
A Gateway to College: Rethinking Postsecondary Mathematics



Overview

- High rates of remediation in mathematics at broad-access institutions
- Possible barrier to college completion
- Concerns about alignment between K12 and higher education math requirements
- Challenges around articulation and transfer of math course credits
- Questions of equity and fairness



Today's Presenters



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The Ohio Mathematics Initiative

Joan Leitzel and Luis Casian



Presentation Overview

- Why revisit postsecondary mathematics at this time?
- How Ohio has structured the review process
- Where work in Ohio is at this time
- Q&A



Reasons we teach mathematics to postsecondary students

- For some, mathematics is an area of choice.
- For some, mathematics includes the tools they need in mathematics-dependent disciplines.
- For all, mathematics can build important “habits of mind”: logical reasoning, analytic and problem solving skills, quantitative modeling and simulation tools.
- For all, we teach appreciation for the applications of mathematics, its relevance, its structure, and its beauty.



Concerns at Ohio Board of Regents in Spring 2013

- Postsecondary mathematics perceived as barrier to entry into other fields of study and as barrier to college completion.
- Students experiencing problems in transfer of mathematics course credit from one institution to another.
- Additional areas of study are now mathematics dependent.
- Ohio anticipating significant changes in secondary mathematics preparation for future graduates.
- In addition to possible changes in course content, there are new tools available for instruction in mathematics.



Ohio Board of Regents (OBR)

- Formed Ohio Mathematics Initiative (OMI) Steering Committee in summer 2013 to study issues and make recommendations for change.
- Steering Committee comprised of 6 mathematics faculty from universities, 5 from two-year colleges, plus Joan Leitzel, chair.
- Two consultants, Uri Treisman and Jenna Cullinane, University of Texas



Charge to OMI Steering Committee

To develop expectations and processes that result in each campus offering pathways in mathematics that yield

- (1) increased success for all students in the study of mathematics,
- (2) a higher percentage of students completing degree programs, and
- (3) effective transferability of credits for students moving from one public institution to another.



Work of OMI Steering Committee

- Identified 5 areas where change was probably needed
- Identified perceived problems and opportunities in each area
- Identified likely drivers of each problem
- Drafted strategies for addressing problems
- Hosted two meetings with 36 department chairpersons
- Crafted recommendations and wrote final report by early 2014



Four Steering Committee Assumptions:

- The work of implementation and change would be done on the campuses by faculty who understand the problems and not handed down from on high.
- Different institutions in Ohio have different missions so program uniformity is not a goal, but rather appropriate and improved programs in every school.
- Criterion for a course being at “college level” and yielding college credit will be that the course builds on and extends Ohio’s secondary school math standards.
- Traditional Intermediate Algebra course is not college level.



OMI Steering Committee: Areas Needing Work

1. Entry level courses and alternative course pathways
2. Criteria and processes for course credit transfer
3. Communication and outreach across the 36 mathematics departments and between the mathematical sciences departments on each campus and their stakeholder departments
4. Data collection, data analysis, and data sharing
5. Alignment of secondary and postsecondary course content and instruction



Response of Math Departments to OMI Steering Committee Recommendations

- The 36 departmental chairpersons took the lead with Luis Casian, Ohio State, serving as convener.
- Formed five working groups that reflect the Steering Committee's five problem areas and related recommendations.
- Five working groups include 71 mathematics faculty members, 25 of whom are chairpersons.
- OBR provides staff support; work has attracted two small grants.



Lessons learned

Lessons learned from working with the OMI Steering Committee

- We learn from each other.
- We can work together.
- This is an important time of special opportunity.
- We have a responsibility to make changes.

And we were reminded

- Public education is never easy.
- The work is never done: mathematics is a dynamic field.



Summarizing: the final report of the Steering Committee has five goals

The first goal responds to: (a) the high percentage (40%) of students attending College requiring remediation and (b) the lack of adequate initial (gateway) math courses that are well linked to the student's intended area of study.



1. Develop high quality entry level courses and pathways
2. Develop transfer policies which are flexible and focus on student learning outcomes
- ➔ 3. Develop a network Math Chairpersons aiming at having better overall communication across campuses
4. Improve Mathematics instruction while collecting, analyzing, and sharing relevant data.
5. Improve student success: align post-secondary expectations with High School practice



- I note that 3) led to the formation of a network of Chairs of Math Departments in the State of Ohio
- However it turned out that Item 3) *addressed much more than a communication issue:*
- It also created a space for *democratic processes* to take place which lead to policies of the Ohio Department of Higher Education



Grassroots level: Community of Faculty working on many institutions in the state of Ohio on instructional issues



Network of Math Chairs in the State of Ohio



Official educational policy level: The Ohio Department of Higher Education





What is Being Done?



