Finding a Balance: Purposeful Mathematics Pathways

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What problem are we trying to solve in Maryland?

- Intermediate Algebra is the “graveyard” for non-STEM majors

- Approximately 71% of Maryland’s community college students test 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

- Inefficient Transfer from community college to 4-year institutions
Can you relate?

Do any of these issues resonate with you on your campus or in your state? If so, which ones?
• Reduce the number of students taking remedial math

• Increase the percentage of students who successfully complete remedial 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 and returning non-traditional students
Cost of Remedial Education

*College and Career—Are Maryland Students Ready* (Maryland Department of Legislative Services February 2015)

- Community Colleges: $7000/student (for a total of $75.3 Million)
- USM: $9000/student (for a total of $14.0 Million)
Think. Pair. Share.

Consider the cost of remediation presented in the previous slide.

- What would you do if this remediation reality was in your state or institution?
- What would happen next?
- What role could you play?
Achieving Buy-In For Policy Changes

✧ Leadership From The Top
  - Intersegmental Chief Academic Officers
  - MMRI Steering Committee

✧ Engaging Faculty
  - Statewide Mathematics Group
  - MMRI Workgroup
  - Campus-level committees and task forces
Leadership from the Top

Example: Intersegmental Chief Academic Officers

The mission of the Intersegmental Chief Academic Officers (ICAO) affinity group is to support Maryland undergraduate education by providing a forum for communication across all segments of higher education. The ICAO helps define Maryland’s general education outcomes by facilitating intersegmental academic discipline group discussions and may act in an advisory capacity to State agencies on issues related to general education, transfer and program development.
Engaging Faculty

Statewide Mathematics Group

- Mathematics faculty representatives from all higher education institutions are invited (Public, Private, Community College, 4-year)

**Sample Types of Work:**

- Established a core definition for the mathematic general education and recommended core course components for the mathematic general education courses

- Identified the expected student outcomes for the general education mathematics courses and developed potential methods of measuring student general education competencies or outcomes

- Shared individual institutions' mathematics general education courses and discussed how these traditional general education courses meet the competencies
Policy Change: New General Education Language

**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).
What is the “right math”?  

**Community College Student Enrollment into Programs of Study**  
- Require Calculus: 20%  
- Do not require Calculus: 80%  

**Four-Year Student Enrollment into Programs of Study**  
- Require Calculus: 28%  
- Do not require Calculus: 72%  

Policy Takeaways

• Take advantage of existing structures and relationships

• Space or forum for open and frank dialogue is key

• Essential Conditions
  • Common understanding of the problem
  • Shared belief that the problem is important and needs to be addressed
Maryland Mathematics Reform Initiative:
A *U.S. Department of Education First in the World-funded Project*
MMRI-FITW Partner Characteristics

• Five 4-Year Baccalaureate Degree Institutions

• Seven 2-Year Community Colleges

• Ten Institutions with open or non-competitive acceptance

• One HBCU

• Two Institutions w/ Majority Non-traditional Freshmen

• Four Rural-Serving Institutions

• Three Research-Oriented Institutions

• Institutional Enrollment Ranging from 3,100 to 85,000
MMRI Logic Model

Inputs

- Dana Center Math Pathways materials
- Experience of IHE Pathway experts, consultants, and project leaders
- Funding from FITW
- Advisors: Brit Kirwan, Uri Treisman

Activities

- Conduct Needs Assessment
- Create Stats Pathway course
- Develop Stats Pathways curriculum: Conduct quality review by IHE experts, Develop placement strategy
- Transferability Review
- Develop normed Stats Pathways course assessment

Outputs

- # students who enter college
  - 1 level below in math
  - 2 levels below in math
  - # of IHEs that develop a Stats Pathway course for students who enter college but are not ready to take college-level math
  - 1 level below
  - 2 levels below
  - #% of faculty using Stats Pathway course materials
- #% of Stats Pathway courses created
- #% of types of students enrolled in a Stats Pathway course who are:
  - 1 level below in math
  - 2 levels below in math

Short

- Students: Pass developmental math, Enroll in college-level stats, Pass college-level stats, Accumulate college credits, Hold positive views of themselves as learners

