Transitioning Learners to Calculus in Community Colleges

http://occrl.illinois.edu/tlc3

Removing Barriers for Students of Color in the STEM Math Pathway

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NSF HIGHLINE COLLEGE ILLINOIS UNIVERSITY OF ILLINOIS AT URBANA-CHAMPAIGN SAN DIEGO STATE UNIVERSITY SCHOOL OF EDUCATION UNIVERSITY OF MICHIGAN

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Racial Equity in the STEM Math Pathway

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The TLC3 Approach

Building racial equity requires “race-conscious” approaches

Constellation of efforts are required in these areas

Placement **Courses** **Instruction** **Support** **Institutional Responsibility**

Institutional Self-Assessment tools can transform how colleges identify and remove barriers for URM (underrepresented racially minoritized).

Our Research

- **2016-17**

National Survey of Community College Mathematics Chairs

- **2018-19**

Case studies of minority-serving institutions (PBI, HSI, AANAPISI, Tribal College)

- **2019-20**

Content validation by TLC3 Advisory Board

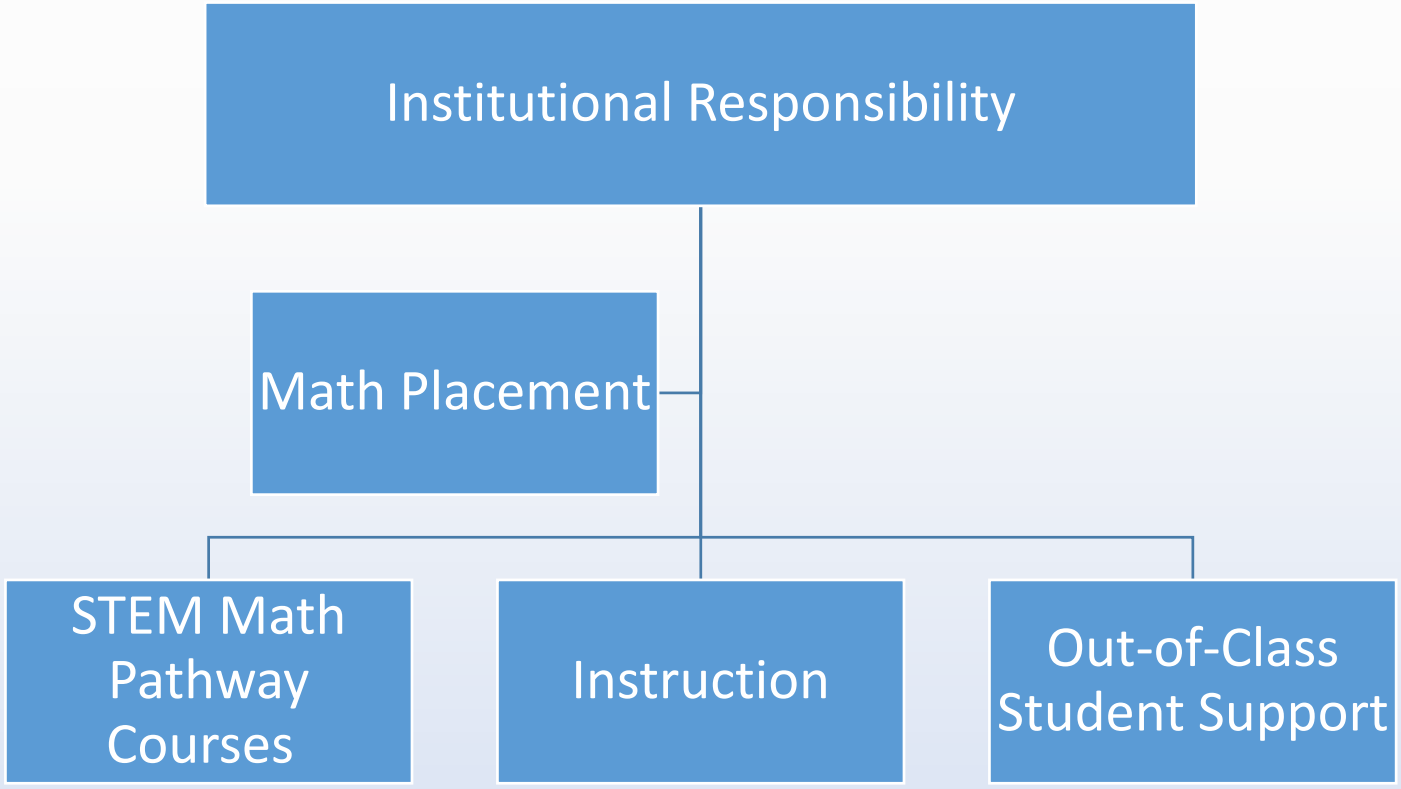
Publications, Podcasts, and Webinars can be found at http://occrl.Illinois.edu/tlc3

