The Challenges of Scaling Gateway Mathematics Corequisites:

Recommendations for Policy and Practice

Sean C. Pepin, PhD
Kheper House Consulting

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The University of Texas at Austin
Charles A. Dana Center

Executive Summary

Overview

This study focused on the challenges of at-scale corequisite mathematics course development and implementation based on the experiences of 21 system leaders, college administrators, and faculty across four states. Corequisite courses allow students who need or want additional support in college-level math to enroll in credit-bearing courses to receive extra, just-in-time help. Based on the identified challenges, this study also illuminated enabling conditions and provides recommendations for policymakers, state and college leaders, and campus faculty as they engage in corequisite development and implementation.

Challenges in Brief

Four stages of gateway corequisite math implementation were found in this study. The table below summarizes the stages and their unique challenges and barriers.

Exploring	Cocreating	Implementing	Revising
• State Legislation • Funding • System Guidance • Research and Data • Convergence of Policy Changes • Trust*	• Champion for Corequisites • Convening Stakeholders • Mindset • Small and Rural Colleges • Models and Modalitites • Wrestling with Inadvertent Past Harms*	• Advising • Faculty Professional Development • Curriculum Approval • General Logistics • Navigating Relationships*	• Course Improvements • Transparent Data and Evaluation • Placement • Low Morale*

* Associated affective domain challenges

Enabling Conditions in Brief

As system officials, administrators, and faculty shared what worked and what did not, five enabling conditions emerged (see below).

Recommendations in Brief

In an effort to provide valuable guidance to system officers, college leaders, and policymakers, the recommendations target each of the four stages of implementation, along with a preparatory stage of

assessment. The five recommendations are further broken down into *why*, *how*, and *what*. The *why* provides the rationale and purpose for engaging in dialogue about these five recommendation areas. The *how* explains the process for how college leaders and teams should engage in this recommendation area. Finally, the *what* comprises strategies and possible actions to address the challenges that emerge in this area.

How	Strategies
Assessing | Recommendation #1: Identify and assess enabling conditions. Why: Teams can identify what they are able to control and adapt or, if they cannot, how they can respond to those issues.	
At the beginning of the exploration and implementation process, teams should use the enabling conditions as a rubric to identify areas for which there is strong support and for which there may be barriers.	• Identify and bring together faculty, staff, and administrators to conduct an assessment using the enabling conditions as a rubric. • Identify team members who bring strengths to the work to help anticipate barriers. • Include skeptics in early exploration phases to help navigate challenges and plan to scale implementation. • Identify and earmark funds for corequisites that align with and contribute to institutional goals.
Exploring | Recommendation #2: Provide research, guidance, and data. Why: Stakeholders are better equipped to understand corequisites and the problems they aim to solve.	
Leaders should make the case for corequisite models, contextualize current research, provide resources, and prompt a shift in data monitoring from course success rates to throughput.	• Share research and data resources, distilling the learnings and contextualizing those learnings to local conditions. • Create effective guidance including: (1) legislation, (2) interpretation, (3) research and resources, (4) funding, and (5) throughputs in gateway math. • Partner with institutional research offices to use throughputs as a standard, regularly reported metric in meetings and in official planning and reporting documents.
Cocreating | Recommendation #3: Convene and engage cross-functional teams in the design and implementation process. Why: Convening teams fosters awareness and knowledge, creates buy-in, and engages voices.	
Leaders should review their organizational charts to identify the sweeping impact of gateway math redesign and to take a broadly inclusive approach to cocreating a new model.	• Identify a faculty member who has strong relationships and political capital within the department and the college to lead the corequisite implementation process. • Convene a cross-functional team of faculty, staff, and administrators from across the campus to foster champions for this work. • During the convening, provide the research and clearly articulate the difference between course completion and throughput to make a data-supported case for corequisites.

How	Strategies
Implementing | Recommendation #4: Provide continuous professional development. Why: Continuously supporting those directly involved in this work help make the work successful.	
Leaders must commit to a professional development approach that contextualizes data, engages a variety of individuals, and fosters developmentally scaffolded conversations.	• Work with the professional development coordinator to present the research and findings from corequisite models at an initial summit on corequisites. • Create a community of practice that encourages faculty in their own growth and supports one another as challenges in teaching arise. • Create training and support around culturally responsive professional development, especially for faculty and advisors.
Revising | Recommendation #5: Develop sustained and emotionally intelligent dialogues. Why: Once realities of this transformational shift begin to set in, changes begin to affect more people.	
As leaders begin implementation, they should set and communicate a clear intention that they will commit to iterative, continuous improvement.	• Consider communities of practice and/or learning communities to be a part of long-term continuous improvement plans. • Train leaders to develop their emotional intelligence, tolerance for critical feedback, and ability to navigate challenging conversations. • Make data-informed decision making a priority long after initial implementation. Make throughput in gateway math data easily accessible and assist teams in making meaning of the data.

Full Report

Introduction

A wave of reforms for gateway mathematics and English courses is moving through the United States. Colleges are enacting a variety of state-mandated or self-imposed policies and practices to increase student completion of gateway math and English courses and to reduce or eliminate equity gaps. Although research shows that gateway corequisite courses[1] are effective (Appendix A), many states and colleges have not implemented corequisite support courses at scale.[2] The purpose of this study was to investigate existing challenges and barriers as colleges moved toward designing and implementing corequisite math at scale.

