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Transition to College Mathematics Course Framework

Executive Summary

Launch Years
an initiative of

The University of Texas at Austin
Charles A. Dana Center

CCRC COMMUNITY COLLEGE RESEARCH CENTER
TEACHERS COLLEGE, COLUMBIA UNIVERSITY

Achieve

ESG Education Strategy Group

Association of Public & Land-Grant Universities

Background

Over the last 20 years, mathematics has become increasingly important to a growing number of fields of study and their related professions. A 1998 report by the National Science Foundation listed 11 fields of study that interface with mathematics, including physics, chemistry, economics, and manufacturing. Fifteen years later, the National Research Council expanded that number to 21 fields of study, which included entertainment, social networks, ecology, computer science, information processing, marketing, and defense.

Recent and ongoing changes in the K–12 and higher education systems have provided opportunities for K–12 school systems to align themselves with the implications of multiple pathways in postsecondary institutions. To help systems seize this opportunity, the Charles A. Dana Center at The University of Texas at Austin began the Launch Years initiative in collaboration with Community College Research Center, Achieve, Education Strategy Group, and the Association of Public and Land-grant Universities. This initiative seeks to modernize math in high school through relevant and rigorous math courses as well as through policies and practices leading to more equitable outcomes for all students.

As part of the Launch Years initiative, the Dana Center is working with stakeholders from K–12 and higher education to develop tools and facilitate processes to equip systems to enact two new approaches to high school mathematics: transition math courses, and changes in Algebra II requirements to build Algebra II-equivalent pathways (A2EPs).

Mathematics Transition Course Framework and Content

The *Transition to College Mathematics Course Framework* was developed by a design team comprising content experts in K–12 and higher education. The framework describes a senior-level transition course that encompasses multiple pathways and that supports students' social, emotional, and academic development—an often-overlooked aspect of education that research indicates is crucial to students' ability to thrive in school, career, and life.

The year-long transition course is intended for 12th grade students whose academic performance prior to their senior year or performance on an accepted external college readiness measure indicates that they are not yet ready to perform entry-level college mathematics coursework. The goal of the course is to ensure that these students meet a college readiness measure by the end of their senior year and are prepared for most entry-level, credit-bearing college mathematics courses, especially quantitative reasoning, statistics, or college algebra. It is expected that students enrolled in this course will have successfully completed Algebra I/Integrated Mathematics I (and any associated EOC exam) and Geometry/Integrated Mathematics II. In addition, students should have taken a third year of mathematics, such as statistics or Algebra II (or its equivalent).

Course Design Principles and Student Learning Outcomes

To guide developers in designing a transition course, the framework provides design principles that recommend how curricular materials and classroom instruction should be structured to support a coherent and engaging experience. Specific design principles illustrate what students are expected to do to engage with the content and what teachers should do to ensure engagement through meaningful activities.

The design principles address student and teacher behaviors that support active learning, constructive perseverance, problem solving, authenticity of mathematics and statistics, context and interdisciplinary connections, communication, and effective uses of technology. For example, the principle focused on active learning calls for regular opportunities for students to actively engage in discussions and tasks using a variety of different instructional strategies (e.g., hands-on and technology-based activities, small group collaborative work, facilitated student discourse, interactive lectures).

Students will . . .

- Be active and engaged participants in discussion, in working on tasks with classmates, and in making decisions about the direction of instruction based on their work.
- Actively support one another's learning.
- Discuss course assignments and concepts with the instructor and/or classmates outside of class.

Teachers will . . .

- Provide activities and tasks with accessible entry points that present meaningful opportunities for student exploration and co-creation of mathematical understanding.
- Create a safe, student-driven classroom environment in which students are not afraid to take risks or make mistakes, and are able to make decisions about the direction for instruction through the results of their exploration of mathematics and statistics.
- Facilitate students' active learning of mathematics and statistics through a variety of instructional strategies, including inquiry, problem solving, critical thinking, and reflection, with limited time spent in "direct teach" activities.

In addition to the design principles, the *Transition to College Mathematics Course Framework* shares sample learning outcomes for the course in these areas:

- **Social, Emotional, and Academic Development**

  Students should develop and strengthen social-emotional skills and competencies critical to academic success, including competencies in the cognitive, social and interpersonal, and emotional domains.

- **Numeric Reasoning**

  Students should solve authentic problems in a variety of contexts that require number sense and the ability to apply concepts of numeracy to investigate and describe quantitative relationships.

- **Proportional Reasoning**

  Students should represent and solve authentic problems using proportional reasoning with ratios, rates, proportions, and scaling. They should be able to strategically and flexibly utilize various representations to describe, make sense of, and draw conclusions in situations involving proportional reasoning.

- **Statistical and Probabilistic Reasoning**

  Students should use the language and tools of probability and statistics to quantify uncertainty in a variety of real-world contexts. They should make informed, evidence-based decisions and justify conclusions about populations based on a random sample from that population. They should be able to critically evaluate statements that appear in the popular media involving risk and arguments based on probability.

- **Algebraic Operations and Functional Analysis**

  Students should investigate problems that facilitate the transition from specific and numeric reasoning to general and algebraic reasoning. They should use the language, symbols, and structure of algebra and the key characteristics of functions and their representations (symbols, graphs, tables) to investigate, represent, and solve those problems.