Corequisite Mathematics Toolkit

Implementation Tools

A collection of resources to support institutions in the corequisite planning, implementation and continuous improvement stages. Implementing corequisite models is complex. Many of the tools will be used repeatedly, either in different steps of the process as new data become available, or as additional stakeholder groups are brought into the work.

Author: Connie Richardson, Course Program Manager,
The Charles A. Dana Center at The University of Texas at Austin

Contact: dcmathpathways@austin.utexas.edu

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Every student deserves a strong start in their first year of college. This toolkit is part of a SSTF three-part series, providing resources to assist postsecondary leaders design and implement reform strategies that support equitable outcomes for students who are marginalized and racially minoritized.

The University of Texas at Austin
Charles A. Dana Center

Implementation Tools

Implementing corequisite models is complex. The tools below will help individuals at all levels of an institution plan, implement and establish processes for continuous improvement. Included are guiding documents, such as a readiness assessment, course design tools, an implementation timeline template and more. Many of the tools will be used repeatedly, either in different steps of the process as new data become available, or as additional stakeholder groups are brought into the work.

Readiness Assessment

- Related resource: Case-Making Webinar "Why Corequisites?"

Attrition-Throughput Equity Analysis

Implementation Timeline Template

Engaging Partner Disciplines: Multidisciplinary Discussion Tools

Course Design Tools

- Models and Case Studies Webinar
- Course Calendar Template – Instructor Version
- Course Calendar Template – Student Version
- Course Design Recommendations
- Online Corequisites Summary and Webinars

Measures of Structural Change

Assessment Rubric

Readiness Assessment

Purpose: This tool highlights important activities, structures and policies that are important to identify during planning stages of corequisite implementation and scaling. Completing this tool at the beginning of your design and implementation work will provide a framework of your current context from which to make decisions about next steps.

Users: Institutional leaders, administrators directly connected to the mathematics program (dean, chairperson, division head, etc.), corequisite coordinator, director of advising, institutional researcher.

Instructions: Respond to each item using the scale provided, seeking input from others, as appropriate. Comments should be brief (e.g., bullet points or short sentences) about any particular assets or challenges your state or region has that may influence this work.

SCALE: (1) None at this time (2) Emerging (3) In progress (4) Well developed (5) Fully implemented

Essential Action	A "5" looks like . . .	Self-Assessment
Action 1: **Establish a well-supported leadership team with clear expectations.**	• Top administrative leaders (president, provost, vice presidents, deans, etc.) have a complete understanding of and are committed to full implementation and scaling of corequisites. • A leadership team with representatives of diverse stakeholders (e.g., administration, advising and student services staff, credit-level and developmental faculty) is established with a clear charge and defined roles and responsibilities. • Team meets regularly and has a timeline and an action plan. • Team has effective processes for monitoring and evaluating progress and documenting decisions.	**Overall Rating for Action 1:** Evidence of Rating: Next Steps:

SCALE: (1) None at this time (2) Emerging (3) In progress (4) Well developed (5) Fully implemented

Essential Action	A "5" looks like . . .	Self-Assessment

Action 2:
 	
Developmental redesign efforts are positioned as part of the institution's overall strategic plan and student success and equity initiatives.
	• Implementation of corequisites is explicitly connected to mathematics pathways and other student success initiatives.
	• Individuals across the institution in a variety of roles can explain why and how the institution is implementing full-scale corequisites, and can describe their role in the implementation process.
	• Administration, faculty, staff and students have a deep understanding of and support for mathematics pathways, and understand how corequisite implementation is a critical component of this work.
	• Mathematics pathways:
	  • Are aligned to broad groups of programs or meta-majors. There is one clear default gateway mathematics course for each meta-major and program.
	  • Are aligned to program requirements of transfer and K–12 partners.
	  • Include a default pathway for undecided students based on data on the programs that students are most likely to enter.
	  • Default placement for students is into a gateway mathematics course with supports as needed. Level of support is determined by evidence-based placement practices that utilize multiple measures of readiness.
	  • Include enrolling students in a gateway mathematics course (with corequisite supports, if needed) in their first 15 hours, or in their first 30 hours if also assigned to Developmental English.
		Overall Rating for Action 2:
		
		Evidence of Rating:
		
		Next Steps:

SCALE: (1) None at this time (2) Emerging (3) In progress (4) Well developed (5) Fully implemented

Essential Action	A "5" looks like . . .	Self-Assessment
Action 3: **Plan for communication and engagement over time.**	• Leaders consistently communicate to the full institutional community a strong and clearly defined commitment to the goals and redesign efforts. • The leadership team has an established process to set short-term communication and engagement goals, plan strategies and activities to meet those goals, and then evaluate and revise periodically. • Team has effective processes to solicit and disseminate information, including measurable progress toward goals, to different stakeholders (e.g., in-person meetings, webinars, forums, website, email distribution list, blog). • Team provides tools and opportunities to practice and improve communications to prepare individuals to communicate about corequisite courses effectively.	**Overall Rating for Action 3:** Evidence of Rating: Next Steps:

SCALE: (1) None at this time (2) Emerging (3) In progress (4) Well developed (5) Fully implemented

Essential Action	A "5" looks like . . .	Self-Assessment

Action 4:
 	
Gather and review information on the current institutional landscape.
	• The leadership team has used the following data to define the problem, identify strengths, opportunities and challenges:
	  • Student data on key performance indicators, including attrition and throughput in the developmental pipeline, enrollment in and completion of gateway mathematics courses, placement, retention beyond the gateway and completion of degree or certificate. These data should be disaggregated and inspected for gaps in equitable access to and success in college-level courses.
	  • Data on faculty credentials:
	  • Which instructors are credentialed for gateway courses?
	  • Which developmental instructors are prepared to support statistics students?
	  • What is the demographic composition of the faculty?
	  • Qualitative information about institutional processes, policies and culture that impact faculty, staff and students, which may either support or hinder implementation of corequisites. Include assessment of campus climate and student sense of belonging.
	  • Research and effective practices from external sources.
		Overall Rating for Action 4:
		
		Evidence of Rating:
		
		Next Steps:

SCALE: (1) None at this time (2) Emerging (3) In progress (4) Well developed (5) Fully implemented

Essential Action	A "5" looks like . . .	Self-Assessment
Action 5: **Define goals.**	• Goals to scale mathematics corequisite courses as normative practice are defined. These goals should include student enrollment projections for the corequisite courses when full-scale implementation is achieved and when interim goals to normative practice are reached. • The goals are communicated across campus to various stakeholders. • Leaders actively and regularly monitor progress toward goals, providing guidance and support when necessary.	**Overall Rating for Action 5:** Evidence of Rating: Next Steps:

SCALE: (1) None at this time (2) Emerging (3) In progress (4) Well developed (5) Fully implemented

Essential Action	A "5" looks like . . .	Self-Assessment

Action 6:
 	
Allocate resources.
	• Leaders furnish resources to implement, scale and continuously improve corequisite supports.
	• Resources (time and funding) are identified for:
	  • Supporting the leadership team with release time, resources, professional development and collaboration.
	  • Supporting faculty as they develop and implement courses. Lead faculty are provided release time for design and development.
	  • Roles and responsibilities of advisors and other staff providing additional support are restructured to allot time for effective service.
	• Consistent and continuous professional learning for faculty and staff.
		Overall Rating for Action 6:
		
		Evidence of Rating:
		
		Next Steps:

Watch the Why Corequisites? Case-making webinar

At each stage of the process, additional stakeholders become involved. It is likely that some of those stakeholders will have lower levels of awareness, or will be skeptical, about corequisites. The Why Corequisites? case-making webinar may be useful in providing a baseline understanding of the research and rationale prior to engaging those stakeholders in a dynamic conversation on implementation.

Attrition and Throughput Equity Analysis Worksheet

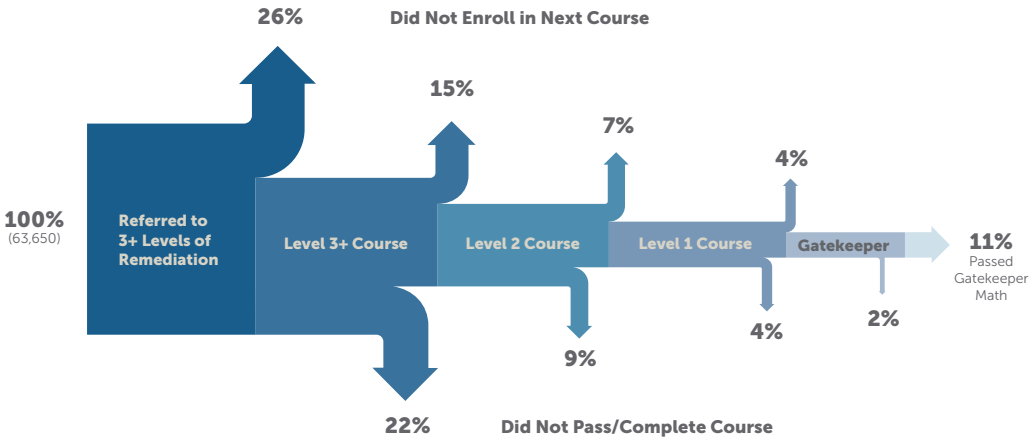
To quantify the attrition and throughput of students from cohorts of first-time, first-year (FTFY) students; to determine whether attrition varies by student group; and to develop action steps to foster equitable throughput. Attrition refers to students who exit the developmental education sequence. **Throughput** refers to the percentage of students who persist through the entire sequence to enroll and succeed in a gateway course.