With the COVID-19 pandemic as the backdrop of this study, it is important to note how the tumult of the past two years had radically changed higher education. The immediate pivot to online teaching and learning consumed significant time, energy, and resources. Although corequisite courses were a proven mechanism for increasing throughput in gateway math,[3] progress on corequisite implementation at many campuses slowed, if not halted altogether.

Prior to the pandemic, states and system offices were beginning to reexamine remedial math and English practices and outcomes. Three intersecting movements were gaining traction, including: (1) new placement models and multiple measures, (2) reduction of developmental/ transitional education courses, and (3) additional, emerging math pathways.

Within these three movements, faculty, staff, and administrators were developing corequisite courses because corequisites had demonstrated an ability to scale for colleges of all types, sizes, and demographics. In an effort to better provide support to colleges in early stages of exploring corequisite models or those still needing to scale, this research aimed to understand the challenges at every stage of implementation and to provide recommendations to help colleges fully adopt this high-impact policy and practice.

Findings

This study identified challenges and barriers to at-scale implementation of corequisite gateway math courses. In addition to policy and practice challenges, three affective domain challenges emerged. By parsing the emotional challenges on leaders and teams, the study illuminated that challenges not only existed both as policies and practices, but they also existed internally or socially. All emerging challenges were interrelated, and no single challenge (aside from the COVID-19 pandemic) served as the sole reason for non-implementation of at-scale corequisites.

Two domains emerged from interviews with system officials, administrators, and faculty (see Appendix B for methodology). First, participants discussed the barriers around designing and implementing corequisite gateway math courses. Second, they shared the enabling conditions that helped them move towards implementation.

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[1] Corequisite courses allow students who need or want additional support in college-level math and English to enroll in credit-bearing courses to receive extra, just-in-time help.

[2] Based on the findings of this research project, the recommended definition of “at scale” means that over 80% of students are enrolled directly into gateway math with a default placement into a corequisite support course. This definition should include equity-minded opt-outs and pathway exemptions for high math performers.

[3] The Research and Planning (RP) Group, a California-based policy and practice organization, defines throughput rate as “the percentage of a given cohort of students who complete a key gateway course—in this case, a transferable, college-level math course—within a designated time frame.”

1. Challenges:
    a. The COVID-19 Pandemic Challenges
    b. Policy and Practice Challenges
    c. Affective Challenges
2. Enabling Conditions

Four stages were identified, each with its own challenges and barriers.

- *Exploring:* A few key individuals first learned about the practice and explored whether the college should initiate design and implementation.
- *Cocreating:* A team of stakeholders was brought together to collaboratively design scalable corequisite gateway math courses and support mechanisms.
- *Implementing:* Faculty, staff, and administrators implemented the model as a pilot or at scale.
- *Revising:* After a pilot or at-scale implementation was complete, faculty, staff, and administrators assessed early impacts, and identified and addressed emerging issues.

The following descriptions of reported challenges provide insight on what serves as a barrier across the four implementation stages.

The COVID-19 Pandemic Challenges

Interviewees reported that the COVID-19 pandemic was the single, most impactful challenge to implementation of at-scale corequisites. The pandemic affected every component of this work, including finding the time to design, having difficulties in convening stakeholders, accessing accurate data, and determining how to deliver corequisites in an online modality. The pandemic also caused great structural shifts in how college faculty and staff think, work, teach, learn, and grow. However, while non-implementers reported significant difficulty in navigating each stage of work through the pandemic, those colleges already at scale prior to March 2020 managed to sustain their efforts.

> "I've been focusing on teaching in a pandemic the last few years, and I have not been digesting every study out there on the corequisite model. I have not seen anything to this point of people who have demonstratively high standards and expectations, who are tracking it into future courses. I haven't seen any results like that."
>
> – *Math Faculty Skeptical of Corequisites*

Policy and Practice Challenges

Exploring: Should we do corequisites?

State Legislation. For system offices and colleges, the legislative process was mentioned numerous times, revealing the following three key challenges.

- Rapid legislative changes with little information about the why to distill to the field – Interviewees noted that legislation moved relatively quickly and left the system office without the necessary information to support the field. Three system officers in different states shared that a nonprofit organization had circumvented the system office and went directly to the legislature to pass the legislation more efficiently, leaving the system office without time to prepare for those changes.

- Mandates' removal of remedial courses without proposing alternative paths –
  Alternative paths such as corequisite courses were a viable, research-backed strategy but interviewees reported that these options were not communicated early or often.
- Accelerated timeline for reduction or elimination of remedial math –
  To respond to the urgency of the mandate, some colleges reported having rushed into deploying a variety of models without investigating research on effectiveness.

State legislation challenges informed other areas of policy and practice challenges (see below), while institution size, geographic location, and service area provided nuance for individual institutions seeking to contextualize these challenges.

Funding. Interviewees in all four states noted that legislated mandates were unfunded and placed pressure on colleges to find the resources to create new curriculum, structures, and policies without defined faculty release time, sponsored professional development, and/or release for conferences or resources to bring experts to campus.

System Guidance. In part due to the speed of legislative changes, system offices did not create guidance for colleges. Faculty and administrators expressed the need for more research on effective models, statewide data, and direction from the state on how to implement the legislation.

