Everyone Counts: Reforming General Education
Mathematics for Student Success

AACU Creating a 21st-Century General Education
San Francisco, CA
February 16, 2019

DEWAYNE MORGAN
P-20 DIRECTOR
UNIVERSITY SYSTEM OF MARYLAND
This interactive session engages participants in a discussion of how to overcome the disciplinary, institutional, or regulatory challenges that far too often stand in the way of undergraduate general education reform in mathematics.

- **PART 1:**
  - Guiding Questions for Session
  - Maryland & USM Higher Education Context

- **Part 2:**
  - Maryland’s Story and Best Practices
  - State Policy Change
  - Maryland’s MMRI FITW Project

- **Part 3:**
  - Examination of Cases
  - Unresolved Issues
Guiding Questions for Session

- What are the value, purposes, and processes of building math pathways for majors?
- Are there compelling reasons to develop such a targeted pathway?
- Who needs to be in the room for initial discussions?
- What quality control mechanisms exist for ensuring that participating students exit the pathway with all necessary knowledge and competencies expected of a general education mathematics course?
University System of Maryland

✧ 11 degree granting institutions
  ▪ 3 research intensive institutions
  ▪ 3 HBI/MSI institutions
  ▪ 6 comprehensive institutions
  ▪ 1 adult education/distance education institution
  ▪ 1 research center for environmental sciences
  ▪ 2 regional centers that host programs from other institutions
  ▪ Professional schools of medicine, law, social work

✧ 120,000 undergraduates
✧ 41,700 graduate students
✧ 8,700 full-time faculty
✧ 6,500 part-time faculty
What & how are we reforming?

Systemic Approach

Content  Sequence Structure  Delivery  Student Supports  Faculty Supports

Articulation

Placement
Why focus on mathematics??

- Algebra has traditionally been the default math requirement for most college degrees. However, algebra is designed to prepare students for calculus rather than for the type of math many students need in their majors, jobs, and lives. With high failure rates in both college-level and developmental math, algebra often ends up functioning as a gatekeeper to higher education for students not majoring in a math-heavy field. Complete College America, 2018

- National average, 59 percent of community college students and 33 percent of students at four-year public colleges test into developmental math. Complete College America, 2012
What is the “right math”? 

Community College Student Enrollment into Programs of Study

- Require Calculus 20%

Four-Year Student Enrollment into Programs of Study

- Require Calculus 28%

What problem were we trying to solve in Maryland?

- Approximately 71% of Maryland’s community college students and 24% of four-year students were testing into developmental math courses
  - Existing regulations drove community college students toward math courses that did not align with the requirements of their majors and resulted in high failure and drop-out rates
  - USM institutions had multiple mathematics pathways, but community colleges did not, leading to inefficient transfer

- High Cost of Developmental Education
  - Community College: $7000/student ($75 Million)
  - USM: $9000/Student ($14 Million)
Our Goals for Improving Mathematics

- Reduce the number of students taking developmental or remedial math
- Increase the percentage of students who successfully complete developmental math within their first year of college
- Increase the percentage of first year freshmen who successfully complete a math course that fulfills a general education requirement in their first year
- Develop math pathways to place students in more appropriate courses for their educational goals and for success in their degree program area
- Provide better advising for incoming freshmen to support other goals
Developmental mathematics students should have access to...

- Multiple pathways aligned to specific fields of study
- Acceleration that allows students to complete a college-level math course in one year
- Intentional use of strategies to help students develop skills as learners directly linked to their courses
- Curriculum design and pedagogy based on proven practice coupled with a context sensitive improvement strategy
Challenges to developing innovations in general education mathematics?

- Misconception that any non-calculus intensive mathematics is basic/elementary (not college level)

- Who will teach these courses? Is this a concern? Why or Why Not?

- New general education requirements bring a host of other changes, including questions of funding, enrollment, and rigor. Who needs to be on board for general education changes?

- Other?
When state policy stifles innovation and improvement...

✧ **OLD LANGUAGE:** One course in mathematics at or above the level of college algebra

✧ **NEW LANGUAGE:** One course in mathematics, having performance expectations demonstrating a level of mathematical maturity beyond the Maryland College and Career Ready Standards in Mathematics (including problem-solving skills, and mathematical concepts and techniques that can be applied in the student’s program of study)
Maryland’s Math General Education Options

• College Algebra,

• Statistics, or

• Topics for Mathematical Literacy
  ◦ A college-level mathematics course, designed for college students who do not expect to need college algebra, a statistics course, or a higher-level mathematics course. The goal of the course is to focus on subjects that could be of value to students, and help to make them mathematically literate.
Essential Course Elements: Statistics

- Course outline builds on statistics strand from within the high school core curriculum

- Designed to prepare students for follow-up courses within their majors
Essential Course Elements: Topics for Mathematical Literacy

- Focus on mathematical needs in the future & connections to some liberal arts majors
- Growth models
- Financial skills
- Applying logic
- Interpreting probability of events
- Statistical reasoning
- Connections to art and/or music
Sharing your thinking and experiences

What are the mathematics general education policies for your institutions?