Users: For data collection, Institutional Research (IR) staff and mathematics department administration. For analysis of data and development of action steps, IR staff, mathematics administration and faculty, advising and student support services staff.

Rationale: Research indicates that prerequisite developmental education is more likely to act as a barrier to college completion than as support:

- 26% of students referred to three or more levels of developmental mathematics never enrolled in the sequence.
- 26% passed at least one developmental course but did not enroll in the next course. (Top of graphic 15% + 7% + 4%.)
- 37% of students did not pass and stopped out of the sequence. (Bottom of graphic 22% + 9% + 4% + 2%.)
- Only **11% of students** who were referred to three or more levels of developmental mathematics eventually completed their credit-bearing mathematics requirement.

Student Progression Through the Developmental Math Sequence[21]



Jaggers, S. & Stacey, G. (2014). Community College Research Center, Teachers College, Columbia University, NY, NY. ERIC Number ED565668

Step 1: Choose the population of interest

Identify a course sequence that you wish to investigate, a timeframe and the student populations that you will use to disaggregate the data.

Course sequence:
Example: Students who need a credit-bearing mathematics course for their program but have been assigned to two levels of traditional prerequisite developmental education.

Timeframe:
Example: Two years may be needed to track gateway course completion of students assigned to multiple levels of traditional prerequisite developmental education.

Population group(s) of interest:
Examples: Race/ethnicity, gender, veteran status, first generation, intersectionalities such as race and gender, etc.

Step 2: Determining throughput counts for target student groups

Example:

Total = All students assigned to two levels of developmental who need a credit-bearing mathematics course.

Group 1 = Asian/Pacific Islander students assigned to two levels of developmental and who need a credit-bearing math course

Group 2 = Black/African American students

Group 3 = Hispanic/Latinx students

Group 4 = Indigenous students

Group 5 = White/non-Hispanic students

	Total	Group 1	Group 2	Group 3	Group 4	Group 5
Number of FTFY students in this category who need a credit-bearing mathematics course and placed into first course:						
1a. Number of students who never enrolled in the first course:						
1b. Number of students who enrolled in the first course:						
2a. Number of students who passed the first course, but did not enroll in the second course:						

	Total	Group 1	Group 2	Group 3	Group 4	Group 5
2b. Number of students who did not pass the first course during the timeframe:						
2c. Number of students who passed the first course and enrolled in the second course:						
3a. Number of students who passed the second course, but did not enroll in the third course:						
3b. Number of students who did not pass the second course during the timeframe:						
3c. Number of students who passed the second course and enrolled in third course:						
4a. Number of students who completed the sequence within the timeframe (throughput):						
4b. Number of students who did not pass the third course during the timeframe:						

Step 3: Determining throughput percentages for target student groups

Example:

Total = All students assigned to two levels of developmental who need a credit-bearing mathematics course.

Group 1 = Asian/Pacific Islander students assigned to two levels of developmental and who need a credit-bearing math course

Group 2 = Black/African American students

Group 3 = Hispanic/Latinx students

Group 4 = Indigenous students

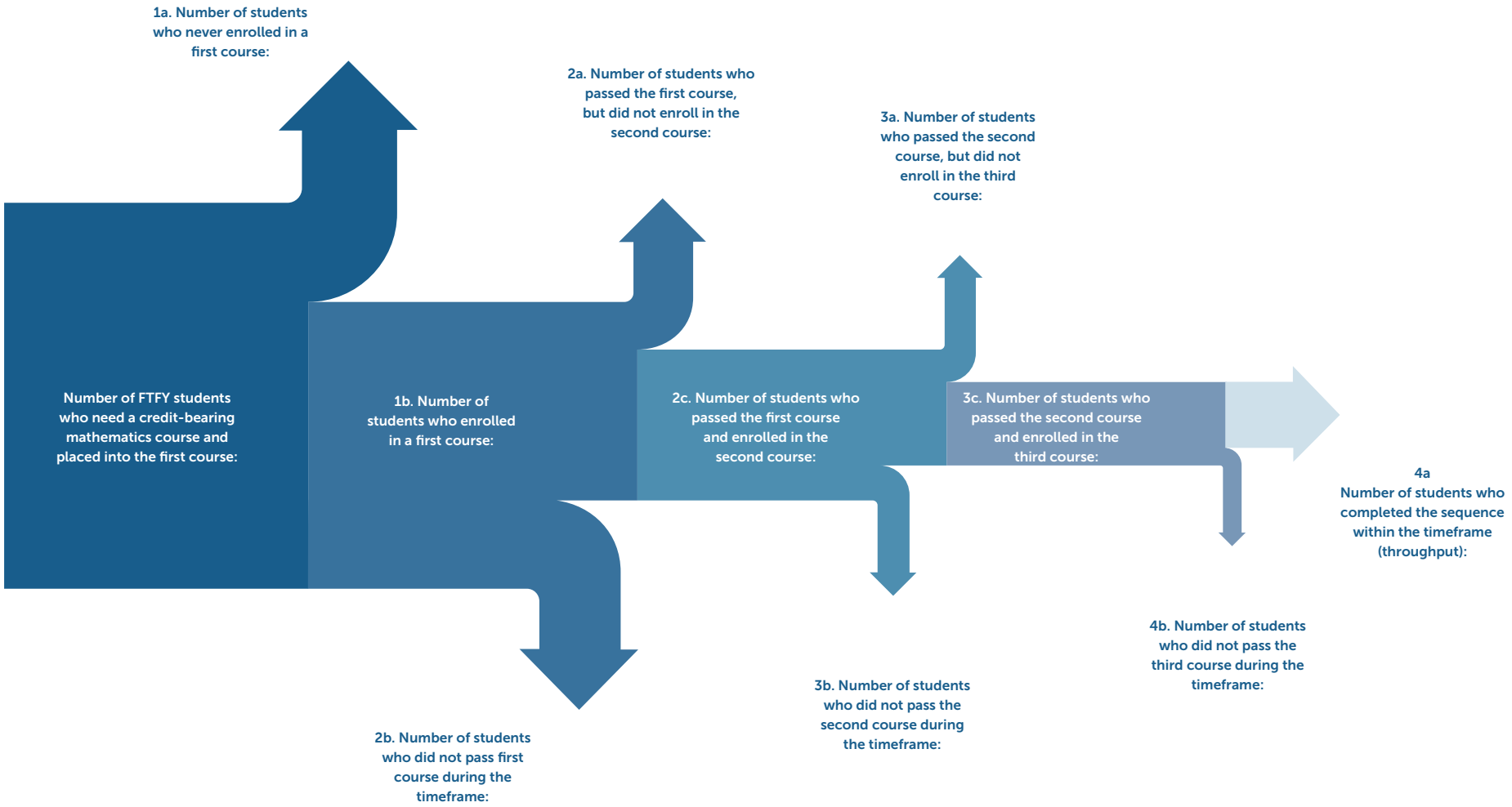
Group 5 = White/non-Hispanic students

	Total	Group 1	Group 2	Group 3	Group 4	Group 5
FTFY students in this category who need a credit-bearing mathematics course and placed into first course:	100%	100%	100%	100%	100%	100%
1a. Percentage who never enrolled in the first course:						
1b. Percentage who enrolled in the first course:						
2a. Percentage who passed the first course, but did not enroll in the second course:						
2b. Percentage who did not pass the first course during the timeframe:						
2c. Percentage who passed the first course and enrolled in the second course:						
3a. Percentage who passed the second course, but did not enroll in the third course:						
3b. Percentage who did not pass the second course during the timeframe:						
3c. Percentage who passed the second course and enrolled in the third course:						
4a. Percentage who completed the sequence within the timeframe (throughput):						
4b. Percentage who did not pass the third course during the timeframe:						

Step 4: Graph it

Using the calculations from Step 3 for the total student population, input the percentages in their appropriate box to create your institution's throughput graph. Repeat these instructions for each student population group of interest.

Total: (Repeat as needed for groups of interest.)



Step 5: Analysis

Please engage in the following questions to better understand the throughput at your institution.

1. What trends do you notice?
2. Where do you notice differences across different population groups?
3. What do you think might be contributing to these differences between groups? Consider:
    - Qualitative or survey data you've seen from your institution regarding specific population experiences, experiences in developmental education, or other relevant data.
    - Anecdotal evidence from your own personal and professional experiences.
    - Research and best practices from other institutions or published reports and articles.
4. What additional questions do these data raise for you?
5. Identify action steps in the following areas to promote equitable opportunities:
    - Explore alternate systemic structures and policies that mitigate historical inequitable opportunities (e.g., replacing prerequisite developmental sequences with corequisite supports courses; rethinking placement policies).
    - Further data to explore (e.g., seeking input from students, faculty and staff).
    - Resources and support for faculty and staff development.
    - Other.