> "It's just astonishing how much better the success is with corequisites than with the long train [of developmental courses]. I think that was what eventually changed the minds of the people who were the hardest to convince."
>
> – *Math Coordinator*

Research and Data. Some faculty and department chairs did not know about national research on the proven effectiveness of corequisite models or how to measure the success of a corequisite model. For instance, participants indicated they were unaware that course success rates would likely decrease while overall numbers of students completing gateway math would increase. At two colleges, participants indicated that lower course success rates prompted them to refrain from scaling corequisites.

Convergence of Policy Changes. As colleges grappled with corequisite course development and implementation, three additional policy shifts converged: (1) new placement models and multiple measures, (2) reduction of developmental/transitional education courses, and (3) additional, emerging math pathways. As faculty participants discussed the challenges that arose with corequisites, they intermingled concerns about all three policy areas, seemingly unable to distinguish their uniqueness and instead experienced them as a single, large-scale paradigm shift.

Cocreating: How do we do it?

Champion for Corequisites. Among those colleges not yet at scale, several participants noted the lack of clearly defined leadership of a faculty coordinator, chair, or dean to lead the work. Participants expressed a need for an expert on corequisite models and someone to coordinate the myriad logistics, training, and resources required to scale this work.

Convening Stakeholders. Participants described that failing to invest in early, broad engagement of constituents on campus slowed or stalled work. By not convening stakeholders, college faculty, administrators, and system officials expressed that they missed an opportunity to disseminate accurate information, generate broad knowledge about corequisites, and increase buy-in.

Mindset. Nearly all participants noted a shared early refrain among campus constituents, which can be summarized as "Corequisites will not work at our college and with our students." They pointed to prior national trends or fads in higher education that were not effective nor successful despite significant investments of time and energy. Self-described skeptical and hesitant faculty expressed a common argument leveled against corequisite implementation, which is that there are no shortcuts to math and that direct placement into gateway math skips important fundamental math concepts.

> "I have been around for a while, I have an aversion to fads in education. And I've seen so many fads come and go, and . . . certain people are like 'Oh, we have the greatest pill, that's going to fix everything' . . . and then it doesn't last in education. I find it off putting."
>
> – *Math Faculty Skeptical of Corequisites*

Small and Rural Colleges. Small and rural colleges had additional burdens when implementing corequisites. Such burdens included having a more limited pool from which to hire adjunct faculty to teach college-level math, fewer financial resources, and smaller departments from which to choose a faculty member to lead this work.

Models and Modalities. During the cocreation phase, faculty and administrators expressed challenges in determining which of the four models for gateway course support to pursue (i.e., corequisite models, modularized courses, compressed courses, and contextualization). Moreover, interviewees grappled with questions about the mechanics of corequisite courses, such as faculty assignment (i.e., a single instructor for both courses or a different instructor for each course), commingled corequisite courses,[4] and number of units for the corequisite course. These questions often led teams to engage in experimentation and pilots rather than move to full, at-scale corequisite offerings.

Implementing: What do we need to do?

Advising. Deans and faculty leadership shared that working across the campus could pose some challenges. Specifically, corequisites directly affected academic advising, yet failure to educate and train advisors adequately on new placement and corequisite policies led to confusion and inefficiencies.

Faculty Professional Development. Most faculty interviewees reported a need for additional professional development in order to teach corequisite courses effectively. Because corequisites often included an affective domain component, faculty shared that while they are experts in their disciplines, they felt unprepared to teach those skills. Additionally, because corequisite courses had a more differentiated classroom in terms of prior math skills and knowledge, faculty felt they needed additional pedagogical strategies to teach a more diverse student population.

Curriculum Approval. Designing new curriculum, seeking academic committee approvals, and ensuring intersegmental alignment with both high schools and four-year colleges were identified as barriers. While such barriers are common with most curricular changes, interviewees shared that these obstacles caused early delays in implementing corequisite courses.

General Logistics. Although logistics did not appear to halt implementation completely, faculty coordinators, department chairs, and deans revealed how minor logistics (e.g., block scheduling, cumbersome processes, technology changes, catalog updates) added to the time and energy needed to implement a new corequisite model.

[4] Commingled corequisites allow students to enroll in any section of the gateway course and any section of the support course. Therefore, students are not cohorted, and the gateway course may have students enrolled only in that course while others are enrolled in both the gateway and corequisite courses.

Revising: How to do it better?

Course Improvements. Once corequisites were created and implemented either as a pilot or during the scale-up process, faculty and administrator interviewees indicated they needed support to identify and implement improvements to either course delivery, structure, or modality. For instance, some participants expressed the need for courses with more affective domain content while others noted a need to increase the course from one unit to two units.

Transparent Data and Evaluation. Of those who were not designated faculty coordinators, all but one faculty member had not been provided their local gateway math throughputs. Instead, these faculty only had access to their course success rates, which captured only one point in time and were generally expected to have lowered. Static course success rates prompted resistance among many faculty due to what they perceived as an increase in course failures. In fact, several faculty participants had not heard about throughput in gateway math as a metric for success of corequisite courses.

Placement. Lower course success rates combined with a desire to improve corequisite courses prompted interviewees to reconsider placement. Interviewees felt as though too many students were set up for failure by being placed directly into transfer-level courses or by having the choice to opt out of a corequisite support course. Additionally, some participants expressed concern about inconsistencies in placement procedures (see "Advising" above).

Affective Challenges

In addition to the challenges resulting from policy and practice changes described in the previous section, another set of challenges emerged in this study based on changes within faculty. Like other transformational changes, corequisite models required faculty to become introspective and to change their own practices—a fundamental change in their relationship to teaching.

