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Charles A. Dana Center

Defining Content in a Transition to College Mathematics Course at the State or Regional Level

Mathematics Launch Years Toolkit • January 2018 #2

ABOUT THIS RESOURCE

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ABOUT THE DANA CENTER

The Dana Center develops and scales mathematics and science education innovations to support educators, administrators, and policy makers 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. For more information about the Dana Center Mathematics Pathways (DCMP), see **www.dcmathpathways.org**.

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The Mathematics Launch Years Toolkit consists of briefs intended to support districts and higher education systems in streamlining the transition for students from high school to college. The "Mathematics Launch Years" in high school refer to the content that follows the foundational algebraic and geometric thinking usually located in Algebra I, Geometry, and parts of Algebra II courses. In Launch Years courses, students can explore mathematics pathways aligned to their postsecondary programs of study and career aspirations.

Defining Content in a Transition to College Mathematics Course at the State or Regional Level

BACKGROUND

Every year, hundreds of thousands of high school students with hopes to attend college either fail to matriculate or are deemed not "college ready" in mathematics. Students impacted by this reality are disproportionately low-income and minority students who are seeking to improve their economic opportunities and fulfill their career aspirations (ACT, Inc., 2015). Students who graduate from high school underprepared for college-level mathematics end up taking and paying for developmental education courses in which they relearn high school content and do not earn college credit. Nationally, an estimated 60 percent of incoming two-year college students are placed into at least one developmental mathematics course each year. Unfortunately, only 33 percent of those students complete the developmental mathematics sequence and only 20 percent ever complete a college-level math course (Bailey, Jeong, & Cho, 2009).

Even with more relevant but equally demanding course choices in high school, some students may still need additional support to be ready for postsecondary options. A high-quality mathematics transition course, offered in the senior year of high school for students who are not deemed college ready, can increase student success in college. A mathematics transition course is the appropriate launch years course for students who need to develop a range of skills to transition to college successfully and who do not yet have the fundamental knowledge to complete their mathematics pathways. Other launch years courses include Algebra II or its equivalents, typically taken in the third year of the high school mathematics sequence. Fourth and fifth year courses include dual credit, Advanced Placement, and International Baccalaureate courses that teach statistics, calculus, and quantitative reasoning content.

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Effective implementation of this type of course depends on three critical areas: content, policy, and pedagogy. Content should be backmapped from the range of college-level gateway mathematics

courses. Policy changes may be needed to allow students who successfully complete these courses to enter directly into college-level gateway courses without further placement testing. Pedagogy should undergo continuous improvement and use strategies that are evidence-based.

This brief focuses on the content of a mathematics transition course and addresses relevant policy issues. It offers education and policy leaders a process for defining the course content.

SHIFTS IN POSTSECONDARY EDUCATION TO MATHEMATICS PATHWAYS

The shifts in higher education mathematics pathways should help define the content for a mathematics transition course. A growing number of states are examining their mathematics requirements to ensure that institutions of higher education prescribe the mathematics course that best prepares students for their ultimate career fields. Increasingly, the entry-level mathematics course a student takes in college is determined by his or her intended program of study or major, rather than the conventional model of having all students move through College Algebra or Calculus. Data from both Texas and California indicate that only about a quarter of students enrolled in public two-year institutions and about a third of graduates from public four-year institutions are in, or graduated from, programs of study that require Calculus (Burdman, 2015). A growing number of students are earning degrees that, instead, require a course in quantitative reasoning or statistics.

Transition courses must prepare students for the full range of entry-level college mathematics courses. Although mathematics pathways have common essential elements, there is some variability between and within states; therefore, localized consensus building is essential. To learn about the importance of aligning high school and college mathematics, read *The Case for Mathematics Pathways from the Launch Years in High School through Postsecondary Education* (Charles A. Dana Center, 2017).

RECOMMENDED PROCESS FOR DEFINING THE CONTENT OF A COLLEGE MATHEMATICS TRANSITION COURSE

The following process is a guide for policy and education leaders in states and regions to develop a framework of learning objectives for a mathematics transition course that prepares students for success in higher education mathematics.

