



# Programs, Structures, and Instructional Strategies that Facilitate Diverse Learners Transitioning to and through Calculus in Two-Year Colleges

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Saturday, January 13, 2018  
2018 Joint Mathematics Meetings  
San Diego, California



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## Outline

- Intro to TLC3 – theory and frameworks
- Present selected findings from TLC3 survey of mathematics department chairs
- Examine differences by minority-serving institution (MSI) status

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## TLC3 Goal

To transform the way institutions approach improving student success in the Dev Math-Precalc-Calc II (DPC2) sequence for historically underserved students, including underrepresented racial minority (URM) students.

Support for this work is provided by the National Science Foundation's Improving Undergraduate STEM Education (IUSE) program under Awards 1625918, 1625387, 1625946, 1625891. Any opinions, findings, and conclusions or recommendations expressed in this material are those of the author(s) and do not necessarily reflect the views of the National Science Foundation.

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## Our Approach:

- Form a networked community around this effort
- Identify current programs and instructional strategies in DPC2 through math chair survey
- Identify how these effect student success, particularly for historically underserved students, through case studies
- Develop a model and self-assessment tools for the networked community to use at their college

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## Theory and Research that Informs our Work

Transition Theory: Situation, Self, Support, and Strategies  
(Schlossberg, 1981)

Anti-Deficit Framework: Focus on what helps student and  
program assets and what contributes to success  
(Harper, 2010)

National Study of Calculus two-year college findings  
(Burn, Mesa, & White, 2015)