> "In the same way that teaching is very personal work, this transformation is very personal work."
>
> – *System Administrator*

Exploring

Trust. As campuses began to explore corequisite models, faculty interviewees noted a lack of trust between faculty and administration. Faculty distrusted the motives of administrators; they felt administrators were mandating direct-to-gateway math and corequisites "just to pass students" in order to increase enrollment and completion rates, but was detrimental to student learning. Faculty felt administrators distrusted them as well, tending to label them as lazy, greedy, and unwilling to change.

Cocreating

Wrestling with Inadvertent Past Harms. As faculty and administrators first came to understand direct-to-transfer-level corequisite models, some participants shared how they wrestled with the notion of being a part of a system and practice that may have done harm, specifically to Black and Latino students. Further, a few faculty noted that they had previously advocated for some of the current models of math remediation and were coming to terms with their contributions to an unjust system.

> "So you're a math teacher and care deeply about the success of your students—you always have. . . . And you've known that part of your identity as a math teacher is that you're really helping students get through this sequence, and then somebody comes along and says, 'We're gonna just take a machete and get rid of the sequence.' . . . You've taken away everything I do. It's like a personal friend to suggest that all of this preparation that you're so good at is not helping them."
>
> *– Faculty Math Coordinator*

Implementing

Navigating Relationships. Faculty leadership, deans, and department chairs were aware that transformational change posed a risk to existing relationships. As one dean said, "Someone has to take the hits in order to keep moving." Interviewees shared there were politics involved, challenging conversations with peers, and a desire to cultivate buy-in among faculty and staff.

Revising

Low Morale. After implementing corequisites, many skeptical faculty and one faculty champion of corequisites were quick to share how teaching a critical mass of students who were failing or dropping was demoralizing. In some cases, faculty noted they had previously taught courses with 65% to 70% success rates; when their course success rates dropped to below 50%, it felt especially difficult and even deeply personal for them. This shift made them question their worth as a faculty member as well as their own ability to teach, resulting in a sense of hopelessness.

> "I've always felt comfortable with my success rates and I always felt good about my teaching and the students' learning. And everything just dramatically declined for the last few years. So yeah, it gets frustrating. It's hard. It's hard to see. It's hard to be a part of. It does weigh on you. . . . If you're a teacher who cares and you want to see your students succeed, it's very discouraging."
>
> *– Math Faculty Skeptical of Corequisites*

Enabling Conditions

Participants explicitly or implicitly noted conditions that helped them or would have helped them scale corequisite courses. The following five conditions were mentioned most often and considered the most impactful.

Leadership Support

Interviewees expressed that the support of a leader with positional power, such as a vice president, dean, chair, or faculty leader who championed corequisites, was exceptionally helpful in using national research and data, navigating challenges, and supporting faculty in their design process. Faculty leadership was especially helpful when navigating academic issues, such as academic freedom and participatory governance, and for shepherding corequisite design and implementation through the proper channels. It was important to have leaders who were clear and transparent communicators, had emotional intelligence, and had political capital, especially when challenges arose.

Convening Stakeholders

To participants, the clearest direct contributor to successful at-scale implementation was convening a cross-functional team to investigate the problem with current support models and codesign a new model of corequisite support. In every case of at-scale adoption, the institution engaged in sustained gathering of stakeholders. Interviewees emphasized that bringing together faculty from

key departments, such as math, English, advising, and others, fostered buy-in, momentum building, information sharing, and shared commitment.

Funding Identified and Secured

As one faculty coordinator shared, the success of at-scale corequisite implementation depended on securing a grant to allow for release time and professional development. Because corequisites are complex to implement—from writing curriculum to moving through local and state approvals, and training faculty on the new components of the course—funding must be identified and allocated to ensure sustainable, scaled success.

Professional Development

Participants identified professional development as a strong enabling condition for at-scale adoption. While there are many types of professional development, participants listed some methods to ensure that faculty are learning about new pedagogical practices and on how to teach affective domain components of corequisite courses—for example, through ongoing workshops, state-hosted convenings, retreats, and communities of practice. While these were the most common areas of interest, some participants stated how case making, providing research and data, and applying guided pathways principles were also effective elements of enabling professional development.

Clear Research, Guidance, and Data

Participants described clear research, guidance, and data as an essential enabling condition to help colleges move to at-scale corequisite adoption and implementation. In just a few short years, research from leaders in states such as Georgia has massively informed the field's understanding of and approach to student success. Interviewees noted that broad stakeholder access to such research was important, as faculty, staff, and administrators were seeking confirmation that a corequisite model can work in multiple contexts and with a wide diversity of students.

Additionally, participants described clear guidance from system offices as an essential factor. Effective guidance included: (1) details about any legislative mandate, (2) interpretation of the mandate, (3) research and resources about corequisite models, (4) funding to initiate implementation of new models, and (5) shifting the data narrative away from course success rates to throughput in gateway math.

Guidance around metrics was critical, particularly as interviewees noted little standardization of what "at scale" means. Based on the findings in this research project, the recommended definition of "at scale" means that over 80% of students are enrolled directly into gateway math with a default placement into a corequisite support course. This definition should include equity-minded opt-outs and pathway exceptions for high math performers.