Suggested Resources: The Center for Urban Education at the University of Southern California Rossier School of Education

When corequisites were introduced in Fall 2019, enrollment in prerequisite developmental mathematics was reduced by 78 percent. Of those who enrolled in corequisite courses, 67 percent earned college-level credit in a single term.

—DIABLO VALLEY COLLEGE, CALIFORNIA

Implementation Timeline Template

Purpose:

Once you have formed your leadership team and inspected your historical attrition and throughput data, this template can be used to organize key actions and deliverables to achieve the goals for year one of corequisite implementation.

Users: Institutional leaders, administrators directly connected to the mathematics program (dean, chairperson, division head, etc.), corequisite coordinator, director of advising and institutional researcher.

Instructions:

Use your institution's goals for year one to complete the table on the following pages. It might be most beneficial to use backward design to start with the semester right before you implement the corequisite model and work backward to the first semester of planning. The table is organized into the following sections: targets, deliverables, data collection, check-ins, adjustments and communications. In each table cell, to the right of the prompts, place information related to the prompt, including the person/group's name responsible for the action. Increase or decrease rows or columns as needed.

Examples:

- Creation of a detailed syllabus/timetable for the college-level course
- Back mapping of skills
- Design of learning support strategies
- Training of faculty
- Date of first draft of Fall Timetable
- Date for finalizing the Fall Timetable
- Deadline for ordering materials from the bookstore
- Begin of Fall registration
- Deadline to submit requests for new faculty lines to budgetary committee

	Four Terms Prior:	Three Terms Prior:	Two Terms Prior:	One Term Prior:	Implementation Term:
Targets What milestones are required to meet your institution's Year One goals?					
Deliverables What needs to be developed?					
Data collection What data will be collected? Who will be responsible for collecting them? When will the data be collected?					
Check-ins When will the responsible party review data and report progress to the implementation team and the entire mathematics department?					
Adjustments How will the implementation team decide what adjustments to make?					
Communications Who is responsible for communicating progress and celebrating success? When will the responsible party communicate this information? How will it be disseminated?					

Engaging Partner Disciplines: Multidisciplinary Discussion Tools

Purpose

Research indicates the importance of coordinating corequisites with robust mathematics pathways implementation.[1] This resource is a collection of templates that faculty and administrators can use to prepare for and implement partner discipline discussions focused on identifying a default gateway mathematics course requirement that is most relevant for each program of study.

1. Ran & Lin, 2019

Audience

This tool is intended for use with a small group that includes mathematics faculty, partner discipline faculty and related department leadership.

The tool contains the following parts:

- Meeting Preparation Suggestions
- Mathematics Department Preparation Guide
- Sample Survey of Mathematical Skills
- Discipline Team Preparation Guide
- Sample Meeting Agenda

Meeting Preparation Suggestions

Establish roles.

- **Meeting facilitator:** This person can be someone from either the mathematics department or the partner discipline team and is responsible for organizing logistics and facilitating agendas.
- **Math lead:** The math lead should have familiarity with the learning outcomes for all college-level math courses and is responsible for bringing appropriate resources to the discussion (described later in this resource).
- **Discipline team:** The discipline team should consist of faculty members from the department that primarily supports the program(s) in consideration. They should be prepared to discuss the quantitative skills students in these programs need, and the ways in which mathematics is used in the careers most commonly pursued by individuals with the degrees in question. They should also be prepared to bring appropriate resources to the discussion and to complete the preparation described in the next section.
- **Other stakeholders:**
    - **Advising representative –** Including an advisor in the discussion leads to deeper understanding of the importance of enrolling students in the appropriate math course, rather than informing the advising department via memo.
    - **Transfer partner representative –** If a significant number of students transfer to a regional partner, invite a discipline representative to discuss mathematical needs of the program.

Mathematics Department Preparation Guide

Preparation: Describe the objectives for each of the gateway level math courses.

- Develop a survey of mathematical competencies that illustrate the content of the gateway courses offered by your math department. This should be a high-level view of the main concepts, rather than a comprehensive list of every skill for each course. A sample survey is provided in the next section.
- Take time to think about how you might explain the outcomes in the survey of mathematical skills to someone without an extensive algebraic background. For example, the term "function" is likely to be interpreted very differently by the liberal arts team.
- Convene a department team to prepare examples of contextualized mathematics problems that illustrate the outcomes in the survey of mathematical skills. When possible, include contexts and examples relevant to the partner discipline in question.

Materials: Consider bringing the following resources to the meeting to share with your partner disciplines.

- The **survey of mathematical skills** developed by your math department.
- The contextualized mathematics examples.
- Recommendations of national mathematics associations, meta-major frameworks, Program of Study briefs, etc. as available and appropriate.
    - MAA's partner discipline reports:
        - MAA (2004). *The Curriculum Foundations Project Voices of the Partner Disciplines*
        - MAA (2011). *Partner Discipline Recommendations for Introductory College Mathematics and the Implications for College Algebra*
    - Arkansas' Math Task Force Report: *Forging Relevant Mathematics Pathways in Arkansas*
    - Sample meta-major frameworks
        - Indiana
        - Texas
    - Dana Center's Program of Study Briefs – currently available are:
        - Emerging Solutions for Mathematics Education in Nursing
        - Mathematics for Business
        - Mathematics for Communications
        - Mathematics for Criminal Justice
        - Mathematics for Pre-Service Elementary (K-5) Teacher Education
        - *Mathematics for Social Work*

[Note to Math Team: The conversation should begin with a small survey (see sample) and then move to an examination of the mathematics department syllabi that most closely match the checked survey items. This sample survey is wide-ranging and is far more extensive than should be given to your partner discipline colleagues. Make sure to select a variety of topics that represent the breadth of content for each gateway course, but be careful not to make the survey too long or too technical; include two or three main topics representing each gateway course. The more in-depth conversations can happen after the partner discipline faculty complete the survey and begin reviewing the appropriate course syllabi.]

Sample Survey of Mathematical Skills

Which of the following best describe the mathematical skills students need in order to be successful in your program? Try to limit your selection to (at most) five of the main list. Then choose as many sub-descriptors as needed, if applicable.

- Read and interpret quantitative information in news reports.
- Read and interpret statistical analyses in professional journals.
- Model the real world using probability:
  - Counting.
  - Conditional.
  - Bayes' Theorem.
  - Diagrams (tree, Venn, two-way tables).
- Apply common probability distributions, such as normal and binomial distributions.
- Apply the theory of functions.
- Reason using ratio and proportions.
- Evaluate all roots of higher degree polynomial and rational functions.
- Apply right triangle trigonometry.
- Determine the validity of an argument or statement; provide mathematical evidence.
- Recognize, solve and apply systems of linear equations using matrices.
- Apply the language and notation of sets.
- Compute confidence intervals and hypothesis tests and interpret the results.
- Given a data set:
  - Choose and create an appropriate graphical display.
  - Interpret and draw conclusions.
  - Determine and interpret measures of center and spread.
- Determine the following for a variety of functions:
  - Domain and range.
  - Inverse.
  - Composition.
- Model the real world using algebraic functions. Choose all that apply:
  - Linear.
  - Exponential.
  - Higher order polynomial.
  - Radical.
  - Rational.
  - Logarithmic
- Other:
- No significant mathematical preparation is required.

Completed by:

Institution:

Name:

Title:

Department:

Discipline Team Preparation Guide

Preparation: Describe what your **students need to be quantitatively prepared** for your department's programs of study:

- What are the mathematical skills and abilities that students need in order to be prepared for upper-division coursework in your discipline? Please be specific.
    - Do you currently have a suggested or required default math course identified?
    - In general, are your students currently coming to you with sufficient and relevant mathematics preparation? Please explain.
- What do the national professional associations and accrediting bodies recommend in terms of quantitative learning outcomes for your discipline?
- What are the mathematical skills used in careers that students in your discipline pursue?
- Which **applications** of mathematics do students use most frequently in your discipline?
- Which of the following best describes how the certificates or degrees in your program connect to future credentials?
    - Our credentials are terminal. After our programs, there are no additional certifications or degrees at other institutions.
    - Our credentials could lead to additional credentials at other institutions.
- Are there any programs of study in this discipline that have mathematics requirements not shared by other programs in this discipline? Make note of any programs that have different mathematical requirements.
- Review the Program of Study Briefs for your discipline, if available. Currently available are:
    - *Emerging Solutions for Mathematics Education in Nursing*
    - *Mathematics for Business*
    - *Mathematics for Communications*
    - *Mathematics for Criminal Justice*
    - *Mathematics for Pre-Service Elementary (K-5) Teacher Education*
    - *Mathematics for Social Work*

Materials: Consider bringing the following resources to the meeting.