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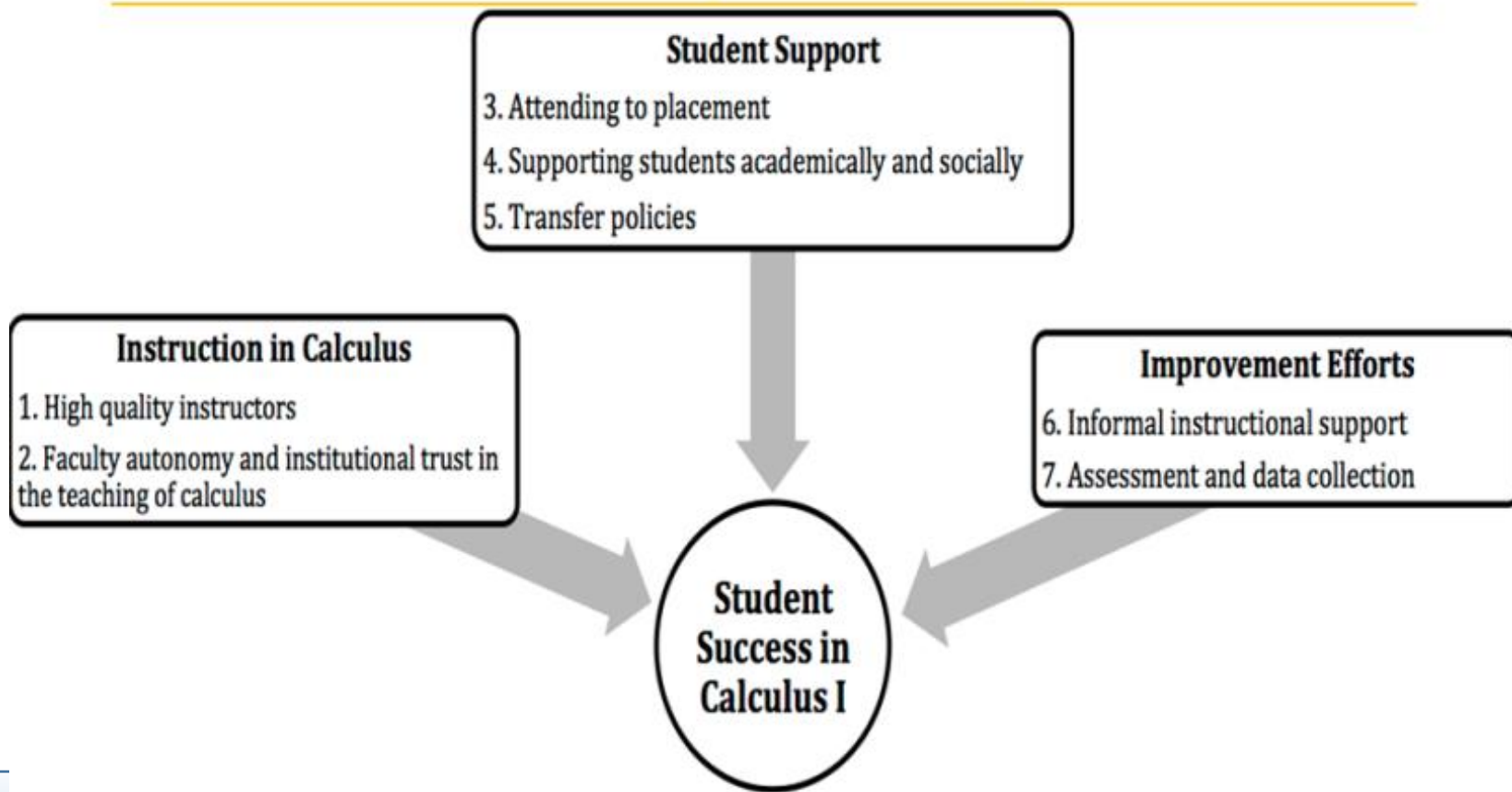
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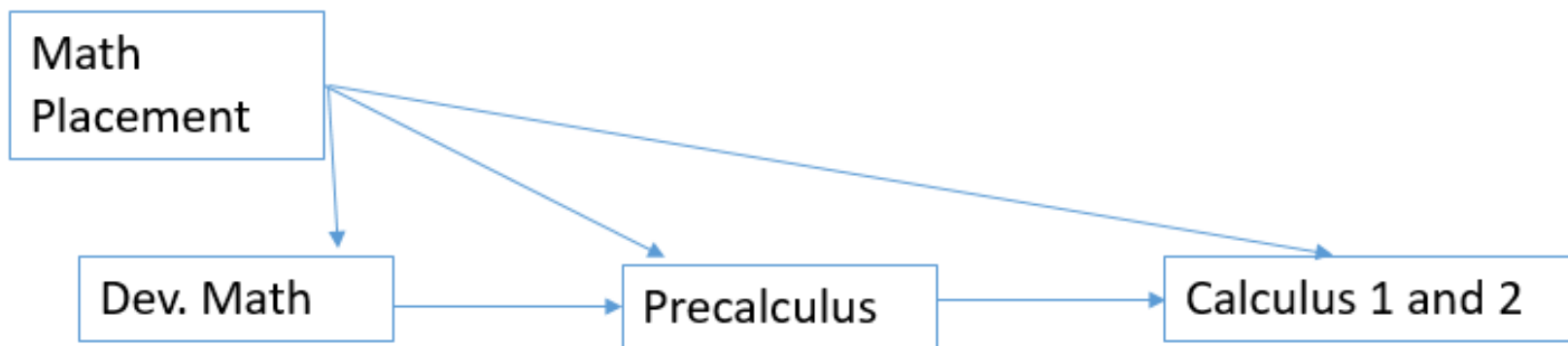
# National Study of Calculus Two-Year Cases

## Summary of Findings





## What supports student transition into, through, and out of Developmental, Precalculus and Calculus II (DPC2)?



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## Mathematics Department Chair Survey Findings

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## Five Areas captured in the census survey of math chairs

1. Respondent information, including # FT and PT faculty
2. Course sequencing and instruction in DPC2
3. Resources to support students: Placement, Tutoring, Additional Support
4. Improvement efforts: Use of local data, faculty PD opportunities
5. Improvement priorities (top three areas)