> "There was a discussion, I will never forget. . . . I said I have so much faith in what we can do here that I dare anyone to say we're going to have a success rate less than 30%. And why that's important is because that's our break even point. In other words, if we do what we plan to do as long as we have a success rate of 30%, we're going to have the same throughput, as we have been having all these years."
>
> *– Math Dean*

No single enabling condition alone guaranteed successful at-scale adoption and implementation of a corequisite model. Instead, findings suggest that applying these conditions in tandem as a holistic approach is the most promising path for most colleges and systems. These conditions can be best understood as a rubric from which a college or system can evaluate the areas with support and opportunity, while acknowledging areas where gaps should be addressed.

Recommendations for Systems and Colleges

The following recommendations are intended to assist system offices and college faculty and staff to engage in this work with greater intention. At each stage of development, the system and college may provide different, complementary, just-in-time, developmentally appropriate, and necessary supports. While this study uncovered four stages of development, an additional precursory stage—an *assessing* stage—is proposed to provide space and dialogue around the enabling conditions, utilize identified strengths thoughtfully, and acknowledge gaps in enabling conditions that may affect subsequent stages.

Five recommendations follow, one for each stage of the work: assessing, exploring, cocreating, implementing, and revising. Each recommendation has three additional components: (1) *why* this recommendation matters, (2) *how* systems and colleges can enact the recommendation, and (3) *what* specific strategies colleges and systems can deploy.

Stage	Recommendation
Assessing	Identify and assess enabling conditions.
Exploring	Provide research, guidance, and data.
Cocreating	Convene and engage cross-functional teams in the design and implementation process.
Implementing	Provide continuous professional development.
Revising	Develop sustained and emotionally intelligent dialogue.

Systems and colleges may not move linearly through these stages, but rather between these stages, to address emergent needs and challenges. Each recommendation specifically targets the challenges and obstacles that arose within that stage of development. Although a recommendation and its correlated strategies are stage based, they can be used throughout the design and implementation process.

Assessing | Recommendation #1: Identify and assess enabling conditions.

Why: By assessing the current landscape, college teams, often comprising key stakeholders, can identify what they are able to control and adapt or, if they cannot, how they can respond to those issues. Assessing a college's enabling conditions and institutional landscape early can help a team design with greater intention and create opportunities early to leverage natural strengths, develop an awareness of anticipated pitfalls, and plan to address barriers by incorporating additional support.

How: At the beginning of the exploration and implementation process, teams should use the enabling conditions as a rubric to identify areas for which there is strong support and for which there may be barriers. After initial review, teams can begin to identify interventions that may address barriers, often by leveraging one of the college's or system's strengths.

Strategies:

Build leadership capacity.

- Identify and bring together faculty, staff, and administrators as thought partners to conduct an assessment of the system or college landscape, using the enabling conditions as a rubric.
- Conduct an internal audit of existing knowledge, skills, and experience in this arena to identify team members who will bring necessary strengths to the work as barriers emerge.
- Include skeptics in early exploration phases to help anticipate resistance, refine the approach to barriers, and create a more enabling environment for change.

Identify and earmark funding.

- Designate one-time or ongoing funds for broad outcomes, such as increasing equitable retention, enrollment, or completion. Make the case that professional development for corequisites can contribute to those broad goals.

> "We were very grateful that we had as much grant funding as we did so that we were able to really spend the time without taking advantage of our faculty. . . . We couldn't have gone forward without the grant money that we had."
>
> – *Math Faculty Coordinator*

Exploring | Recommendation #2: Provide research, guidance, and data.

Why: When systems and colleges provide clear research, guidance, and metrics, stakeholders are better equipped to understand what corequisites are and the problems that corequisite models intend to solve. This process of using current local and national research can build early trust and can prepare individuals to shift their mindsets, carving a clearer path toward at-scale corequisite implementation.

How: System offices and colleges can make the case for corequisite models by clearly curating and distilling resources that explain and contextualize current research, provide guidance and resources about implementation of corequisite models, and prompt a shift in data monitoring and evaluation from course success rates to throughput.

Strategies:

Provide relevant research.

- Appendix A lists several research reports on corequisite implementation and evaluation. Sharing these resources, distilling the learnings, and contextualizing those learnings to local conditions are critical.

Provide clear, consistent guidance.

- Guidance often originates at the system level; however, colleges can provide a level of guidance as well. Effective guidance includes: (1) details about any legislative mandate, (2) interpretation of the mandate, (3) information, including research and resources about corequisite models, (4) funding to initiate implementation of new models, and (5) shifting the data narrative away from course success rates to throughput in gateway math.

Refine the data narrative.

- Partner with institutional research offices and leaders to begin using throughputs as a standard, regularly reported metric in meetings and in official planning and reporting documents.

> "The power of something becoming a moral imperative is that you can change who you are. You [realize that you] are harming students and you can't look in the mirror and do that anymore, but the idea that we're going to iterate who we are that's, that's big work right there."
>
> – *System Administrator*

Cocreating | Recommendation #3: Convene and engage cross-functional teams in the design and implementation process.

Why: Convening stakeholders was noted by many participants as the one thing that most helped or that they most wished they had done. Convening people fosters stakeholder awareness and knowledge, creates buy-in and new champions of the work, engages and includes voices from across the institution, and disperses the workload in a more equitable way.

How: Identifying and involving those who are affected by corequisite course development and implementation are an essential early step. Leaders should review their organizational charts to identify key stakeholders who may be affected by the sweeping impact of gateway math redesign and to take a broadly inclusive approach to cocreating a new model. Key stakeholders will likely include math and English faculty, instructional deans, admissions and outreach staff, advisors, special program coordinators, financial aid professionals, and students.