Outcomes

- Institutions: Introduce new approaches to teaching and supporting students, Adopt broad use of instructional principles targeted in redesigned courses, Accept Stats Pathway course credits within and across IHEs
- Institutions: Seamless transfer of Stats Pathway course across MD, Increased financial and faculty resources to support student research experiences (resulting from lower need for faculty to reteach the same course to struggling math students), Contribute findings to the knowledge base

Contextual factors: Policy context, IHE coordination, local IHE challenges, population differences, state-wide math group advisory council, support for system-wide capacity transformation provided by the USM’s Center of Academic Innovation
Maryland FITW Research Design

Students - 1 or 2 levels below college level math

**FALL Course**
- **Treatment Group**
  - New Developmental Pathway Course
  - 1 or 2 levels below

**Control Group 1:**
- Intermediate Algebra
  - 1 level below college math

**Control Group 2:**
- Elementary Algebra
  - 2 levels below

**SPRING Course**
- Gen. Ed. Statistics
Maryland FITW Timeline

Fall 15
Project Begins;
Planning & Kickoff Events

Spring-Summer 16
Development of curriculum and placement, advising, & registration processes

Fall 17 – Spring 18
Evaluation Cohort Enrolled

Fall 16
Spring 17
New Statistics Pathways Launch
Pilot Cohort Enrolled

Jan 16
Course Outcomes Defined

Fall 17– Spring 20
Data Collection, Analysis, Dissemination
Newly-Designed Course
Outcomes and Frameworks for Non-STEM Majors

• Developmental Mathematics Course
• General Studies Statistics
• Topics for Mathematical Literacy: Liberal Arts Math
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 between faculty, advisors, and administrators?
Challenges and Next Steps

1. Will we have enough students enrolled in the experimental sections for a robust study?

2. What is the best way to ensure that the experimental sections of the courses are measuring common outcomes?

3. What do we need to do to ensure that the new courses transfer seamlessly?

4. Can we improve the way we gather data, including qualitative information to monitor the progress of the project and the students?

5. What happens to students who start down non-stem pathway and decide to change majors to STEM?

6. How should the academic community respond to the push for common course numbering, when the goals is common course outcomes?

7. Who decides if the Statistics courses and Quantitative Literacy courses cover the minimal mathematical concepts and skills necessary for civic participation?
Think. Pair. Share.

What strategies would you use to engage faculty in intra-and inter-institutional conversations?

- Faculty in disciplines outside mathematics rarely ask their students to find the equation of the line that passes through two given points. But social scientists, for example, will expect students to recognize a linear pattern in a set of data, interpret the parameters of the line of best fit, and use the equation of the line to answer questions in the context of a real-world scenario. Mathematical sciences departments should be aware of applications used in other disciplines and adjust their general education and introductory courses accordingly (p. 21)
What’s the connection of mathematics and mathematical thinking to civic engagement and citizenry?

“Trump has claimed that studies back up his belief [that up to five million ballots were illegally cast]. Those studies, however, prove no such thing. A 2012 Pew study found that about 1.8 million deceased people were still on the rolls and that 2.75 million people were registered in two states. The study called for states to clean up their voter rolls but did not draw conclusions about voter fraud.

Spicer incorrectly claimed that the Pew study showed that 14 percent of voters were noncitizens. That was a different study that was later debunked by other social scientists. One attempt to quantify cases of voter impersonation fraud over a period of years found just three handfuls of cases out of about a billion ballots cast. Dartmouth College conducted a post-election study of the 2016 results and found “no evidence of widespread voter fraud.”

Still, in a time of hyper-partisanship, doubts about the credibility of elections exist. Pre-election polling by The Washington Post and ABC News found that between 1 in 5 and 1 in 6 Americans said voting by people who were ineligible happened “very often.” A September survey found that, overall, 47 percent of likely voters said it happened either “very” or “somewhat” often.

Dan Balz, Washington Post, January 25
Policy Questions

• How To Best Place Students Into The Most Appropriate Mathematics Course?

• How To Lead Faculty Discussions About Rigor of Different Mathematics Courses?

• Should There Be A Common-Shared Credit-Allotment For Mathematics Courses?

• Does/Should Developmental Mathematics Transfer?
QUESTIONS?
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