What is your experience developing new pathways for (or with) particular majors?
Achieving Buy-In For Policy Changes

Leadership From The Top

- Inter-segmental Chief Academic Officers
- Maryland Mathematics Reform Initiative Steering Committee
Engaging Faculty In Grassroots Leadership

- State Wide Math Group
- Maryland Mathematics Reform Initiative Workgroup
- Campus-level teams that include advisors, faculty, IR
- Ongoing Inter-institutional convenings to share progress and challenges
Example of Engaging Faculty: Statewide Mathematics Group

- Mathematics faculty representatives from all higher education institutions are invited (public and private, two-year and four-year)

- Sample Types of Work:
  - Established a core definition for general education mathematics and recommended core course components for the general education mathematics
  - Identified the expected student outcomes for the general education mathematics courses and developed potential methods of measuring student general education competencies or outcomes
  - Shared syllabi from individual institutions' general education mathematics courses and discussed how these traditional general education courses meet the competencies
Engaging Faculty: Maryland Mathematics Reform Initiative (MMRI)

- Designing multiple high-quality pathways linked to career paths, while...

- Ensuring that general education mathematics courses have sufficient mathematical integrity and rigor.
Engaging Student Advising Community

- Quality advising is an essential element of successful institutional plans and practice.

- What are the most effective methods of reaching out to student advising departments?

- What are the greatest challenges with sustaining relationships?
What are students saying about experiences in the new mathematics pathway?

➢ “Even talking about it now, I'm excited to take it. I'm excited.”

➢ “I was so proud of myself. I sucked at math and when I had done that class I was like, "Wow." I had an A and I never thought I could do that.”

➢ “This has made me think seriously about continuing and I'm 64. I'll be 65 next year for me to get my associates next year. I think I'm going to continue with it. I'm going to go to a four year college.”

➢ “I looked forward to going to statistics. I enjoyed it.”

➢ “Finally, I said, "You know what? I have no other option so I need to try this." I'm running an A in the class.”
CASE: Your institution has recently created a new general education mathematics option or pathway for students who are interested in pursuing non-STEM degrees. After two semesters, you notice that the enrollment in the new courses has remained very low. In fact, you may have to cancel some scheduled sections due to low enrollment.

- WHAT MIGHT THE CAUSE(S) OF THE LOW ENROLLMENT IN THE NEW MATHEMATICS COURSE?
- HOW MIGHT YOU GO ABOUT IMPROVING THE ENROLLMENT IN THE NEW COURSE?
- METRICS FOR SUCCESS?
CASE: Your state legislature is very concerned about the number of students being placed in developmental or remedial mathematics. They have even threatened to reduce state support for non-college credit courses taught by any 2-year or 4-year institution.

- HOW WOULD YOU DESCRIBE THE ISSUE AND CHALLENGE FOR COLLEGES AND UNIVERSITIES IN THIS STATE?
- WHY MIGHT THE LEGISLATURE BE CONCERNED ABOUT THIS ISSUE?
- WHAT ARE POTENTIAL STRATEGIES FOR ADDRESSING THIS ISSUE?
CASE: An examination of trend data for your institution’s placement exam reveals that most (75-80%) of the students who fail to place into a credit-bearing mathematics course, do so because they miss questions related to the same 2 or 3 concepts.

- PRE-QUESTION: WHO HAS ACCESS TO PLACEMENT DATA AT YOUR INSTITUTION?
- WHAT MIGHT YOU DO WITH THIS INFORMATION AS A FACULTY MEMBER?
- WHAT MIGHT YOU DO WITH THIS INFORMATION AS AN ADMINISTRATOR?
- WHAT OTHER INFORMATION/DATA MIGHT BE USEFUL?
CASE: You are department chair at a 4-year institution. You are examining trend data on student success in the first course of a particular degree program of study. You notice that there are significant differences in the success (grades on tests) in the degree’s first course between native and transfer students? There are no differences in class attendance or homework completion rate.

- HOW DO YOU USE THIS DATA?
- WHAT STRATEGIES DO YOU USE IF NATIVE STUDENTS OUTPERFORM TRANSFER STUDENTS?
- WHAT STRATEGIES DO YOU USE IF TRANSFER STUDENTS OUTPERFORM NATIVE STUDENTS?
CASE: You have just returned from a professional conference where you met a new colleague from a neighboring IHE who shared with you the details of their institution’s transformative general education course sequence (i.e., mathematics). You learn that student success in the course and subsequent progress to degree have improved for all students---but particularly for females and/or under-represented minorities.

- **Would this information be compelling for your institution? Why or why not?**

- **How might you go about leading your institution to examine its own general education course sequence? What’s your first move?**

- **What might be potential goals or metrics for success?**
On-going Policy and Implementation Questions

- How should we place students into the most appropriate mathematics course?

- What is the best approach to leading faculty discussions about the rigor of different mathematics courses?

- How should a system deal with transferability of the new courses?
Lessons Learned

- Make the case for improvement or innovation with partner disciplines.
- Communicate, communicate, communicate.
- Focus on learning outcomes *NOT* courses.
- Design for scale.
- Considerations for survey instrument.
- Know your measures for success: student, faculty, institution
Contact

Dewayne Morgan
University System of Maryland
dmorgan@usmd.edu