Creating racial equity requires “race-conscious” approaches

Which students are a priority at your college?

https://docs.google.com/document/d/1USBcCxiXagVFZaaHSOpQJo5rNJgVi83HSWZMb872sEg/edit?usp=sharing

Improvement at scale requires a **constellation** of efforts involving **multiple campus stakeholders**



Calculus Allies

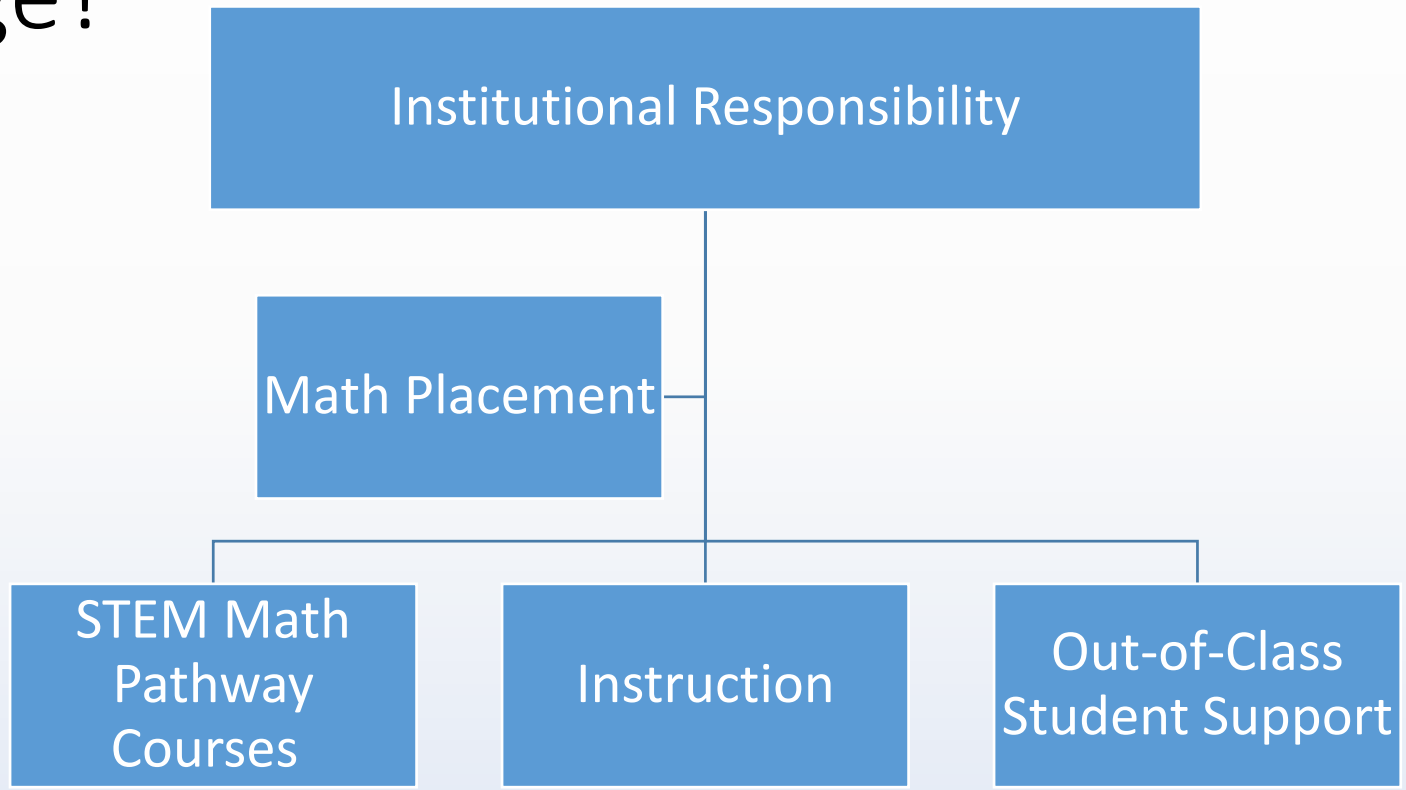
Wake Technical Community College
24% African American; 49% European American; 10% Latinx

Strategic plan specifies attention to underrepresented groups
Redesigning precalculus with a spiral approach and required lab manual (activities and
worksheets
Instructional improvement through faculty leadership team
Coordinated outcomes assessment

Howard Community College
31% African American, 34% European American, 14% Asian, 12% Latinx

Enhancing student learning in upper-level STEM math pathway courses
Honors Calculus (1, 2, 3)
Companion seminars for linear algebra and differential equations
Campus research journal includes student math submissions

Which domains have been the focus at your college?



https://docs.google.com/document/d/1Oik1kWxQEUnwoA12vlIQY9WB4s1vQlodcmEe8b6_3Wk/edit?usp=sharing

Self-Assessment Tools

www.curriculumresearchgroup.org

The pandemic is an opportunity to do planning and to build infrastructure, develop action plans.