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## TLC3 Census Survey of Mathematics Department Chairs

- Open March – August, 2017
- Sent to public 2- and 4-year colleges primarily associate's granting (N = 1020)
- 49% response rate -- Very high relative to other surveys in two-year settings

Respondents: 50% female, 72% master's degree, mix of employment status

13% Latino/Hispanic/Mexican

5% African American

3% AANAPISI

1% American Indian or Native American

78% White/Caucasian

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## Integrated Postsecondary Education Data System (IPEDS)

- Geographic region
- Size (FTE)
- Urbanicity
- Primary degree
- MSI (Minority-Serving Institution) designation
- Available enrollment and retention data

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## Minority Serving Institutions (MSIs) in the chair survey data

Designation	Number	Number of States
HBCU	5	3
PBI Award	10	7
PBI Eligible (40% +)	7	7
Tribal College	7	5
AANAPISI Award	8	6
AANAPISI Eligible (10%+)	29	12

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## Comparison used in this presentation

HSI Designation	Number of Survey Respondents	Number of States Represented
HSI (25% + Hispanic or Latino )	105	13
Emerging HSI (15 – 24% Hispanic or Latino)	57	23
Non-HSI ( less than 24% Hispanic or Latino)	288	48

Excelencia in Education <http://www.edexcelencia.org/>

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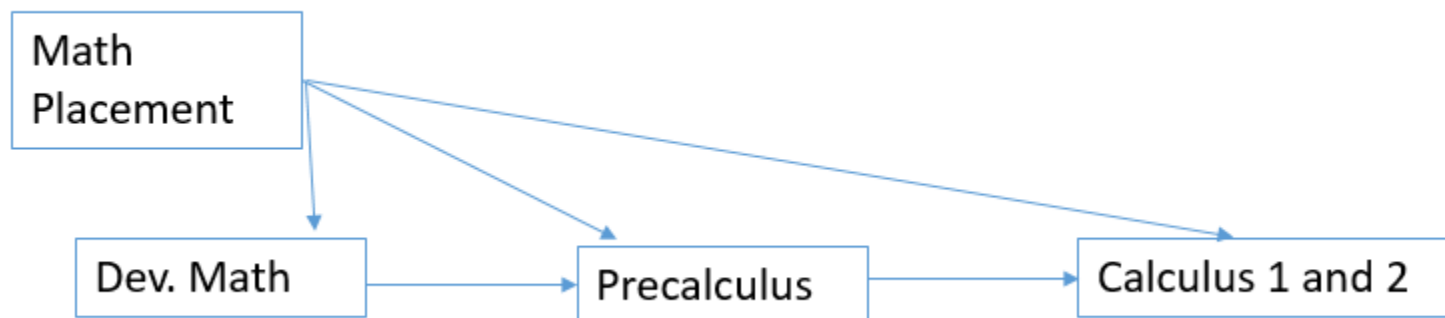
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## Theme 1: Acceleration





## Math Placement

	HSI (n = 105)	Emerging HSI (n = 57)	Non-HSI (n = 288)
Use of AP testing for placement	25%*	18%	10%
Policies to test out of precalculus	74%*	69%	61%
Policies to test out of calculus	69%**	61%	50%

\* $p < .01$     \*\* $p < .001$

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## Moving through DPC2: Dev Math Course Offerings

	HSI (n = 105)	HSI Emerging (n = 57)	Non-HSI (n = 288)
Differentiated pathways for STEM and non-STEM	64%***	61%	38%
Compressed courses (16 weeks in 8)	63%**	47%	41%
Co-requisite model (Int + Coll Alg)	26%**	33%	19%
Learning Communities**	21%**	12%	9%
Traditional Lecture	91%**	86%	74%
Emporium Model	29%**	35%	42%

\*\*p < .01   \*\*\*p < .001

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## Precalculus Course Offerings (all institutions)

