



Mathematics in the First Two Years

Moving the Conversation Forward

SUSAN L. GANTER

There are a lot of exciting changes happening in the curriculum for the first two years! Widespread efforts to examine and revise introductory college mathematics courses—calculus, precalculus, developmental mathematics, introductory statistics, and quantitative reasoning—are changing the content and organization of these courses in significant ways. And while this is not a new conversation, the basis for the conversation is shifting dramatically from individual courses to a more integrated curriculum. MAA's Committee for Curriculum Renewal Across the First Two Years (CRAFTY), a subcommittee of the Committee for the Undergraduate Program in Mathematics (CUPM), is

organizing a series of articles written by individuals at the forefront of these changes. This is the first article in that series.

Conversations at the local and national levels have led to a strong convergence of ideas across the introductory college mathematics curriculum CRAFTY's Curriculum Foundations Project—which studied the mathematical needs of students in many partner disciplines—led to national changes in such courses as College Algebra (see MAA's College Algebra Curriculum Guide at maa.org/cupm/crafty).

The efforts of CRAFTY and others have motivated discussions that focus on the synergies across the courses in the first two years, recognizing the critical importance of a curriculum that simultaneously considers all of the mathematics topics, from developmental mathematics, statistics, quantitative literacy, the preparation of students for calculus, college algebra, and the wide variety of other offerings. For example, what mathematics do majors in the partner disciplines need? How might the topics and learning environment in course sequences like calculus or statistics be reconsidered to serve those needs?

The goal is no longer about “reforming” a specific course; rather, it is important that the selection of and sequence for necessary topics be developed in a way that maximizes the mathematical sophistication of the student audiences we serve. The question then becomes: What are the important mathematical themes in the first two years—across the many and varied courses—and how can we teach those themes in a way that empowers students and encourages them to employ that mathematics when studying problems in any arena?

CRAFTY is working to discover and promote these broadly conceived efforts to revise the curriculum across the first two years. A panel at the 2016 Joint Mathematics Meetings in Seattle, facilitated by CRAFTY Chair Su Dorée (Augsburg College), brought together curricular leaders from calculus, quantitative literacy, statistics, precalculus, and developmental mathematics—Mike Axtell (University of St. Thomas), Caren Diefenderfer (Hollins University), Patti Frazer Lock (St. Lawrence University), Rebecca Hartzler (Seattle Central College), and Bruce Yoshiwara (emeritus, Pierce College). This panel discussed questions about the changing nature of these introductory courses and served as the kickoff for this series of articles, with the purpose of promoting greater participation in this national conversation about mathematics in the first two years.

The panel was asked four questions: What is an example of a new or reformed curriculum in your area? Why is there a push right now to change the curriculum in your

area? What does the research tell us about how students learn in your area? What steps would you recommend to departments interested in changing this curriculum?


Panelists reported that the changing curricula take many shapes, including using simulations in statistics, teaching functions as process in precalculus, increasing the focus on quantitative thinking, incorporating biological and social sciences models into calculus, and developing alternative pathways to support underprepared students.

A variety of forces drive the curricular revisions: the power of new technologies, concerns about high failure and low graduation rates, and responses to the needs of partner disciplines and the workforce. All panelists

CRAFTY is working to discover and promote these broadly conceived efforts to revise the curriculum across the first two years.

affirmed recommendations from the Curriculum Foundations Project about the importance of learning environments that utilize relevant context, actively engage students in the learning, make connections between mathematics and other disciplines, and address students' varied levels of understanding and anxiety about mathematics.

In response to the final question, panelists agreed that there are many resources to help departments contemplating change—and encouraged colleagues to learn from others and utilize national policy documents and curricular guides. Other important steps include gathering and studying local student data, building a culture of departmental and university change through ongoing conversations, and providing faculty development and support.

Whether you already are examining courses that are part of the first two years or planning to start, there is much to be learned from the current widespread work in the introductory mathematics curriculum. Get involved in these important conversations on a local, regional, and national level. And watch for more information from CRAFTY's series of articles in the coming months about how these ideas apply to specific courses taught in the first two years! 

Susan L. Ganter is director of the School of Education and professor of mathematics at Virginia Tech. A former chair, current member, and longtime friend of CRAFTY, she has been a leader for the Curriculum Foundations Project since 1999 and continues to promote national efforts to implement recommendations across the first two years curriculum.