- Examples of the ways in which students in your program are expected to use mathematics. This may involve specific examples from a wide range of courses in the field of study.
- Examples of program-specific contexts that you would like to see incorporated into the mathematics courses, if possible.
- Guidance from national professional associations or accrediting bodies regarding the quantitative learning outcomes for the discipline.
- **If students commonly transfer to specific institutions to pursue further credentials in your program or discipline, bring those institutions' mathematics requirements.**

	Sample Meeting Agenda
5 minutes	**Set the charge.** **Identify shared goal:** • Work together toward identifying a default gateway mathematics course requirement that is most relevant for the programs of study in question. **Establish group norms:** • Recognize that everyone has expertise. • Honor requests for additional thinking time so everyone can participate. • Use specific examples and agree on definitions. • Presume positive intentions.
10 minutes	**Develop common understanding of the context.** • Math department provides background on the development of the survey of mathematical skills and the process for engagement. • Think time: Partner discipline(s) explores the survey of mathematical skills and identify questions.
30 – 40 minutes	**Develop common understanding of mathematical needs for these specific program(s) of study.** • Give partner discipline(s) an opportunity to ask questions about the Survey of Mathematical Skills, and address them as needed. • Discuss related materials, relevant applications and address other questions. • Understanding that it is not about the math department providing every mathematical skill; rather, it is about the two departments coming to an understanding of what skills are in the purview of the math department courses and what skills will be studied in the program courses.

5 – 10 minutes	**Plan future action.**
	
	Reflect on the discussion.
	• What progress has been made toward identifying a default mathematics course for the first year of the degree plan/academic map?
	• What additional information is needed to make progress on this decision?
	• When will this decision be finalized?
	
	Identify next steps.
	• Administrative support: What additional supports do you need to make this decision?
	• Communication:
	  ○ Who needs to be informed about this discussion?
	  ○ Who should be involved in future discussions?
	• Responsibility: Who is responsible for:
	  ○ Pursuing changes to degree plans/academic maps; organizing future discussions?

Course Design Tools

Models and Case Studies Webinar

This pre-recorded webinar provides an overview of the basic corequisite models, as well as some institutional examples of how the models have been adapted to suit each institution's context.

Course Calendar Templates – Instructor and Student Versions

Why: The content of support courses should be highly structured and based on the foundational skills that students need to be successful in the college-level course. In addition to the necessary mathematics, these skills should include academic mindsets instruction in growth mindset, belonging, and purpose and relevance, as well as learner strategies. For more on academic mindsets, see the Student Experience Research Network. The templates that follow are designed to facilitate the process of back mapping learning outcomes for the support course based on the college-level course.

Users: Course coordinators of college-level and corequisite courses. At minimum, mathematics faculty who share students in a college-level and corequisite course pairing should work together to create a common calendar. Ideally, the mathematics department collaborates to create a common calendar that is shared by all and facilitated by a common course in the Learning Management System.

Instructions:

1. Course design team should inspect the existing college-level course and ask:
    - Is there any missing or extraneous content, based on programs served and the next mathematics course in the sequence, if any?
    - What is the consensus on equity-focused and culturally inclusive pedagogies, procedural strategies, preferred notation, etc.?
    - Are academic mindset and learner strategy instruction needed in this course?
2. Beginning with the fourth column, create a day-by-day calendar.
3. In the last column, note the agreed-upon instructional strategies.
4. To determine the content of the support course, carefully consider the foundational skills needed for the fourth column. Schedule that content by backing up one to three days and list the support content in the second column. This column should also include academic mindset and learner strategy instruction.
5. The last column is removed to create the student-facing version of the course calendar.

Resources

Dana Center Mathematics Pathways Curriculum Design Standards
Dana Center Transition to College Mathematics Course Framework
Mathematics Foundations for Success in Introductory Statistics

Course Calendar Template – Instructor Version

Course:

Day/ Date	Support content (Math and Learner Strategies)	Day/ Date	(Course) Content	Notes on Instructional Strategies

Course Calendar Template – Student Version

Day/ Date	Support content	Day/ Date	(Course) Content

Course Design Recommendations: What to Adopt, Adapt, Avoid and Implement

Keep in mind that there is not a "best" model for corequisites; there are many successful ways to structure corequisites, depending on the student and faculty composition of your institution. However, best practices do exist.

Adopt/Adapt:

- Require structured content.
- Align content that gives students just-in-time remediation.
- Provide a sufficient number of hours of support based on student need.
- Run side-by-side or embedded remediation.
- Incorporate academic mindset and learner strategy instruction.
- Inspect data regularly.

Avoid:

- Running a traditional intermediate algebra course side-by-side with the college-level course.
- Determining hours of support based on what is easiest to schedule.
- Running an unstructured homework hour.
- Focusing solely on individual course pass rates (rather, inspect throughput).
- Offering an eight-week developmental followed by an eight-week college-level

Recommendations for Implementation

- Math faculty works together to reach consensus on each college-level course's topics and sequence, and develop a common course calendar.
- Math faculty back map from the common course calendar to achieve a common calendar for the corequisite supports activities.
- Math faculty collectively decide which academic mindset and learner strategy concepts to focus on.
- Department encourages faculty collaboration and communication.

- Department provides professional learning to faculty who previously taught developmental algebra but will now teach statistics support or quantitative reasoning support.
- Department engages in continuous improvement processes, including gathering qualitative and quantitative data from both students and faculty.
- Department works together regularly to inspect disaggregated data for inequitable outcomes and collaborates to propose and implement more equitable departmental- and classroom-level policies and practices.
- Department carefully considers whether to assign one grade or separate grades and how to address students who fail the college-level course or the support course. Be open to analyzing these decisions and changing if necessary.

Austin Community College in Texas created course notes with guided handouts and a bank of student activities to create consistency across course sections. The class starts with an activity with the students working collaboratively. If many students become stuck on the same concept or problem, the instructor brings the class together and provides an explanation.

Measures of Structural Change

Purpose

Measures of structural change assess the extent to which policies and practices create institutional conditions that yield equitable access to and experiences in corequisite mathematics for students. This guide offers a framework of defining key structural change measures that support high-quality corequisite design. The framework includes data gathering and interpretation, as well as implementation practices intended to improve student outcomes.

Users: Administrators and corequisite project leads.

What is the difference between structural change measures and student outcome measures?

The phrase "structural change" refers to the administrative policies and practices that create conditions for student success. Measures of structural change include placement policy, advising practice, multiple mathematics pathways, appropriate number of sections for corequisite courses based on enrollment projections, and proportional representation of student groups that are enrolled in corequisite math pathways courses based on overall enrollments or program of study designations.

Student outcomes are measured by indicators such as GPA, course grades, graduation rates, retention rates and social-emotional development. Student outcomes can vary as a result of structural changes, but often those improvements lag behind policy reforms.

Creating structures that attend to equitable access, opportunity and experiences may lead to equitable student outcomes that are sustainable as long as the right quantitative and qualitative data are consistently reviewed, updated, critically queried and used as the basis for action.

Each section below describes a key measure of structural change related to mathematics corequisites, along with guidance on data collection and interpretation. To determine equitable access and experiences, all data should be disaggregated by a variety of student groupings, including race/ethnicity, gender, age, socioeconomic status and other groupings relevant to the institutions' equity goals.

Structure 1: Placement policy definition

Placement policy refers to institutional structures governing the assessment of student readiness for college-level courses and the assignment to developmental supports for students assessed as

underprepared. The vast majority of those students should be provided supports via corequisite courses.[2, 3] Placement policies that are leading indicators of structural changes in support of student completion include the following:

- **Multiple measures** of readiness include high school performance indicators, such as high school GPA, high school mathematics course-taking and grades; do not privilege standardized tests.
- **Default placement** into college-level mathematics with corequisite supports for the vast majority of students assessed as underprepared.
- **A requirement to enroll** in mathematics within one year of matriculation or the first 30 credit hours in college.

Data collection for each of the placement policy areas	Notes
1. **Multiple measures:** Review state, system and institutional policy documents to determine the extent to which measures other than standardized tests are used in assessing student readiness. Student-level data from institutions/systems can be used to determine the accuracy of student placement. Multiple measures placement policies should be based on empirical evidence about the validity of measures in predicting outcomes of interest, in particular college-level course completion. All available evidence shows that high school GPA should be the primary indicator of readiness, and can be combined with test scores when appropriate. No standardized exams have validity tests that account for corequisite supports or multiple math pathways.	

2. Bahr, P. R., Fagioli, L. P., Hetts, J., Hayward, C., Willett, T., Lamoree, D., Newell, M. A., Sorey, K., & Baker, R. B. (2019). Improving placement accuracy in California's community colleges using multiple measures of high school achievement. Community College Review, 47(2), 178–211. https://journals.sagepub.com/doi/full/10.1177/0091552119840705

3. Uretsky, M.C., Shipe, S. L., & Henneberger, A. K. (2019). Upstream predictors of the need for developmental education among first-year community college students. Community College Journal of Research and Practice. DOI: 10.1080/10668926.2019.1655501

Data collection for each of the placement policy areas	Notes
2. **Default placement:** Data for this measure can be retrieved from multiple sources. Policy documents can indicate that corequisites are the default placement for the majority of students. Institutional scheduling data can be used to determine the amount of prerequisite developmental courses that are offered compared to college-level courses with corequisite supports. Finally, student-level data can be used to determine the observed instances of default placement practices. 3. **Enrollment:** Data for this measure can be accessed similarly for other measures in this category. Policy documents and student-level data can reveal the extent to which enrollment within one year of matriculation is both required and achieved.	