Single-page infographic with domains and practices
https://drive.google.com/file/d/1-JzK07Klh1ZQAhMxVFQuS2W9j1PRjE0U/view?usp=sharing

Multi-page document with interactive response set
https://drive.google.com/file/d/1-S9Y6jKo1LjUPb5oyc9V3IGR0qAfWwqo/view?usp=sharing

Online form (mobile-friendly)
https://survey.az1.qualtrics.com/jfe/form/SV_73BIw6xBAzFfbeJ

1. Mathematics Placement

Processes used to determine the first course URM students need to take in the STEM math pathway course sequence.

	To what extent has your college implemented this practice?	Are the majority of your URM students aware of this practice?	What next steps are needed to enhance your efforts around this practice?
1.1 Mulitple measures used for placement, including high school transcripts	○ Fully implemented ○ Being implemented ○ Being proposed ○ Not implemented	○ Yes ○ No ○ Unsure ○ Not applicable	
1.2 Advising about the placement process and results is given to students	○ Fully implemented ○ Being implemented ○ Being proposed ○ Not implemented	○ Yes ○ No ○ Unsure ○ Not applicable	
1.3 Policies and practices ensure highest possible placement (e.g. retesting, test prep resource, adjustments afer term begins)	○ Fully implemented ○ Being implemented ○ Being proposed ○ Not implemented	○ Yes ○ No ○ Unsure ○ Not applicable	

2. STEM Math Pathway Courses

The sequence of courses that URM students interested in pursuing STEM majors must take at the two-year college. Math courses in the pathway can range from developmental mathematics through precalculus and calculus.

	To what extent has your college implemented this practice?	Are the majority of your URM students aware of this practice?	What next steps are needed to enhance your efforts around this practice?
2.1 The course sequence and required course materials in the STEM math pathway are optimized for timely progress	○ Fully implemented ○ Being implemented ○ Being proposed ○ Not implemented	○ Yes ○ No ○ Unsure ○ Not applicable	
2.2 Courses are designed to transfer to baccalaureate institutions	○ Fully implemented ○ Being implemented ○ Being proposed ○ Not implemented	○ Yes ○ No ○ Unsure ○ Not applicable	
2.3 Data on student outcomes in STEM math pathway courses, disaggregated by race/ethnicity within gender, are reviewed at least annually by mathematics faculty	○ Fully implemented ○ Being implemented ○ Being proposed ○ Not implemented	○ Yes ○ No ○ Unsure ○ Not applicable	

4. Student Support

Refers to out-of-class supports for URM students in the STEM math pathway.

	To what extent has your college implemented this practice?	Are the majority of your URM students aware of this practice?	What next steps are needed to enhance your efforts around this practice?
4.1 Current grade standing is available to students throughout the term	○ Fully implemented ○ Being implemented ○ Being proposed ○ Not implemented	○ Yes ○ No ○ Unsure ○ Not applicable	
4.2 Dedicated space is available on campus for students to gather and work together on mathematics	○ Fully implemented ○ Being implemented ○ Being proposed ○ Not implemented	○ Yes ○ No ○ Unsure ○ Not applicable	
4.3 Math tutoring and instructor office hours are available and easily accessible to students	○ Fully implemented ○ Being implemented ○ Being proposed ○ Not implemented	○ Yes ○ No ○ Unsure ○ Not applicable	
4.4 Relevant support services are highlighted in syllabi and during instruction (e.g. tutoring, disability services, transfer advising, wellness center)	○ Fully implemented ○ Being implemented ○ Being proposed ○ Not implemented	○ Yes ○ No ○ Unsure ○ Not applicable	

5. Institutional Responsibility

Refers to a value system that suggests the institution takes ownership of and assumes responsibility for the success of URM students.

	To what extent has your college implemented this practice?	Are the majority of your URM students aware of this practice?	What next steps are needed to enhance your efforts around this practice?
5.1 Permanent base funding is provided by the college to bolster and support the success of URM students in the STEM math pathway	○ Fully implemented ○ Being implemented ○ Being proposed ○ Not implemented	○ Yes ○ No ○ Unsure ○ Not applicable	
5.2 High-quality and ongoing professional learning focused on inclusive teaching strategies, implicit bias, and racial micro-aggressions is provided to full- and part-time mathematics faculty	○ Fully implemented ○ Being implemented ○ Being proposed ○ Not implemented	○ Yes ○ No ○ Unsure ○ Not applicable	
5.3 Targeted efforts are undertaken by the college to provide resources for students facing food, health, and housing insecurities (e.g. food pantry, free walk-in clinic, emegency financial assistance)	○ Fully implemented ○ Being implemented ○ Being proposed ○ Not implemented	○ Yes ○ No ○ Unsure ○ Not applicable	

3a. Instruction, Mathematical

Refers to instructional practices that support the development of procedural flexibility, conceptual understanding, and the communication of mathematical ideas, and that contribute to the development of a positive mathematical identity.