1) Consider the policy environment.
2) Establish the goal and model of the course.
3) Convene the right stakeholders.
4) Backwards map from entry-level college mathematics courses and build consensus.
5) Implement and evaluate.

Using an effort in Texas as a case study, this brief illustrates the recommended process to define content for a mathematics transition course.

Consider the policy environment.

Transition courses are meant to prepare students to be college-ready in mathematics by the time they graduate from high school. Education leaders must first ask how students can demonstrate college readiness in the state or region. Additionally, leaders should consider if there are current state policies supporting or expanding students' access to the college readiness designation. States including Florida, West Virginia, Illinois, Tennessee, Texas, and New Jersey, for example, all passed legislation that led to statewide implementation of transition courses with clearly articulated measures for demonstrating college readiness (Barnett, Fay, Pheatt, & Trimble, 2016). In those states, eligible students are able to enroll in a college-level course in the subject and are not required to take developmental courses. Without this type of legislation, districts, in partnership with their local higher education institution, would need to determine which designation tools for college readiness, such as placement tests, should be aligned with the transition course. Not all college readiness designation tools, however, are reflective of current research in mathematics pathways in higher education. It may be necessary to include content beyond what the college readiness tools measure.

Texas as a Case Study

Texas legislation from 2013 mandated districts to offer the College Prep Mathematics course. K–12 districts must collaborate with at least one institution of higher education to develop and offer this course. The Texas Success Center, part of the Texas Association of Community Colleges, convened a mathematics task force to create a **statewide framework of student learning objectives** for the College Prep Mathematics course. The Framework is a resource available to K–12 districts and higher education institutions, but they are not required to teach a course that is aligned to those objectives.

In Texas, House Bill 5 defined only the broad parameters of transition course implementation, allowing K–12 districts and higher education institutions to clarify and manage the details of the work. This comprehensive education bill included the College Prep Mathematics course. Districts are required to offer this course and work with their higher education partners to determine:

- the content of the course,
- student eligibility,
- professional development for faculty,
- the measure of "successful completion," and
- how to inform the partnering higher education institution which students successfully completed the course via a transcript or other means of communication.

After the districts and their higher education partners determine all components of implementation, they codify them in a memorandum of understanding between each district and institution. If students successfully meet an agreed-upon measure, they receive a waiver to enroll in an entry-level mathematics course at the partnering institutions. The Texas Higher Education Coordinating Board policy stipulates that students must enroll in college within two years and must take the college-level mathematics course within their first year of enrolling to take advantage of the college readiness designation they earned by successfully completing the College Prep Mathematics course.

Establish the goal and model of the course.

The overarching goal of mathematics transition courses is to prepare students for success in college-level mathematics courses. However, there are a variety of ways to measure college readiness as well as a range of entry-level college mathematics content for which students should be prepared. State-level policy can create a common definition and measures of college readiness or allow institutions to define college readiness.

The Dana Center recommends that the goal of a transition course for a given region is to prepare students for the range of possible college-level mathematics courses that correspond to available programs of study. Entry-level courses for mathematics pathways vary slightly from state to state and options often include courses in algebra, quantitative reasoning, and statistics. Each state also uses different documents (e.g., student learning objectives for entry-level mathematics courses, content tested on placement exams) to guide the writing of student learning objectives for the transition course.

If the model of the course is not already defined in legislation or elsewhere, a task force of mathematics education leaders will need to use data related to the identified student outcomes to select among a variety of models (e.g., a year-long course, semester course, modular courses). The model chosen will determine how to organize the content.

In Texas, the goal of the College Prep Mathematics course is to prepare students for entry-level college mathematics courses. Regions or districts could also decide that the goal of this course is to pass a college readiness or placement exam. The model in Texas is to deliver the year- or semester-long course in high schools. If students successfully complete the transition course, they are exempt from developmental mathematics, meaning they can take entry-level college mathematics upon enrollment at the partnering higher education institutions without passing the Texas Success Initiative Assessment or any other exam used to measure college readiness or placement into courses.