- Some definitions emerging from discussions in the Chair's network:
- A credit-bearing, college-level course in Mathematics must use the standards required for high school graduation by the State of Ohio as a basis and must do at least one of the following: 1) broaden, or 2) deepen, or 3) extend the students learning



- A Math Pathway is a math course or sequence of courses taken by both college-ready and underprepared students to meet the requirements of their program of study.
- A pathway allows students to actively engage with mathematical concepts, access prior knowledge, and reflect on new learning.
- A pathway aligns with specific fields of study.



- Math Gateway courses are credit bearing, college-level course in Mathematics that a sequence of course in a given pathway begins with.
- Examples of gateway courses: a newly developed Quantitative Reasoning course, and existing College Algebra and Statistics courses.



- Three Pathways have been identified or developed and a fourth one is in the planning stages



1. Statistics Pathway

College-level introductory statistics course designed for students without a calculus background and who do not require College Algebra or Calculus.



2. Quantitative Reasoning Pathway

College-level courses designed to emphasize quantitative thinking and problem solving using quantitative methods.



3. STEM Preparation Pathway

College-level courses designed for students in mathematics-intensive majors.



- An additional pathway is in the planning stages for Early and Middle Childhood Education majors.

Transformation at-scale across the University System of Georgia

Malcolm Adams and German Vargas



University System of Georgia

- 29 institutions
- More than 300,000 students
- 4 Research Universities, 4 Comprehensive Universities, 10 State Universities, 11 State Colleges
- 6 year graduation rates range from below 30% to 83%



Introduction

- January 2013: The University System of Georgia (USG) establishes a system-wide Task Force on the Role of Mathematics in College Completion
- Task Force:
 - 8 mathematics faculty from a wide spectrum of institutions, 4 USG specialists.
 - Consultants: Uri Treisman, Jenna Cullinane from Dana Center and Bruce Vandal from CCA
 - Charge: *How to dramatically increase success rates in mathematics gateway courses without compromising the integrity of the mathematical content*



Introduction

- July 2013: Task Force final report - 8 recommendations.
- September 2013: Ad Hoc Steering Committee appointed by USG to direct implementation.
 - A broad representation of faculty from every USG institutional classification.
 - Works in conjunction with the Advisory Committee on Mathematical Subjects (ACMS).



Introduction

- February 2014: The Ad Hoc Steering Committee finalizes the implementation plan - endorsed the ACMS.
- March-April 2014: A series of regional workshops to discuss institutional ideas and concerns, followed by a system-wide Transforming Remediation Symposium.



Recommendation 1

- **Focus on supporting success in college credit-bearing, gateway mathematics courses for *all* students.**
 - Remediation should focus on success in college level courses, not to reteach HS material unless it is essential to college course success.



Recommendation 2

- **Align gateway mathematics course sequences with academic programs of study. In particular, College Algebra should not be the default class for non-STEM majors.**
- Two Pathways: STEM (1111) and non-STEM (1101 or 1001)
 - MATH 1111 College Algebra:
 - This course was designed explicitly to develop the algebra skills needed for success in calculus. Students who will not need these specific skills in a later course are usually better served in the other pathway.
 - MATH 1001 Quantitative Reasoning or MATH 1101 Introduction to Mathematical Modeling:
 - Both courses include the analysis of data–centered problems with the intent of developing appropriate mathematical models and communicating results in a clear and effective fashion.



Recommendation 3

- **Implement a co-requisite approach to support student success in gateway mathematics courses.**
 - Just-in-time support



Recommendation 4

- **Develop year-long mathematics pathways for students with significant gaps in preparation.**
 - Year-long Pathways:
 - First term: Foundations course
 - Second term: Gateway + Co-requisite



Recommendation 5

- **Use multiple measures to place students in gateway courses and appropriate supports.**
 - A combination of high school GPA and a standardized test score is a better predictor of student success in a gateway math course than either measure alone



Recommendation 8

- **Develop advising systems and protocols for placing students in gateway mathematics courses and co-requisite supports that align with their intended programs of study**
 - Transitioning to the new system of gateway mathematics courses and course support systems demands significant change in long-established traditions of college advising by both faculty and professional staff.



Recommendation 3 Implementation Plan

- **Implement a co-requisite approach to support student success in gateway mathematics courses.**
 - **Implementation Plan:**
 - Support courses aligned separately with STEM and non-STEM gateway courses
 - Implementation parameters well defined
 - Common course numbering throughout the state
 - Best practices outlined
 - Course descriptions, sample syllabi, and sample curriculum proposals provided to support the implementation at each institution



Recommendation 4 Implementation Plan

- **Develop year-long mathematics pathways for students with significant gaps in preparation.**
 - **Implementation Plan:**
 - Foundation courses also aligned with STEM and non-STEM gateway courses
 - Implementation Parameters well defined
 - Common course numbering throughout the state
 - Best practices outlined
 - Detailed course descriptions for each of the new foundation courses, including course content, course outcomes, and student learning objectives.
 - Sample syllabi, sample curriculum proposals, and sample year-long pathway curricular models (from other states) provided to support the implementation at each institution



Recommendation 5 Implementation Plan

- **Use multiple measures to place students in gateway courses and appropriate supports.**
 - **Implementation Plan:**
 - **Math Placement Index (MPI)**



Status of Implementation

- All the recommendations (with the exception of the MPI) have been implemented at-scale throughout the system.