Since implementation began, the number of students with access to college-level math in their first year in college grew from 47 percent in 2014–15 to 95 percent in 2018–19.

— ROANE STATE COMMUNITY COLLEGE, TENNESSEE

Interpretation for each of the placement policy areas	Notes
1. **Multiple measures:** Moving from traditional placement policies (e.g., using standardized tests and firm cut scores) to modernized placement policies (prioritizing high school GPA and additional measures of readiness) are key signals of structural changes. The success of these changes should be measured by the number and proportion of students that gain access to college-level courses compared to the prior system, and the rate at which students placed under new measures successfully complete college-level coursework. In addition, placement measures can be reviewed annually and updated to improve the accuracy of placement for future cohorts. Finally, data from student and family surveys can be examined in conjunction with the accuracy of placement measures to determine whether changes in policy practice are warranted. 2. **Default placement:** This measure helps identify which policies permit students to enroll in certain courses, and what exceptions may exist to the default practice of enrolling students in gateway classes with corequisite supports. 3. **Enrollment**: Research shows that completing key gateway courses in programs of study within one year of enrollment helps students gain momentum toward degree completion[4]. Policies that require students to enroll in gateway courses early in their academic career increase the likelihood that students will go on to complete a degree or to transfer. This is particularly important in mathematics, as many students have anxiety or limited self-efficacy in math and frequently delay completing these courses.	

4. Belfield, C. R., Jenkins, D., & Fink, J. (2019). Early momentum metrics: Leading indicators for community college improvement. CCRC Research Brief. https://ccrc.tc.columbia.edu/media/k2/attachments/early-momentum-metrics-leading-indicators.pdf.
Wang, X. (2017). Toward a holistic theoretical model of momentum for community college student success. In Paulsen, M. B. (Ed.) Higher Education: Handbook of Theory and Research, Volume 32 (pp. 259–308). Cham, Switzerland: Springer International Publishing.

Structure 2: Advising practices definition

Advising practices consist of interpersonal practices, such as advisors counseling students into corequisite supports rather than prerequisite developmental courses. They also include tools and resources that inform students and families of options and offer advice such as informational media and self-advisement tools. Media and other communications should consistently and predictably advise students on the processes for developmental education assessment, enrollment in corequisite courses and identifying the appropriate mathematics pathway (see Structure 3).

Data collection for advising practices	Notes
Collect data through reviews of advising media, interviews with advisors, and data from students and families who were identified as in need of developmental education. Consult advisors and review advising resources to determine if and how advisors use multiple measures to identify students in need of developmental education. Survey, interview and/or conduct focus groups with advisors to get a deeper understanding of how advisors inform and engage students and families.	
Interpretation of advising practices data	**Notes**
Advisors should consistently and equitably use all measures and rules for identifying students for developmental education and placing students in corequisite courses. If advisors are not doing so, a revision of policies, advising processes and practices, and training of advisors may be necessary. Use feedback from students to determine students' experiences with advisors, including what advisors tell students, what media advisors make accessible to students and families, etc.	

Structure 3: Multiple mathematics pathways definition

This measure captures the degree to which an institution has aligned relevant mathematics courses to programs of study. Traditionally, at many institutions, college algebra has been the default gateway course for all students. However, professional associations of mathematicians recommend that college algebra only be required for students enrolled in programs of study that also require calculus. Instead, mathematics courses such as statistics, quantitative reasoning and mathematical modeling are more relevant for programs that do not require calculus. The appropriate default course should be defined by faculty in the program of interest, along with recommendations for the appropriate professional associations. Additionally, departments in related fields (meta-majors) should collaborate to determine a common default course. If an institution has a large number of programs, consider beginning this process by focusing on the top 10 programs of study based on total student enrollment.

Data collection for mathematics pathways practices	Notes
Collect data by reviewing degree plans or academic maps to determine whether a single mathematics course has been identified as the default gateway course for each degree or credential program. Review student and course enrollment data to determine whether students are completing the default mathematics course. Check for over-representation of students in college algebra compared to the proportion of students in programs that require college algebra (i.e., students are taking college algebra when their program requires a different mathematics course).	
Interpretation of mathematics pathways practices data	**Notes**
Focusing on the top 10 programs of study as the starting point for alignment gives institutional decision-makers a limited set of programs to target initially, while ensuring that large numbers of students gain access to relevant gateway courses. At most institutions, the top 10 programs of study vary in terms of quantitative skills required; many STEM programs, for example, require calculus, while most programs in non-STEM areas do not. The frequency of each gateway course can be counted. If all 10 programs require college algebra, then it is unlikely that students are taking the most relevant gateway course for their academic and professional needs. Given this framework, the vast majority of students should be required to take statistics, quantitative reasoning or modeling courses if their programs do not ultimately require calculus.	

Structure 4: Sufficient corequisite course offerings definition

This measure captures the degree to which institutions are effectively operationalizing corequisite courses by offering sufficient numbers of corequisite course sections in each mathematics pathway. They must also create the conditions for students to access those courses by offering them at a variety of times and in a variety of modalities to meet students' needs. Additionally, consider the appropriate maximum number of students that may be enrolled in each section. This measure focuses on establishing enough sections of gateway mathematics courses, with aligned corequisite supports, to enable all students to enroll within one year of matriculation.[5]

Data collection for course offerings practices	Notes
Review the number of first-year, first time (FYFT) students enrolled in each program of study to determine the number of seats needed in each gateway mathematics course. Review the number of students assigned to developmental education enrolled in each program of study to determine the number of seats in corequisite courses needed. Use the enrollment caps to determine the number of sections needed. Compare results with actual course offerings. If first-year enrollment in mathematics has not been the norm, offerings will need to increase to include returning students who have not yet completed their mathematics requirement.	
Interpretation of course offerings data	**Notes**
Based on enrollment caps and the number of students in each program of study, determine if the institution offers the appropriate number of sections for corequisite and gateway courses. For example, if class sizes are capped at 25 students, and 97 students have declared a major that requires a statistics course, at least four sections of statistics should be offered. If sufficient sections of corequisite or gateway courses in each math pathway are not offered, the institution may not be meeting students' needs. This may be an indication that faculty need to teach more course sections, the number of adjunct faculty needs to increase, and/or the institution needs to engage in creative mechanisms to ensure students have equitable access to the courses they need to take.	

5. Robles, S., Gross, M., & Fairlie, R. W. (2020). The Effect of Course Shutouts on Community College Students: Evidence from Waitlist Cutoffs. (EdWorkingPaper: 20-314). https://doi.org/10.26300/xkck-3b89

Structure 5: Ensuring proportional representation definition

Student groups should be proportionally enrolled in corequisite courses based on proper identification for developmental education. The goal is to consistently and equitably identify students' needs and place them in courses that lead to their success. Racially minoritized student groups should not be disproportionately assessed as needing or assigned to developmental education.

Data collection for proportional representation practices	Notes
Collect student-level demographics on the number of FYFT students who were assigned to developmental education and who were enrolled in corequisite courses. Obtain this value for the following student groups: • Race/ethnicity • Gender • Socioeconomic status • Age • Intersectionality (e.g., Black males) By dividing the number of FYFT freshmen assigned to and enrolled in corequisite courses by the total number of FYFT freshmen assigned to developmental education courses, the rate of enrollment in corequisite courses will be obtained. By obtaining percentages by student group, over- or under-representation of student groups enrolled in corequisite courses will be obtained.	
Interpretation of proportional representation data	**Notes**
When student groups are under- or over-identified as enrolled in corequisite courses, this may be a signal that inequities exist in policies and/or practices. Race/ethnicity and other demographic identifiers should not be factors that determine student enrollment in corequisites. Institutions may need to examine resource allocations, course offerings, staffing, etc., if students cannot be enrolled in corequisite courses based on criteria that indicate they should be enrolled.	

Assessment Rubric

Rubric for Design and Delivery of Corequisite Math

Purpose:
Use this rubric to assess your college's status in implementing each principle for design and delivery of corequisite mathematics instruction.

Users:
Implementation team members.

Instructions:
Rate your institution on a scale using the categories Advanced Practice, In Progress or Emerging Practice. The rubric includes a description of the evidence that indicates progress within each category. You will not be asked to provide this evidence, but use it in your own determination.

"As a department, we had started to see corequisite data from other places, and it was a no-brainer to move away from what we were doing—it wasn't working."