If students pass the Texas Success Initiative Assessment, then they are considered college ready at every higher education institution in the state. For this reason, the task force that wrote the Framework of student learning objectives for the transition course in Texas included additional algebraic content to ensure the course prepares students for this exam as well as all entry-level college mathematics courses. Additionally, the task force used a variety of resources to help determine what students may have already learned, need to review, and need to know once they enter a college-level mathematics course. The following resources helped to guide development of the transition course: course objectives for College Algebra, Elementary Statistical Methods, and Contemporary Mathematics[1]; the objectives tested on the Texas Success Initiative Assessment; the College and Career Readiness Standards; and the K–12 state mathematics standards.

Convene the right stakeholders.

College readiness is the responsibility of both K–12 and higher education systems and requires collaboration between these stakeholder groups. Mathematics faculty from both systems must agree that the content for the transition course will prepare students for entry-level college mathematics. In assembling the task force of stakeholders, educational leaders should determine whom to include and take into account ethnic, geographic, and other types of diversity. For

[1] Contemporary Mathematics is the course name for quantitative reasoning in the Texas Academic Course Guide Manual (Texas Higher Education Coordinating Board, n.d.).

example, critical stakeholders might include both two-year and four-year mathematics faculty who have experience with and expertise of different gateway mathematics courses. Leaders should also consider asking peers from relevant state agencies and organizations to approve, formally or informally, the validity of the course.

In Texas, districts and education leaders urged the Texas Success Center to lead the task force of stakeholders developing the learning objectives for the College Prep Mathematics course. As part of Texas Association of Community Colleges, the Texas Success Center has the legitimacy to lead the creation of state standards. The task force convened for three days and created the Framework of student learning objectives for the transition course. The process included discussions about which content to include in the course and required compromise.

Backwards map from entry-level college mathematics courses and build consensus.

Grounding the task force in the actual learning objectives from entry-level mathematics courses in college is essential to the process. A variety of resources—course learning objectives, learning objectives from college placement tests, college and career readiness standards, and high school mathematics course standards—can all help in determining what content students need to learn

to be college ready. Additionally, these resources clearly articulate what students will learn in the entry-level courses and thus what prerequisite knowledge is necessary and what they can wait to learn in the college-level course. Throughout the work, the task force should refer to these documents as a guide and to gauge what should—and should not—be included in the learning objectives for the transition course.

Part of the value of the process is building collaborative relationships between secondary and higher education faculty to clarify content expectations and work together to build a course around those expectations. It is important to honor and allow time for consensus building. The level of authority behind the learning outcomes—whether they are offered as guidelines or mandated—will depend on the policy environment. In many cases, the task force members will need to strategically act as advocates in order for institutions to adopt the outcomes. Task force members need to understand and prepare for this role.

While developing the learning objectives, the task force in Texas discussed whether to include objectives on student success strategies and behaviors such as malleable intelligence, growth mindset, goal setting, and perseverance. Although some members felt it was important to include student success strategies, the task force reached consensus and ultimately decided to focus the Framework objectives strictly on mathematics content and mention student success strategies in the course description. The Framework allows for flexibility for districts to add student success content to this course if they choose to do so.

Implement and evaluate.

Because the implementation of mathematics transition courses is in its early stages, there is little conclusive evidence about these types of courses and which strategies work best. Nonetheless, the Dana Center offers guiding questions to help education leaders in planning the implementation and evaluation of these transition courses.

Questions to guide implementation

1. Which entity is taking the lead on implementation—the state, a non-profit organization, institutions of higher education, or K–12 districts?
2. What is the scale of implementation—state, region, individual higher education institution, or K–12 district?
3. What are the costs of implementation and who will pay for it?
4. Which leaders and faculty members need information about implementation?
5. What forms of communication are necessary to reach the key leaders and faculty?
6. At what frequency will key leaders need to communicate?
7. How will districts and higher education institutions track which students became college ready through the transition course so that successful students enroll in college-level mathematics at their institution?
8. Will the NCAA recognize the mathematics transition course as a mathematics course credit? If not, which entity will be in charge of submitting it to the NCAA for review?