College Algebra	72%
Trigonometry	63%
Elementary Functions, Analytic Geometry	46%
Precalc/Trig Combined	32%
College Alg/Trig Combined	18%
Intro to Mathematical Modeling	2%
3 or more options offered*	38%
*3 options (n=148), 4 options (n = 34), 5 options (n = 8)	

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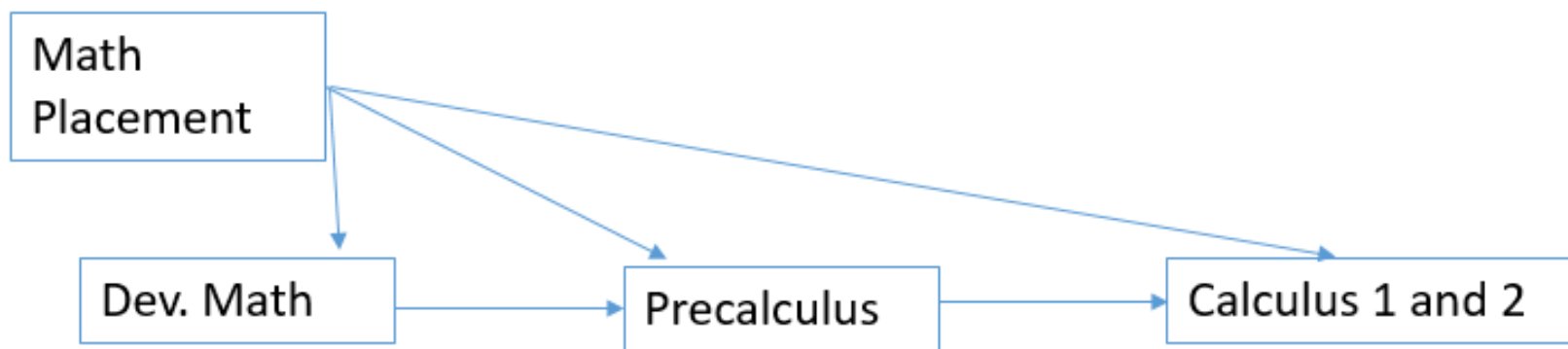
## Calculus I Offerings (all institutions)

Standard Calc I and II (one term each)	92%
Honors Calculus*	12%
Tailored STEM calculus (e.g., bio)	7%
Calculus for first-timers	2.2%
Co-requisite Calculus (Calc I + selected precalc)	1.4%
Stretched-out Calculus (Calc 1 over two courses)	1%
2 or more options offered*	21%

\*HSI 22%, Emerging HSI 19%; non-HSI 9% (p = .000)



## Theme 2: Student Support





## Student Support in DPC2

52% of respondents offered support services for students from traditionally underserved or underrepresented groups in STEM (e.g., TRiO, MESA, UMOJA, PUENTE, grants, special tutoring).

Additional Supports (all institutions)	Dev	Precalc	Calc
Space for students to informally gather and work	74%	71%	70%
Online Tutoring (70% had tutoring at all levels)	57%	50%	46%
Early Alert Systems after start of term	74%	69%	66%

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## Moving through DPC2: Student Support

	HSI (n = 105)	HSI Emerging (n = 57)	Non- HSI (n = 288)
Math Clubs (precalculus)	53%***	44%	28%
Math Clubs (calculus)	57%***	47%	34%
Supplemental instruction dev math	54%**	39%	34%
Supplemental instruction calculus	33%**	21%	20%
In-class peer tutors dev math	45%***	44%	26%