Strategies:

Build leadership support.

- Identify a faculty member who has strong relationships and political capital within the department and throughout the college to lead the corequisite implementation process.
- Identify a member of the executive leadership team at the college who has demonstrated an ability to make a case for other projects effectively and who has strong emotional intelligence.

Convene stakeholders.

- Bring together a cross-functional team of faculty, staff, and administrators from across the campus to foster champions for this work.
- Include individuals who are skeptical to help anticipate potential resistance and build a proactive response. By pointing to gaps in the rationale, rollout, or anticipated impact, such individuals can help strengthen case-making skills.
- During the convening, provide the research and clearly articulate the difference between course completion and throughput to make a data-supported case for corequisites.

Focus on structure, not people.

- In early phases, teams may wrestle with the notion that they advocated for and participated in a structure that was harmful and prevented students from completing their goals. When teams convene, it is essential to communicate—without blaming or shaming the people who are engaging in the solution—that today's structures are simply not working for today's students.

Implementing | Recommendation #4: Provide continuous professional development.

Why: Continuously supporting instructors, advisors, and other campus professionals in the form of technical assistance, policy and practice guidance, and a thoughtful inclusion of affective domain work will help those directly involved in making this work successful. In professional development spaces, leaders should acknowledge that transformational change is about policy and practice changes, along with changing how one does this work. It was clear in this study that when people changed their relationship to their work, they found themselves having emotional responses to the changes that stemmed from fear, excitement, and uncertainty.

How: At the system level, leaders should consider providing statewide professional development opportunities to cultivate a shared understanding of the purpose, the anticipated challenges, and the support available to colleges. Statewide professional development can alleviate burdens on resource-limited institutions while providing consistency in messaging. At the college level, leaders should commit to a robust, campuswide professional development approach that contextualizes local data, engages individuals across functional areas and roles, and fosters long-term and developmentally scaffolded conversations.

Strategies:

Engage individuals in the data.

- Work with the professional development coordinator or committee to present the research and findings from corequisite models at an initial summit on corequisites to generate interest in broadening the conversation and engagement.

Focus on pedagogical practices.

- Create a community of practice within the math department focused on teaching and learning. Use the space to encourage faculty in their own growth and to support one another as challenges in teaching arise, particularly related to the affective domain.

Prioritize culturally responsive advising.

- In addition to providing technical training to advisors on the changes to academic schedules and course offerings, it is essential to put equal effort into culturally responsive professional development. For instance, students of color are less likely than white students to self-advocate to be placed into gateway math and they may opt to take a remedial course, even if it is not in their best interest. Help advisors recognize these socialized behaviors and counter the deficit mindsets they may hold. Promote the role of advisors as coaches who believe in their students' inherent ability to succeed when they are adequately supported.

Revising | Recommendation #5: Develop sustained and emotionally intelligent dialogues.

Why: After corequisite implementation, the realities of this transformational shift begin to set in, and the changes start to affect more people. Ideas that were once theoretical are now operationalized. During this stage, this study revealed deep emotions. Individuals often questioned the efficacy of this new practice, doubted their abilities to teach in a new way, grappled with lower course success rates, and began to contemplate their own relationship to their work. Establishing and sustaining space for

dialogue about these emergent feelings can help leaders anticipate long-term barriers while combating burnout and creating a sense of shared commitment to continuous improvement.

> "I think there were a few sources of support, like the trainings we had attended either from the Dana Center or other professional development [opportunities]…. Because, at the college level, you don't have to have a teaching license or be trained in education, just content. A lot of the folks, who answered the call, care enough and have the lens of what's best for the student, not necessarily what's easiest for the instructor."
>
> – *Math Faculty Coordinator*

How: When beginning implementation, leaders should set and communicate a clear intention that they will commit to continuous improvement. Articulate internally and externally that the work does not end when the model has been implemented; instead, the demand for support only increases. Creating open lines of communication and communicating feedback are not only welcome but also essential.

Strategies:

Sustain communities of practice/learning communities.

- Communities of practice and/or learning communities should be considered a part of long-term continuous improvement as they create an ongoing structure for personnel support.

Train and engage emotionally intelligent leaders.

- When possible, train leaders to develop their emotional intelligence, tolerance for critical feedback, and ability to navigate challenging conversations. Research made clear that emotionally intelligent and asset-minded campus leaders (i.e., chairs, deans, and faculty leads) were significantly more likely to facilitate a move from dialogue to thoughtful implementation.

Commit to transparency in data sharing.

- Data-informed decision making must still be a priority, long after initial implementation. Make throughput in gateway math data easily accessible and commit to assisting faculty to make meaning of what the data illuminate, which will help faculty understand if their time, training, and effort resulted in meaningful change.

> "I knew the most negative thing would be that somebody stands up and objects… And you have to overcome that and you take the hits."
>
> – *Math Dean*

Implications for Future Research and Policy

This study revealed two implications for future research and policy.

Scaling Policy | Implication #1: Increase rigor and testing on promising practices to scale.

Why: Many participants shared they were skeptical about corequisites, viewing them as another educational fad like the many they had previously experienced. They assumed corequisites were not scalable or sustainable and did not translate to other colleges and systems. While corequisite models have been rigorously studied and tested at individual institutions, researchers must study scalability

of such models as new knowledge in this domain emerges. Studying the effectiveness of corequisite models at scale can help policymakers, nonprofit organizations, and educational reformers build trust with systems and colleges for future work.