	What proportion of your faculty (full- and part-time) are doing this practice for URM students?	Are the majority of your URM students experiencing this practice?	What next steps are needed to enhance your efforts around this practice?
3a.1 Student active involvement in problem solving is central to mathematics instruction	○ All ○ Most ○ Some ○ None	○ Yes ○ No ○ Unsure ○ Not applicable	
3a.2 Students are invited to discuss or share their thinking about mathematics with each other	○ All ○ Most ○ Some ○ None	○ Yes ○ No ○ Unsure ○ Not applicable	
3a.3 The relevance of mathematics is made explicit to students during class or in class materials	○ All ○ Most ○ Some ○ None	○ Yes ○ No ○ Unsure ○ Not applicable	
3a.4 The mathematical content and tasks are challenging in terms of cognitive demand	○ All ○ Most ○ Some ○ None	○ Yes ○ No ○ Unsure ○ Not applicable	

3b. Instruction, Relational

Refers to instructional practices that can positively impact URM students in mathematics classrooms.

	What proportion of your faculty (full- and part-time) are doing this practice for URM students?	Are the majority of your URM students experiencing this practice?	What next steps are needed to enhance your efforts around this practice?
3b.1 Authentic care and welcomeness to engage are expressed to students	○ All ○ Most ○ Some ○ None	○ Yes ○ No ○ Unsure ○ Not applicable	
3b.2 What students find helpful or hindering in their college and math courses is well known and understood by mathematics faculty	○ All ○ Most ○ Some ○ None	○ Yes ○ No ○ Unsure ○ Not applicable	
3b.3 Student questions and concerns are validated and addressed in a timely fashion	○ All ○ Most ○ Some ○ None	○ Yes ○ No ○ Unsure ○ Not applicable	
3b.4 Performance monitoring techniques are used consistently (e.g. feedback on learning, reminders about deadlines, etc.)	○ All ○ Most ○ Some ○ None	○ Yes ○ No ○ Unsure ○ Not applicable	

Why might these practices positively impact URM student success in the STEM Math Pathway?

STEM Math Pathway Courses

1. The course sequence and required course materials in the STEM math pathway are optimized for timely progress

2. Courses are designed to transfer to baccalaureate institutions

3. Data on student outcomes in STEM math pathway courses, disaggregated by race/ethnicity (African American, Latinx, Indigenous, Southeast Asian) within gender, are reviewed at least annually by mathematics faculty

Why might these practices positively impact URM student success in the STEM Math Pathway?

Student Support (out of class)

1. Current grade standing is available to students throughout the term
2. Dedicated space is available on campus for students to gather and work together on mathematics
3. Math tutoring and instructor office hours are available and easily accessible to students
4. Relevant support services are highlighted in syllabi and during instruction

Why might these practices positively impact URM student success in the STEM Math Pathway?

Pick a domain or two

Note your ideas about why these practices might have disproportionate impact on URM student success:

https://docs.google.com/presentation/d/1f1p3TovdGMwFh5XYN6OprkYIJWlA7kQ4xoMR1EvjD-Q/edit?usp=sharing

Discussion

- Racist ascriptions of intelligence can be heightened in mathematics
- Lived experienced of URM influences engagement with the institution and faculty
- Race/ethnicity is correlated with first-generation and socioeconomic status
- Help-seek patterns can differ by race/ethnicity and gender

Mitigate these through

- Fair placement
- Optimizing costs
- Out-of-class support
- Positive faculty-student interactions (requires professional development)
- Permanent funding for faculty PD (full- and part-time) and URM student support in STEM

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Thank you!

Consider completing the institutional self-assessment tool

Follow-up available through 2020-21

Interested in providing feedback on the Self-Assessment Tool?

Join our networked community: hburn@highline.edu

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Burn, H., Mesa, V., Wood, J. L., & Zamani-Gallaher, E. (2016). *Collaborative research: Transitioning learners to calculus in community colleges (TLC3): Advancing strategies for success in STEM* (NSF Award 1625918, 1625387,1625946,1625891). Retrieved from National Science Foundation website: https://www.nsf.gov/awardsearch/showAward?AWD_ID=1625918

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