Questions to guide evaluation

1. Does the evaluation plan accurately measure if the district and higher education institution met their goals for the course?
2. What data needs to be collected (e.g., transition course passing rates, college readiness rates, postsecondary enrollment, mathematics course taking in college, matriculation to the second year of postsecondary)?
3. How can this data be collected?
4. Which institutions need to agree to share data and what needs to be written into a data sharing agreement, memorandum of understanding, etc.?
5. Is funding needed to support data collection?
6. Is parental or student consent necessary?

It is important to encourage a state or region to implement the same transition course for the benefit of students, faculty, and other stakeholders. Higher education faculty benefit by having more input into and information about the preparation of students who are enrolling in their courses. Students benefit from consistency because higher education institutions are more likely to recognize that successful completion of the course indicates college readiness. With the portability of a college readiness designation, students have increased options to select the higher education institution best suited to their needs and be better prepared for college

coursework. High school counselors, higher education advisors, and admission counselors have a less complex system to navigate if there is consistency across a state or region for the content of the transition course. Consistency makes it easier to communicate accurate information to students. High school faculty benefit from the opportunity to develop and use common resources across institutions.

The Dana Center encourages districts and their higher education partners to implement agreed-upon student learning objectives for a course and to evaluate implementation so the field can learn more specifically about how transition courses prepare students for success in entry-level college mathematics. We suggest collecting data on students' previous mathematics courses, course passing rates, final exam and college placement exam passing rates, and enrollment and success in college mathematics courses.

In Texas, the Dana Center supports over 35 districts in three regions to implement the College Prep Mathematics course, providing instructional materials that are aligned to the Framework. We have collected data as described above on two cohorts of students since 2016. Preliminary findings for the Dana Center mathematics transition course are promising and will be part of the two-year report to be released in Fall 2018. More information about the Dana Center mathematics transition course implementation efforts can be found in *K–12 and Postsecondary Collaboration to Improve Mathematics Course Alignment: Recommended Process and Case Studies (Charles A. Dana Center, 2018)*.

Other regions in Texas are working collaboratively and gathering data on different course models that are aligned to various content standards. A report by the Community College Resource Center, *What We Know About Transition Courses* shares data on transition courses across the country and points to promising results in Tennessee and the City University of New York's At Home in College transition effort.

CONCLUSION

This is an exciting time to be engaged in developing and implementing mathematics transition courses. These courses can dramatically increase the number of high school graduates who are ready to succeed in college mathematics courses. It is therefore critical to determine the appropriate content of these courses by considering external policy factors, engaging the right experts, clarifying goals, defining the target population, and to then evaluate implementation to ensure the course is meeting the intended outcome for the course. Implementing transition courses will be exponentially more valuable if mathematics education leaders across the country can learn from one another to more quickly hone this promising intervention. Transition courses can help fulfill the promise to students that high school graduation is synonymous with college ready.

REFERENCES

ACT, Inc. (2015). *The ACT profile report – National, graduating class 2015*. Retrieved from http://www.act.org/content/dam/act/unsecured/documents/ACT-National-Profile-Report-2015.pdf.

Bailey, T., Jeong, D. W., & Cho, S. (2009). Referral, enrollment, and completion in developmental education sequences in community colleges. *Economics of Education Review, 29*(2), 255–270. Retrieved from http://www.sciencedirect.com/science/article/pii/S0272775709001071

Barnett, E., Fay, M. P., Pheatt, L., & Trimble, M. J. (2016). *What we know about transition courses*. New York: Community College Research Center, Teachers College, Columbia University. Retrieved from http://ccrc.tc.columbia.edu/publications/what-we-know-about-transition-courses.html.

Burdman, Pamela, (2015). *Degrees of freedom: Varying routes to math readiness and the challenge of intersegmental alignment*. Retrieved from http://edpolicyinca.org/sites/default/files/PACE%202.pdf.

Charles A. Dana Center. (2017). *The case for mathematics pathways*. Austin, TX: Author.

Charles A. Dana Center. (2018). *K–12 and higher education postsecondary mathematics readiness collaboration: Recommended process and case study*. Austin, TX: Author.

Texas Higher Education Coordinating Board (n.d.). *Academic Course Guide Manual (ACGM)*. Retrieved from http://www.thecb.state.tx.us/AAR/UndergraduateEd/WorkforceEd/acgm.htm.