—CHRISTINE BENSON, THEN-CHAIR OF THE MATH DEPARTMENT, NORTHWEST MISSOURI STATE UNIVERSITY

Corequisite Principle 1: Corequisite Math Course Objective

The objective of a corequisite math program is to ensure that each student:

Design Principle	Advanced Practice 3	In Progress 2	Emerging Practice 1	What Evidence Can be Used to Indicate Level of Implementation?
1.1 Enrolls in a college-level math course aligned to their program of study within the first year of enrollment.	At least 80% of students are intentionally advised into the appropriate math pathway based on their program of study.	Fifty to 79% of students are intentionally advised into the appropriate math pathway based on their program of study.	Less than 50% of students are intentionally advised into the appropriate math pathway based on their program of study.	Student enrollment in mathematics pathways courses (statistics, college algebra, quantitative reasoning, business math, teacher math, other). Comparison of student enrollment in programs of study to college-level math course enrollment.
	At least 80% of first-year, first time (FYFT) students are enrolled into a gateway mathematics course.	Fifty to 79% of FYFT students are enrolled into a gateway mathematics course.	Less than 50% of FYFT students are enrolled into a gateway mathematics course.	
1.2 Is assessed using evidence-based measures to determine their needs for additional academic support.	At least 80% of students are advised using multiple measures for mathematics placement.	Fifty to 79% of students are advised using multiple measures for mathematics placement.	Less than 50% of students are advised using multiple measures for mathematics placement.	• Use of multiple measures for student placement and advising. • Advising protocols.
1.3 Receives those supports through just-in-time corequisite supports.	At least 80% of students with developmental placements are intentionally advised into college-level mathematics courses with corequisite supports.	Fifty to 79% of students with developmental placements are intentionally advised into college-level mathematics courses with corequisite supports.	Less than 50% of students with developmental placements are intentionally advised into college-level mathematics courses with corequisite supports.	• Corequisite course offerings. • Student enrollment in corequisite courses. • Student passing rates for corequisite courses, disaggregated by preparation level and demographic group.

Design Principle	Advanced Practice 3	In Progress 2	Emerging Practice 1	What Evidence Can be Used to Indicate Level of Implementation?
1.4 Completes the gateway math course with the relevant skills and knowledge essential to succeed in their program of study.	At least 70% of FYFT students pass a gateway mathematics course within one year of enrollment.	Fifty to 69% of FYFT students pass a gateway mathematics course within one year of enrollment.	Less than 50% of FYFT students pass a gateway mathematics course within one year of enrollment.	• Student gateway math completion in one year. • Student gateway math completion in two years. • Persistence rates. • Degree or certificate completion. • Transfer rates.
	Mathematics requirements for the institution align with recommendations from professional organizations.	Mathematics requirements for the institution weakly align with recommendations from professional organizations.	Mathematics requirements for the institution do not align with recommendations from professional organizations.	
1.5 The implementation of math pathways with corequisite supports is a component of comprehensive institutional policies and practices designed to result in students' greater enrollment and success in programs of study, with special attention to programs that provide opportunities for upward economic mobility and income equality.	For example, populations of racially minoritized students are enrolled in corequisite courses at significantly higher rates than they enroll in non-credit bearing prerequisite courses.	For example, populations of racially minoritized students are enrolled in corequisite courses at higher rates than they enroll in non-credit bearing prerequisite courses.	For example, there is a clear underrepresentation of racially minoritized student populations enrolling into corequisite courses compared to the rate at which they enroll into non-credit bearing prerequisite courses.	• Disaggregated data* by student ethnicity, gender, SES (using Pell eligibility), age, part-time/full-time status and other categories, as well as intersectionalities of these categories. • Overall enrollment. • Developmental determinations. • Corequisite course enrollment. • Corequisite course completion.
	Students from all demographic groups pass corequisite courses at high and equal rates.	There is variation in corequisite pass rates among different demographic groups.	There is wide variation in corequisite pass rates among different demographic groups.	
	Except for students who require calculus for their program of study, populations of racially minoritized students enroll in mathematics pathways courses at significantly higher rates than they enroll in intermediate algebra or college algebra courses.	Except for students who require calculus for their program of study, populations of racially minoritized students enroll in mathematics pathways courses at higher rates than they enroll in intermediate algebra or college algebra courses.	There is a clear underrepresentation of racially minoritized student populations enrolled in mathematics pathways courses.	
	Populations of racially minoritized students enroll into STEM and other programs that provide upward economic mobility at the same rate as they enroll into the college or university.	Populations of racially minoritized students enroll into STEM and other programs that provide upward economic mobility at the same rate as they enroll into the college or university.	There is a clear underrepresentation of racially minoritized student populations enrolling into STEM and other programs that provide upward economic mobility compared to the rate at which they enroll into the college or university.	

Corequisite Principle 2: Corequisite Math Course Design Process

Institutions that successfully implement a corequisite math course:

Design Principle	Advanced Practice 3	In Progress 2	Emerging Practice 1	What Evidence Can be Used to Indicate Level of Implementation?
2.1 Identify and dismantle policy and practice barriers that deny students access to college-level math courses and result in unequal student outcomes. Doing so will ensure that each student has access to, and successfully engages in, high-quality, college-level math courses in their first term.	See Rubric Items 7.1–7.3 At least 80% of FYFT students enroll in a college-level mathematics course in their first academic year rather than a non-credit bearing course.	Fifty to 79% of FYFT students enroll in a college-level mathematics course in their first academic year, rather than a non-credit bearing course.	Less than 50% of FYFT students enroll in a college-level mathematics course in their first academic year, rather than a non-credit bearing course.	See Rubric Items 6.1–6.6 • Student enrollment in college-level courses over time. • Enrollment in corequisite courses.
2.2 Establish processes for implementing, assessing, improving and scaling corequisite courses that involve key institutional stakeholders (e.g., administrators, faculty, instructional designers, advisors, student support services, financial aid professionals and registrars.)	A leadership team is in place and it includes administrators, faculty, instructional designers, institutional researchers, student support services, financial aid professionals and registrars. The leadership team has created a plan for moving from implementation to scaling corequisite courses with clear processes and responsibilities. This plan has been shared with key stakeholders.	A leadership team is in place and it includes administrators, faculty and support services (advisors). A plan is in place for beginning to implement corequisite courses with assigned responsibilities. The plan has been shared with involved parties.	One or two individuals make the key decisions for this initiative. The individuals in charge of implementing corequisite courses have an informal plan.	See Rubric Item 7.2 • Leadership team membership. • Implementation plan. • Scaling plan.

Design Principle	Advanced Practice 3	In Progress 2	Emerging Practice 1	What Evidence Can be Used to Indicate Level of Implementation?
2.3 Understand the postsecondary experiences of students, use this understanding in design decisions, and pay particular attention to the impact of design decisions on racially minoritized communities.	See Rubric Items 6.1–6.6			See Rubric Items 6.1–6.6
2.4 Implement corequisite model(s) that will most effectively achieve equal access and success for each student and ensure these models are sustainable within their institutional context.	Equity was a key consideration for the leadership team when choosing a corequisite model.	Equity was a factor when choosing a corequisite model.	Equity was not considered when choosing a corequisite model.	• Artifacts representing the leadership team's considerations of equity and sustainability, including strategic plans, communications materials, advising materials, presentations, policies, etc.
	Sustainability was a key consideration for the leadership team when choosing a corequisite model.	Sustainability was a factor when choosing a corequisite model.	Sustainability was not considered when choosing a corequisite model.	

Corequisite Principle 3: Corequisite Math Course Design Elements

Essential elements of effective corequisite math courses include:

Design Principle	Advanced Practice 3	In Progress 2	Emerging Practice 1	What Evidence Can be Used to Indicate Level of Implementation?
3.1 Enrollment of students in the college-level math course aligned to their chosen program path.	See Rubric Item 1.1			See Rubric Item 1.1
3.2 Sections of the college-level course with corequisite supports that are identical in content and learning outcomes to those available to students in non-corequisite sections.	The content of the college-level course with corequisite supports is exactly the same as the standard college-level course.	The content of the college-level course with corequisite supports is similar to the standard college-level course, but some content has been added or removed.	The content of the college-level course with corequisite supports is substantially different from the standard college-level course.	• Syllabi for college-level course with corequisite supports. • Syllabi for standard college-level course.
3.3. Content in the corequisite supports course that is explicitly aligned and organized to support student learning and success in the college-level course.	The content of the corequisite supports course aligns exactly with the content of the college-level course.	The content of the corequisite supports course is somewhat aligned to that of the college-level course, with some areas that are not supported.	The content of the corequisite course is either not explicitly specified or focuses on general skills.	• Syllabi for corequisite supports courses.
3.4 Support content that is provided in a single term side-by-side or embedded within the college-level course, not as a precursor to the college-level content.	The corequisite supports course has curriculum that is designed to provide just-in-time support for the college-level course within a single semester.	The corequisite supports course runs concurrently with the college-level course, but either does not have an explicit curriculum or has a curriculum that is not well-aligned with the college-level course.	The corequisite supports course is completed before the college-level course begins (8-week/8-week model or 4-week/12-week model).	• Syllabi for corequisite supports courses.