How: When new policies and practices emerge, researchers and policymakers should begin by overtly and consistently sharing that a practice is promising but untested. Moreover, policymakers can work with a diverse set of colleges to experiment with the model and determine its success. Working only with colleges that self-select into these studies may skew results, as those institutions often have more prevalent enabling conditions, particularly leadership support. When data come from systems that have mandated or evenly implemented a practice, it is more likely to represent a variety of institutional characteristics and conditions.

Affective Domain Research | Implication #2: Be attentive to the emotional issues that emerge in policy research.

Why: The affective domain is becoming a more prominent area of consideration in higher education policy and practice. Researchers and policymakers must address the affective domain in their work. Some participants revealed that corequisite design itself was not especially difficult, but managing the emotions, fears, and insecurities that people experienced during the design process was hard. If policymakers aim to understand the full breadth of challenges to scaling transformational practices, the affective domain will be a critical component.

How: For researchers, asking probing questions to understand why this is challenging work is a good starting point and can help them delve deeper. Asking these questions not just of champions of the work but also of those who remain skeptical will reveal a more complete picture of the challenges. For policymakers and technical assistance providers, more attention should be given to building trust, creating buy-in, and allowing people the developmental time needed to shift their mindsets. Timelines are important and students need changes now, but engaging in affective domain work is an important facilitator of transformational change.

Conclusion

The mission of the community college is clear: to provide opportunity for every student who wants to pursue higher education, regardless of their background. Community colleges are unquestionably the key to meaningful college access for our country's rapidly diversifying population. Moreover, community colleges are undoubtedly the single, most critical lever for strengthening the local and statewide workforce to combat the major socioeconomic crises facing the U.S. in the wake of COVID-19 and an ongoing reckoning with racial injustice. These intersecting crises have created more urgency for community colleges to transform policies, practices, and mindsets to attend to the needs of their students.

Initially, this study aimed to unveil challenges and barriers to corequisite math adoption and implementation in order to support colleges as they embarked on this necessary transformational change. Yet, while there was a multitude of challenges at every level of this work, the participants' stories showed great courage and passion.

> "I really feel like I get passionate about community colleges, because I feel like who else is going to offer that bridge [to students who have been left behind in education]."
>
> – *System Administrator*

Policy implementation is not only about changing our practices; it is also about changing ourselves. To fully engage in policy and practice change, scholars, policymakers, leaders, and practitioners must also attend to the very deep feelings that arise in transformational change work.

This study revealed the admirable faculty and staff who are steadfast in their commitment to ensuring that this change will work for their respective colleges. They demonstrated their commitment to a more personal and professional change in order to better serve their students.

As administrators, faculty, staff, and policymakers aim to make systems more equitable and just for all students, this work strives to use an asset-based mindset, ready to harness the enabling conditions that will equip colleges to navigate challenges with relative ease. This research project does not prescribe an exact approach but instead offers a vehicle for traversing this terrain.

In higher education, the process is as critical as the outcome. This study affirmed the power of the process, emphasizing that change happens when good policy, clear guidance, emotionally intelligent leadership, and committed practitioners converge to advance a shared goal.

For colleges or systems wishing to engage in any stage of this work, the Charles A. Dana Center and the Dana Center Mathematics Pathways program are available to assist systems and college leaders in identifying enabling conditions, navigating emergent challenges, and addressing the needs of faculty, staff, and students.

Appendix A

Corequisite Resources on Research and Practice

Co-requisite courses: Narrowing the gap Between instruction and supports
Charles A. Dana Center, 2017
http://dcmathpathways.org/sites/default/files/resources/2018-07/Co-req_Supports_2018_07_24.pdf

No room for doubt: Moving corequisite support from idea to imperative
Complete College America, 2021
https://completecollege.org/article/coreq-report/#download

Corequisite work: Student success models at the University System of Georgia
Complete College America, 2021
https://completecollege.org/wp-content/uploads/2021/11/CCA_Corequisite-Works.pdf

Scaling co-requisite developmental education
University System of Georgia Academic Affairs Technical Brief No.1
University System of Georgia, 2021
https://www.completegeorgia.org/sites/default/files/resources/CoRequisite%20Full%20Implementation.pdf

Appendix B

Methodology

For this study, a case study approach was used to understand the challenges and barriers to corequisite mathematics course implementation at scale. Snowball sampling was used to recruit participants.

Participants

States with enacted legislation around developmental math, had an uneven implementation of corequisite courses, and were diverse regionally were identified. After speaking with multiple experts in the field, the list of states was narrowed down to four: Colorado, Florida, North Carolina, and Washington. Community college system office administrators and partner organizations in each state were then contacted to begin the interview process. At the end of each interview, participants were asked to recommend two colleges as case studies: 1) a college that successfully implemented at scale, and 2) a college that has yet to implement at scale but showed efforts in moving towards implementation at scale. This design yielded information both about the challenges across the spectrum of implementation and about the enabling conditions that facilitated at-scale implementation.

To include a broader perspective of this work, a dean or department chair, a faculty champion (most often a faculty coordinator for corequisites), and a faculty member who self-identified as hesitant or skeptical of the corequisite model were asked to participate. These interviews provided insight into these individuals' current or past challenges and the ways in which they were working to overcome those challenges.

The table below shows the number of participants from each state, their roles within an organization or college, and how participants self-identified for corequisite work.