\*\*p < .01   \*\*\*p < .001

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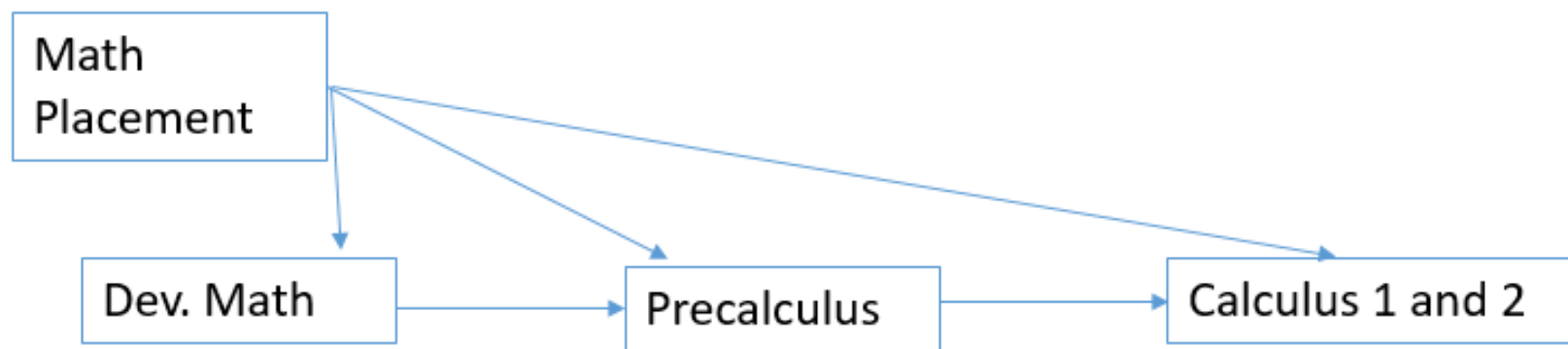
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## Theme 3: Improvement Efforts



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Use of Local Data (all institutions)	% Yes
Have access to data and readily available	45%
Have access to data but not readily available	44%

	HSI (n = 105)	HSI Emerging (n = 57)	Non-HSI (n = 288)
Data disaggregated at all	57%**	54%	40%
Data disaggregated by race/ethnicity	31%***	21%	10%
Disaggregated by both race/ethnicity and gender	27%***	16%	9%

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Professional Development Offered	
Using technology in class/new textbook	79%/62%
Collaborative learning	61%
Culturally relevant teaching (HSI 48% ; Emerging HSI 30%)	34%
Performance monitoring	33%
Building Relationships	32%
Intrusive practices	22%
Validating practices	20%
Implicit Bias (HSI 25%; Emerging HSI 15%)	18%
Racial microaggressions (HIS 23%; Emerging HSI 14%)	15%
PT Faculty PD <b>required</b> or strongly recommended	48%

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## Summary

In many important areas, HSIs appear to be taking more action to advance student success in the DPC2:

- Math placement (AP tests scores and placing out)
- Accelerating students through dev math (differentiated pathways for STEM and compressed courses)
- Supporting students (use of SI, peer tutors, math clubs)
- Disaggregating data by race/ethnicity and offering PD in areas known to bolster the success of students of color (CRT, implicit bias, racial microaggressions)



## TLC3 Activities 2017-18

- Networked community events (next webinar on combined survey results)
- Case studies: Pilot Jan 2018; 4 visits spring 2018
- Publications

Chair survey findings (on TLC3 website; faculty survey findings (MathAMATYC Educator)

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## Seven Dimensions of the TLC3 Model

1. Math Placement Processes
2. DPC2 courses: Dev – Precalculus – Calculus I and II
3. Outcomes Assessment
4. Instruction that Supports Student Mathematical Learning
5. Instruction that Incorporates Relational Strategies and Other Promising Practices
6. Support for Students in Transition
7. Institutional Responsibility/Campus Ethos

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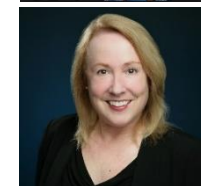


## Thank You

### Programs, Structures, and Instructional Strategies that Facilitate Diverse Learners Transitioning to and through Calculus in Two-Year Colleges

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<https://occrl.illinois.edu/tlc3>



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