Success rates in Gateway Course by area of remediation		
Area	Fall 2011, Pre-req Remed within 2 years	Fall 2015, Corequisite in 1 term
Math Only	26%	69%
English Only	36%	73%
Both	16%	63%
All (Total Remedial)	24%	70%



Status of Implementation

- Performance beyond the gateway courses (CCGA Data):

Success in courses beyond the gateway course CCGA Spring 15 - Spring 16		Enrolled	Passed	%
Trigonometry	College Algebra + Corequisite Support	17	9	53%
	College Algebra with no remediation requirement	238	150	63%
Probability and Statistics	College Algebra + Corequisite Support	47	27	57%
	College Algebra with no remediation requirement	883	573	65%
Probability and Statistics	Quantitative Reasoning + Corequisite Support	39	25	64%
	Quantitative Reasoning with No remediation requirement	883	573	65%



Lessons Learned to Date

- From the Implementation
 - Use the time in the corequisite support wisely
 - Do not teach material that is not completely linked to the content that is being presented in the gateway course.
 - The support that the students need goes beyond content (e.g. study skills, discipline, and persistence).
 - Be open and ready to solve additional administrative challenges.
 - Faculty Workload
 - Scheduling and space utilization
 - Faculty credentials
 - Financial Aid
 - Be ready to reevaluate placement thresholds



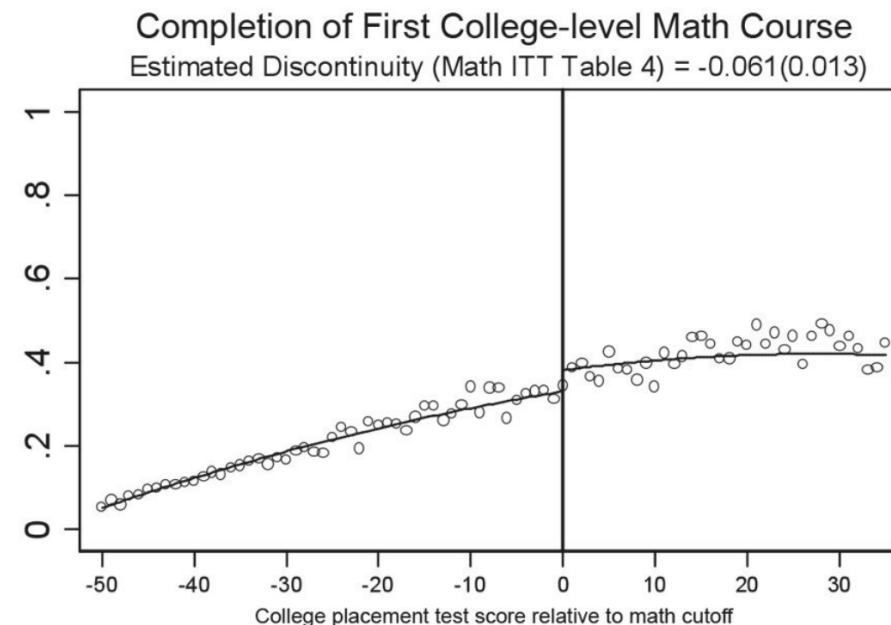
Lessons Learned to Date

- Importance of the role of faculty in the development of system-wide changes
- Importance of institutional data awareness
 - Create a sense of urgency
 - Contextualize the issues



Lessons Learned to Date

- The corequisite approach may be counterintuitive for some faculty
 - Compare and contrast your internal institutional or state research to national research, and prepare to be challenged.
- **Diagnosis and Treatment**



Calcagno, J. C., & Long, B. T. (2008). The impact of postsecondary remediation using a regression discontinuity approach: Addressing endogenous sorting and noncompliance (NCPR Working Paper), New York, NY: National Center for Postsecondary Research.



Resources

- http://www.usg.edu/educational_access/complete_college_georgia/transforming_remediation
- http://www.usg.edu/educational_access/documents/transforming_remediation/TaskForceMath.pdf
- http://www.usg.edu/educational_access/documents/transforming_remediation/AdHocSemiFinalMath050214.pdf

Discussion



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Thank You For Joining Us

The webinar will be posted on the websites of The Opportunity Institute and LearningWorks.

For more information, please contact: Pamela Burdman,
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And join us for the second webinar in this series on June 8.
More info at theopportunityinstitute.org.

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