Design Principle	Advanced Practice 3	In Progress 2	Emerging Practice 1	What Evidence Can be Used to Indicate Level of Implementation?
3.5 Strategies to boost academic confidence, sense of social belonging, and understanding of the relevance of the math concepts and to achieving academic, career and personal goals.	Student success strategies and social emotional content are embedded in the curriculum of the mathematics courses.	Services outside of the classroom promote social belonging and strategies to boost academic confidence.	Student success strategies and social emotional content are not available for students.	• Syllabi for corequisite supports courses. • Syllabi for college-level course with corequisite supports.
3.6 Policy stating that successfully completing the college-level course, regardless of the grade in the corequisite supports course, is the only requirement for students to earn college-level credit and move on to subsequent courses in the math pathway and/or program of study aligned to the gateway course.	A policy is in place that states that passing the college-level course is all that is required to receive full credit and be eligible to move on to the next math course.	Individual instructors make decisions on whether or not students must pass their corequisite supports course to receive full credit for their college-level course.	Students are required to pass both the corequisite supports course and the college-level math course to receive full credit.	• Advising protocols. • Advising policies. • Mathematics department course policies.
3.7 Consistent instructional practice across the college-level math course and corequisite supports course that supports each learner's needs in order to achieve equal outcomes for students, regardless of race, income, age, gender or other minoritized status.	Common instructional practices are evident in the college-level math course and the corequisite course. Equity: See Rubric Item 1.5	Instructional practices in the college-level math course and the corequisite course are similar with some small differences.	Instructional practices in the college-level math course and the corequisite course are distinctly different. As an example, the corequisite support course may be offered as a self-guided computer module.	See Rubric Item 1.5 • Classroom observations. • Instructor surveys. • Student surveys.

Other corequisite math courses design elements depend upon the needs of the student population and institutional context. Institutional teams examine available research on effective practices and local data to make decisions on design elements. The Corequisite Structure Decision Schema supports this process.

Corequisite Principle 4: Course Enrollment Practices

Institutions that successfully deliver the instruction students need to achieve their academic goals:

Design Principle	Advanced Practice 3	In Progress 2	Emerging Practice 1	What Evidence Can be Used to Indicate Level of Implementation?
4.1 Identify and enroll all students in the gateway math course consistent with their academic goals and chosen program of study, regardless of any assessment of their preparation level for that course.	See Rubric Items 1.1, 1.3			See Rubric Item 1.3
4.2 Assess students to ensure instruction and academic support will maximize their success in the college-level math course, not determine access to the college-level course.	See Rubric Items 1.3, 4.3			See Rubric Item 1.3
4.3 Assess the need for support through multiple evidence-based measures, including, but not limited to, high school GPA and grades in high school mathematics.	Listed in Rubric Item 1.2 Advisors use multiple measures, including high school GPA, with all students when determining if a student requires corequisite supports courses.	Advisors use multiple measures, including high school GPA, to determine corequisite placement for students who have tested "on the bubble."	Advisors use multiple measures, including high school GPA, only in rare circumstances.	• Advising protocols.
4.4 Make corequisite supports mandatory for students when the evidence-based measures referenced above show corequisite supports will increase the likelihood that they will pass the college-level course.	Corequisite courses are mandatory for all students with a developmental placement, and at least 80% of students with a developmental placement enroll into college-level courses with corequisite supports.	All students are advised into college-level courses, and corequisite support courses are optional for students with a developmental placement.	Not all students are advised into college-level courses, and corequisite courses are not available to all students with a developmental placement.	• Advising protocols. • Course catalogues.

Corequisite Principle 5: Integration with a Comprehensive Student Success Framework

Institutions that implement comprehensive student success frameworks:

Design Principle	Advanced Practice 3	In Progress 2	Emerging Practice 1	What Evidence Can be Used to Indicate Level of Implementation?
5.1 Align math pathways to other institutional pathways initiatives.	Leaders of math pathways initiative have aligned the work with other pathways initiatives taking place at their institution.	Leaders of math pathways initiative are aware of other pathways initiatives taking place at their institution and are moving toward alignment.	Leaders of math pathways initiative have not taken into account other pathways initiatives at their institution.	• Institutional pathways documentation (where applicable).
5.2 Include corequisite math supports as an essential strategy for increasing the likelihood that students achieve critical first-year momentum. Metrics to include: completing gateway math and English, earning 30 credits, enrolling into and earning at least nine credits in a program of study in their first academic year.	Corequisite math supports are listed as an essential strategy for achieving first-year momentum metrics.	Corequisite math supports are informally seen to be important to achieving first-year momentum metrics, but they are not officially listed as a part of the work.	Corequisite math supports are not seen as relevant by those working to achieve first-year momentum metrics at the institution.	• Momentum metrics. • FYFT gateway math course completion, longitudinal. • FYFT persistence. • FYFT enrollment in programs of study or meta-major.
5.3 Design math courses and corequisite supports to meet the specific needs of their student population. Understand and address how policies and practices impact subpopulations differently.	Math courses at this institution are designed with an equity lens.	Math courses at this institution are designed to serve all students, without taking any particular groups into account.	Math courses at this institution are not designed with equity or the needs of particular groups in mind.	• Disaggregated course enrollment data in corequisites. • Disaggregated course completion data (A, B, C, CR) in corequisites. • Description of the course design process.
	Stakeholders at this institution understand how policies and practices impact subpopulations differently.	Stakeholders at this institution are beginning to investigate how policies and practices might impact subpopulations differently.	Stakeholders at this institution do not consider how policies and practices might impact subpopulations differently.	

Corequisite Principle 6: Continuous Improvement

Institutions that deliver an equitable, high-quality learning experience that maximizes the success of each student:

Design Principle	Advanced Practice 3	In Progress 2	Emerging Practice 1	What Evidence Can be Used to Indicate Level of Implementation?
6.1 Collect, analyze and act upon disaggregated quantitative and qualitative data that measure the impact of course design, course content, instructional strategies, placement policies and other relevant institutional or state policies on the success of students by race/ethnicity, income level, gender, age or other minoritized status.	See Rubric Items 6.2–6.6			See Rubric Items 6.2–6.6
6.2 Collect qualitative data that capture the experiences of students and faculty, and examine the messaging students receive about math pathways, corequisites and other types of supports.	Qualitative student data have been gathered and analyzed to better understand what messages students are receiving about math pathways and corequisite supports.	Plans for gathering and analyzing qualitative student data are in place.	There are no plans in place for gathering and analyzing qualitative student data.	• Faculty interviews. • Student interviews. • Open-ended survey responses.
	Faculty understanding of math pathways and corequisite supports has been analyzed using qualitative data.	Plans for gathering and analyzing qualitative faculty data are in place.	There are no plans in place for gathering and analyzing qualitative faculty data.	

Design Principle	Advanced Practice 3	In Progress 2	Emerging Practice 1	What Evidence Can be Used to Indicate Level of Implementation?
6.3 Establish clear measures of success that include the number and percentage of students completing a college-level math course and mid- and long-term measures, such as retention, success in subsequent courses and completion of a certificate or degree.	The institution has set clear goals and benchmarks for all of the following: • College math course completion in one year. • College math course completion in two years. • Student retention between semesters. • Student success in subsequent courses. • Certificate completion in two years. • Degree completion in two or four years, depending on sector. • Transfer in two years.	The institution has set clear goals and benchmarks for some of the following: • College math course completion in one year. • College math course completion in two years. • Student retention between semesters. • Student success in subsequent courses. • Certificate completion in two years. • Degree completion in two or four years, depending on sector. • Transfer in two years	The institution has not yet set clear goals and benchmarks for student success.	• Gateway course enrollment. • Gateway course completion in one year. • Gateway course completion in two years. • Transfer in two years. • Transfer in four years. • Semester to semester retention rates. • AA degree completion in two years. • AA degree completion in three years. • Bachelor's degree completion in four years. • Bachelor's degree completion in six years. • Certificate completion in two years.
6.4 Use data to continuously improve and refine both the college-level course and corequisite supports and related practices, including placement and advising.	Faculty and staff have a strong understanding of how to use data for continuous improvement and might have some experience doing this work.	Faculty and staff have some understanding of how to use data for continuous improvement.	Faculty and staff are not aware of how data are involved in continuous improvement.	See Rubric Item 6.3
	Institutional leadership is gathering data that will be used to identify areas for positive change.	Institutional leadership has data on the success of these initiatives and is planning to make change, but is not sure how the two connect.	Institutional leadership is not planning to make further refinements to the college-level course and corequisite supports.	

