that enables them to persist and ultimately succeed.

As Rockland Community College student, Kathleen Renaldi, notes, “[Quantway] opened my mind. It changed my perspective on math completely. I was afraid of it before, but…[this] was fun. And it’s given me more confidence.” Since taking Quantway, Kathleen has felt encouraged to pursue further coursework in statistics and has shared her new appreciation of math with her children.

SUNY Quantway students demonstrated gains in growth mindset and lowered math anxiety throughout the course! For Mariea Robertson, a social work student at Onondaga Community College, Quantway helped her overcome her fear of math. “I know now coming out of Quantway that I will be able to give what is required of me and won’t have the anxiety that I won’t be able to do this. Before I started this my anxiety was through the roof. But I have no anxiety now walking into my class. I look forward to walking into the class.”

SUNY students’ success through Quantway and Statway is bringing both personal and institutional benefits. Students are achieving their gateway math credit within one year and building confidence that is supporting them as they advance toward their college and professional goals. Meanwhile, by investing in math instruction and providing math options that are meaningful to students’ studies and careers, SUNY institutions are seeing improved and more equitable outcomes. Together these impacts are helping SUNY make progress on its completion agenda and towards ensuring the success of all SUNY students.

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1. AY2018-19 and AY2019-20, Quantway Corequisite success rate (n=219) was 78.8% at SUNY, based on CMP’s success data as reported by faculty.
3. Results were calculated using SUNY IR data from Quantway Core and the comparable traditional math course in each institution from Fall 2016 through Spring 2020.
4. Results were calculated using SUNY IR data from Quantway Core and the comparable traditional math course in each institution from Fall 2016 through Spring 2020. For Nassau, the analysis contained 1,222 Black and Hispanic students and 436 White students. For Suffolk, the analysis contained 550 Black and Hispanic students and 580 White students.
5. As demonstrated through Carnegie Math Pathways Productive Persistence surveys administered at week 1, week 4, and end of term. Gains from week 1 to 4 have lasted and even showed further improvement when measured again at the end of the term.
KEY LEARNINGS AND RECOMMENDATIONS FOR MOVING FORWARD

The SUNY-Carnegie Math Pathways partnership is truly unique in that it is faculty-led and supported by important campus stakeholders, including administrators, advisors, tutors, and other student support staff. This design, in which faculty are empowered to create and lead change, has led to its success and will ensure its ongoing sustainability.

Engaging faculty in the early effort—in examining the problem to be addressed, exploring solutions, recruiting their peers, and designing a path toward change—was essential to the launch. Once off the ground, investment in professional learning became key to sustaining this effort. Faculty directly influence students’ learning experience and their ability to see themselves as successful, confident learners. Yet, to produce these results, faculty need opportunities to learn in order to improve their practice; they need access to the latest research; and they need a community of peers they can rely on for support.

The regular opportunities for engagement, learning, and relationship-building that SUNY and Carnegie Math Pathways created resulted not only in more faculty with increased expertise, but an ongoing, self-sustaining network of faculty (who otherwise wouldn’t know each other) supporting each other across campuses and across the state.

An additional takeaway has been the value of partnership with researchers and experts in the field who played a critical role in providing faculty and the SUNY system with the knowledge they needed to execute successfully. Finding a partner that shared the same goals and complemented existing institutional expertise allowed SUNY to quickly and efficiently build a program that resulted in significant gains for students. Further, it helped ensure that SUNY established a framework of support that could be sustained beyond the conclusion of grant funding.

Looking forward, SUNY’s deep commitment to transforming learning and outcomes in mathematics has provided a blueprint for how to approach other ambitious redesign efforts. SUNY’s success in this initiative has generated both the will and the know-how that have been essential to SUNY’s guided pathways initiative. A continued investment in our math pathways initiative and implementation signals a commitment to the many faculty leaders engaged and moving this network forward. It also provides an opportunity to continue the math pathways scaling efforts, reaching more students and ensuring more students graduate.
ABOUT SUNY AND CARNEGIE MATH PATHWAYS

About the State University of New York
The State University of New York is the largest comprehensive university system in the United States. Our impact in New York State and across the globe begins with our 64 institutions, including research universities, academic medical centers, liberal arts colleges, community colleges, colleges of technology and an online learning network. We serve nearly 1.3 million students, including nearly 600,000 in credit bearing courses and programs and more than 700,000 through continuing education and community outreach programs. Our nearly 3 million SUNY alumni are located around the globe, each making their own unique impact.

About Carnegie Math Pathways
At Carnegie Math Pathways, we believe that math should be a gateway, not a gatekeeper on students’ path to college graduation. That’s why we’ve fundamentally reimagined teaching and learning by collaborating with a national network of educators to inspire students who previously struggled with math to deeply understand and even love the subject. Because when we transform the experience of mathematics on campuses nationwide, we see generations of graduates develop the self-efficacy, quantitative reasoning, and collaboration skills to achieve their goals and transform the world around them.

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