Participant Demographic Information

State		Roles		Advocacy	
Colorado	5	System Office	5	Champions	17
Florida	8	Nonprofit Organization	1	Skeptics	4
North Carolina	3	Deans	4		
Washington	5	Department Chairs	2		
		Faculty Coordinators	3		
		Faculty	6		

After interviews were completed, data were coded and themed, and a conceptual model or framework was produced to share the findings.

Methods

Interviews included a series of questions that began with broad questions and moved into more specific queries (Appendix C). Although the primary research interest was to uncover challenges and barriers to at-scale implementation of corequisites, learning about what helped or supported successful implementers revealed enabling conditions that can combat existing challenges.

Appendix C

Interview Protocol

Introductions

1. Could you begin by sharing with me a little about your background and role?
    a. How long have you been in your role and within the system?
2. What has been your role when it comes to at-scale implementation of corequisite gateways math courses?

State Level

1. Could you please share with me the current state of implementation for gateway math corequisites within the system?
2. What is the state system office or college doing to advance gateway math corequisite implementation for all students?
    a. Policy, interpretation, guidance, resources and research, funding, and professional development opportunities exist within the state.
        i. Have the number of students who have access to gateway math and/or corequisite courses changed as a result of policy, guidance, or resources?
    b. How is corequisite placement determined?
    c. How many students are placed into corequisites?

College/Department Level

1. What is the state system office or college doing to advance gateway math corequisite implementation for all students?
    a. Policy, Interpretation, Guidance, Resources and Research, Funding, PD
2. Are those actions enough to move implementation forward effectively and efficiently, from your perspective?
    a. What more can or should be done around Policy, Interpretation, Guidance, Resources and Research, Funding, PD?
3. Can or should systems or colleges require mandates for corequisite implementation, that takes into account local control, unions, curriculum rights, and other possible challenges?
4. Who is making the decisions about pushing implementation of corequisites for all students at scale?
    a. What voices seemed to move the conversation forward?
    b. What voices were more critical?
    c. How did you bring people along? (or not?)

5. What were the barriers and challenges you faced as you moved towards full implementation?
    a. To dig a little more deeply into different components, what about the challenges at the:
        i. The state, system office, or policy level?
        ii. Campus level?
        iii. The math department level?
        iv. Individual faculty, staff, and administrator level?
    b. How are you trying to overcome these challenges?
        i. You shared _____, how did you overcome that challenge or barrier?
6. What support, information, or enabling conditions could have helped you move through the implementation process more effectively, efficiently, or with more ease?

Faculty Level

1. What is the state system office or college doing to advance gateway math corequisite implementation for all students?
    a. Policy, Interpretation, Guidance, Resources and Research, Funding, PD
2. Are those actions enough to move implementation forward effectively and efficiently, from your perspective?
    a. What more can or should be done around Policy, Interpretation, Guidance, Resources and Research, Funding, PD?
3. Can or should systems or colleges require mandates for corequisite implementation, that takes into account local control, unions, curriculum rights, and other possible challenges?
4. Who is making the decisions about pushing implementation of corequisites for all students at scale?
    a. What voices seemed to move the conversation forward?
    b. What voices were more critical?
    c. How did you bring people along? (or not?)
5. What were the barriers and challenges you faced as you moved towards full implementation?
    a. To dig a little more deeply into different components, what about the challenges at the:
        i. The state, system office, or policy level?
        ii. Campus level?
        iii. The math department level?
        iv. Individual faculty, staff, and administrator level?
    b. How are you trying to overcome these challenges?
        i. You shared _____, how did you overcome that challenge or barrier?

6. What support, information, or enabling conditions could have helped you move through the implementation process more effectively, efficiently, or with more ease?

Concluding Thoughts and Recommendations

1. What did/do you need to be successful to help more students successfully pass gateway math?
2. If you could go back and change something about your implementation process, what would you do differently?
3. If you had a magic wand to change policy, funding, structures, practices, mindsets, etc. what would you change?
4. My goal is to interview colleges who have at-scale implementation of gateway math corequisites and those who are still early adopters. Could you recommend other campuses in both categories?
    a. Do you know of a person specifically to contact there and their role?
5. My goal is to talk with math faculty who have championed at-scale gateway math corequisites and math faculty who have been more critical of the move towards corequisite courses. Could you recommend faculty in both categories who may be willing to talk with me?

About the Author

Sean C. Pepin is a student- and equity-centered scholar–practitioner with over 15 years of experience. His prior roles have spanned 2-year, 4-year, public, and private colleges, and include work at system offices, nonprofit organizations, and policy centers. Dr. Pepin's work focuses on collaboratively creating the conditions that increase student completion, eliminate racial and economic equity gaps, and cultivate a culture of thriving among historically and persistently marginalized communities. He holds a PhD in student affairs from the University of Maryland, College Park, an MA in higher education and student affairs leadership, and a BA in ethnic and gender studies.

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About the Dana Center

The Charles A. Dana Center develops and scales mathematics and science education innovations to support educators, administrators, and policymakers in creating seamless transitions throughout the K–16 system for all students, especially those who have historically been underserved. We focus in particular on strategies for improving student engagement, motivation, persistence, and achievement.

The Center was founded in 1991 at The University of Texas at Austin. Our staff members have expertise in leadership, literacy, research, program evaluation, mathematics and science education, policy and systemic reform, and services to high-need populations.