Design Principle	Advanced Practice 3	In Progress 2	Emerging Practice 1	What Evidence Can be Used to Indicate Level of Implementation?
6.5 Use data to identify, understand and address the needs of students who are not well served by the corequisite supports.	Data have been disaggregated in a variety of ways to determine if there are any groups who are not well served by corequisite supports.	Data are being used to determine the overall efficacy of corequisite courses and for general course improvement.	Data are not currently available or there is limited capacity for analysis.	• Disaggregated student enrollment data. • Disaggregated student corequisite course enrollment data. • Disaggregated student corequisite passing data with A, B or C.
	Data are being used to make decisions about what additional supports should be made available for students.	Data are being used to re-enroll students who did not pass their college-level math courses.	Data are not being used to address student needs.	
6.6 Explicitly identify, understand and address factors that contribute to the success or struggles of students from minoritized communities in college-level mathematics courses.	Data have been disaggregated in a variety of ways to determine if there are any minoritized groups who are not well served by corequisite supports.	Data have been used to determine the overall efficacy of corequisite courses and for general course improvement, but not with an equity lens.	Data are not currently available or there is limited capacity for analysis.	See Rubric Item 6.5

Corequisite Principle 7: Policy

States, systems and institutions that successfully scale corequisites:

Design Principle	Advanced Practice 3	In Progress 2	Emerging Practice 1	What Evidence Can be Used to Indicate Level of Implementation?
7.1 Adopt policies that create the enabling conditions for each student to enter directly into and succeed in a gateway mathematics course aligned to their goals.	Explicit written policies exist that require faculty and advisors to enroll students into the gateway mathematics course aligned with their program of study.	Informal policies exist around gateway course placement.	There is no clear policy around gateway course placement.	• Advising protocols. • Math department course policies.
	Explicit written policies exist that require advisors and faculty to enroll all developmental students into gateway math courses with corequisite supports.	Informal policies exist around corequisite course placement.	There is no clear policy around corequisite course placement.	
	All advisors are aware about policies surrounding math course placement.	Most advisors are aware of the policies around math course placement.	A majority of advisors do not know the policies around math course placement.	
7.2 Involve institutional leaders and faculty in developing, designing and advocating for policies to support the implementation of math corequisites.	Institutional leaders are a part of the leadership team and/or planning process around math corequisites.	Institutional leaders have been vocal in their support of math corequisites.	Institutional leaders have had limited or no involvement in math corequisites.	• Leadership team membership.
7.3 Design policies to ensure that corequisite math courses are accessible to all students who are assessed as needing additional academic support, and to address structural and systemic inequities present in entry-level mathematics programs.	See Rubric Item 7.1			• Advising protocols. • Advising policies. • Math department course policies.

Corequisite Principle 8: Professional Development and Support of Stakeholders

Institutions that successfully implement and scale corequisite math, and design professional development and other supports:

Design Principle	Advanced Practice 3	In Progress 2	Emerging Practice 1	What Evidence Can be Used to Indicate Level of Implementation?
8.1 Build the capacity of faculty to design, deliver and continuously improve corequisite math at their institution, with supports for different stages of the implementation process.	All math faculty involved in designing corequisite math courses are given professional development and/or support. Funding or release time is provided.	Support in designing corequisite math courses is available to faculty who seek it out. Funding or release time is provided.	Faculty can seek out professional development on designing corequisite math courses with their own time and funding.	• Professional development attendance records. • Professional development evaluations.
	All math faculty, including adjunct faculty, are given professional development to implement corequisite mathematics courses. Funding or release time is provided.	Support in implementing corequisite math courses is available to faculty who seek it out. Funding or release time is provided.	Faculty can seek out professional development on implementing corequisite math courses with their own time and funding.	
	All math faculty, including adjunct faculty, are given professional development and/or support to improve coreq-uisite mathematics courses. Funding or release time is provided.	Support in improving corequisite math courses is available to faculty who seek it out. Funding or release time is provided.	Faculty can seek out professional development on improving corequisite math courses with their own time and funding.	
8.2 Facilitate collaboration among diverse stakeholders, including institutional researchers, administrators and student support professionals.	Institutional researchers, faculty, administrators, advisors, registrars, financial aid professionals and student support professionals are embedded in the decision-making around math pathways and corequisite implementation.	Institutional researchers, faculty, administrators, advisors, registrars, financial aid professionals and student support professionals are consulted occasionally in the decision-making around math pathways and corequisite implementation.	One or two individuals make the key decisions around math pathways and corequisite implementation without consulting other stakeholders.	• Leadership team membership.

Design Principle	Advanced Practice 3	In Progress 2	Emerging Practice 1	What Evidence Can be Used to Indicate Level of Implementation?
8.3 Deploy inclusive pedagogies and practices that maximize the success of students from racially minoritized communities.	At least 80% of instructors use inclusive pedagogies throughout their courses.	Fifty to 79% of instructors use inclusive pedagogies throughout their courses.	Less than 50% of instructors use inclusive pedagogies in their courses.	• Disaggregated college-level math course completion data. • Disaggregated corequisite course completion data. • Classroom observations.
8.4 Enable faculty, advisors and student services staff to maintain and build the academic mindset of students. Faculty and advisors receive support on having a growth mindset about students.	The institution offers staff training on academic mindsets to all faculty, advisors and student services staff.	The institution encourages faculty, advisors and student services staff to seek out training on academic mindsets with some economic incentive.	The institution recommends that faculty, advisors and student services staff attend training on academic mindsets.	• Professional development attendance records. • Professional development evaluations. • Faculty, advisors and student services staff surveys. • Student mindset surveys for a sample population, pre- and post. • Student interviews or focus groups.
	At least 80% of faculty, advisors and student services staff have been trained in academic mindsets.	Fifty to 79% of faculty, advisors and student services staff have been trained in academic mindsets.	Less than 50% of faculty, advisors and student services staff have been trained in academic mindsets.	
8.5 Inform faculty, advisors and student services staff of how students can access additional social supports.	Extensive student social supports are available on campus.	Some student social supports exist on campus.	Student social supports are not available on campus.	• Survey of student support staff (financial aid, testing, tutoring, registrar, advising). • Student survey.
	Advisors are given clear information on how students can access social supports.	Some advisors are aware of available social supports for students.	Advisors are not aware of any available student social supports.	
	Faculty are given clear information on how students can access social supports.	Some faculty are aware of available social supports for students.	Faculty are not aware of any available student social supports.	

Design Principle	Advanced Practice 3	In Progress 2	Emerging Practice 1	What Evidence Can be Used to Indicate Level of Implementation?
8.6 Sustain support and engagement from all institutional stakeholders responsible for the successful implementation of corequisite math. In particular, advisors receive support on equitable practices when advising for math pathways.	Stakeholders meet more than once per semester to evaluate progress and plan for the future.	Stakeholder groups meet at least once per semester to evaluate progress and plan for the future.	Stakeholder groups meet at least once per year.	• Stakeholder meeting attendance. • Professional development attendance records. • Professional development evaluations. • Disaggregated student population data in each pathway and/or program.
	All advisors are given professional development in equitable practices (e.g., mindsets instruction, moving from a needs-based to a strengths-based model, identifying implicit biases) when advising for math pathways.	Advisors have received training in advising for math pathways, but without an equity lens.	Advisors have received no training in equitable advising or in advising for math pathways.	

About This Toolkit

The development of this toolkit was guided by the advice of a national advisory panel made up of experts who have worked deeply with corequisites across a variety of roles and contexts. The panel includes researchers, policymakers, faculty members, equity advocates and curriculum experts who collectively articulated a consensus statement on the foundational core of this toolkit, the "Corequisite Design Principles" document and vetted the associated resources.

About The Authors

Project Lead

Connie Richardson, Course Program Manager, The Charles A. Dana Center at The University of Texas at Austin

Connie leads the curriculum development team for the Dana Center Mathematics Pathways, a transformative redesign to modernize entry-level college mathematics programs through working with states, systems, universities and colleges. She also supports the development of DCMP's professional learning offerings related to curricular redesign, corequisite supports and pedagogy. In this work, Connie collaborates with faculty to identify best practices and disseminate to the field.

Contributors

- **Amy Getz,** Dana Center
- **Jeremy Martin,** Dana Center
- **Afi Wiggins**, Dana Center
- **Jen Dorsey,** Dana Center
- **Ophella Dano,** Dana Center
- **Bruce Vandal,** Principal, Bruce Vandal Consulting
- **Karon Klipple,** Senior Director, Carnegie Math Pathways

National Advisory Panel

- **Tristan Denley,** Executive Vice Chancellor for Academic Affairs and Chief Academic Officer, University System of Georgia
- **Nikki Edgecombe,** Senior Research Associate, Community College Research Center, Teachers College, Columbia University
- **Karon Klipple,** Senior Director, Carnegie Math Pathways
- **Connie Richardson,** Course Program Manager, The Dana Center
- **Anders Stachelek,** Assistant Professor, Mathematics, Hostos Community College
- **Bruce Vandal,** Principal, Bruce Vandal Consulting

About The Charles A. Dana Center

The Dana Center works to dismantle barriers in education systems to ensure all students—especially those who have historically been underserved—have equitable access to and success in an excellent math and science education. Our higher education work focuses on strategies and tools that support faculty and institutions in creating more seamless transitions from high school to and through gateway mathematics courses.

About Strong Start to Finish

Strong Start to Finish is a network of policy and research partners, institution and systems leaders, and foundations advancing system reforms in developmental education, so every student can succeed in their first year of college. In particular, we support college success for Black, Brown, Asian American, Indigenous students, adult learners, and students with low incomes, who have been underserved by the education system for too long. We work to scale the use of proven, proactive strategies that remove barriers that typically impede these students from earning essential college credits in English and Math courses in their first year. Education Commission of the States is the host of the Strong Start to Finish network.

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