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Student Recruitment and Retention Improvements through Success in First Year Mathematics: A Multi-faceted Approach

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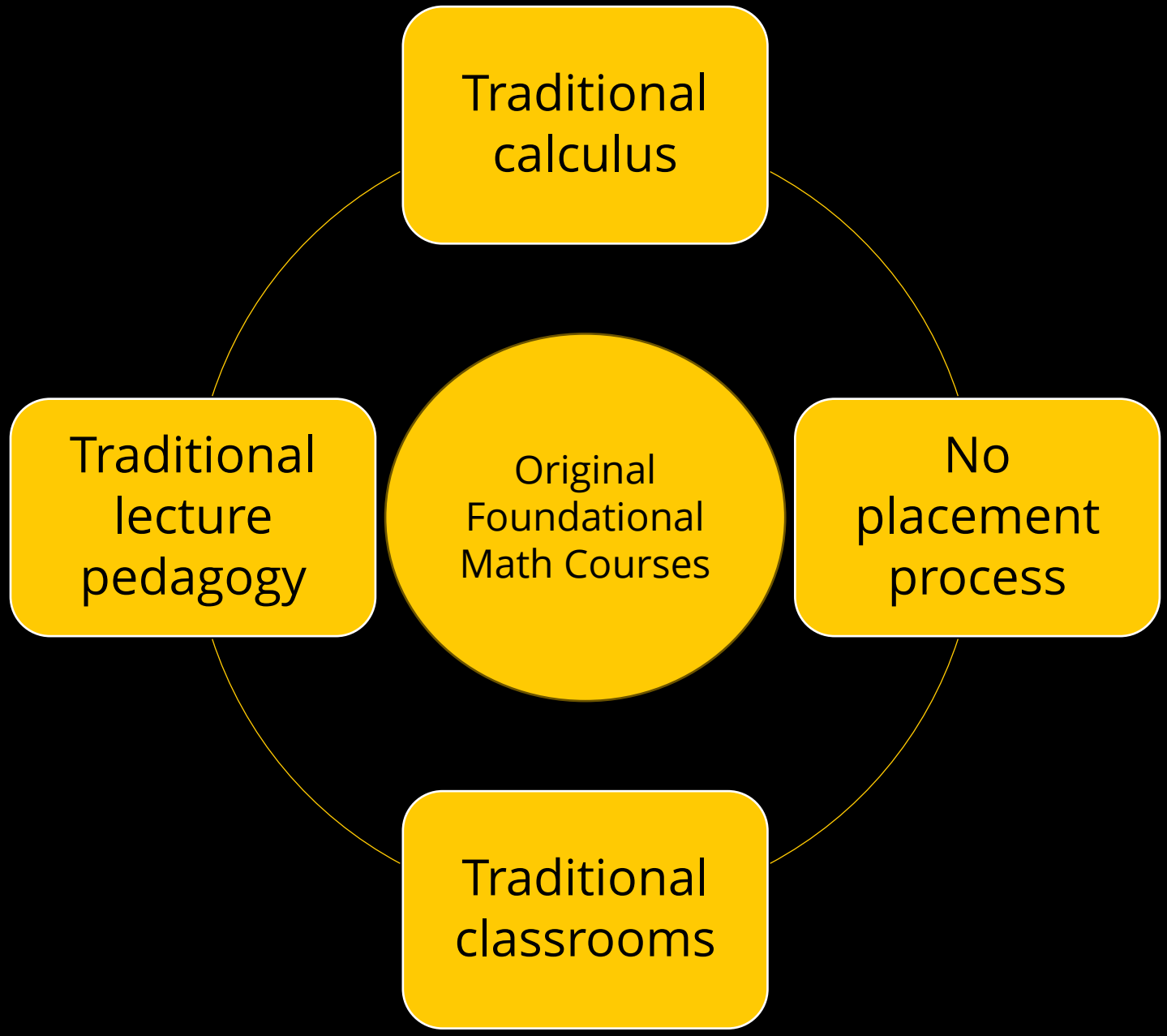
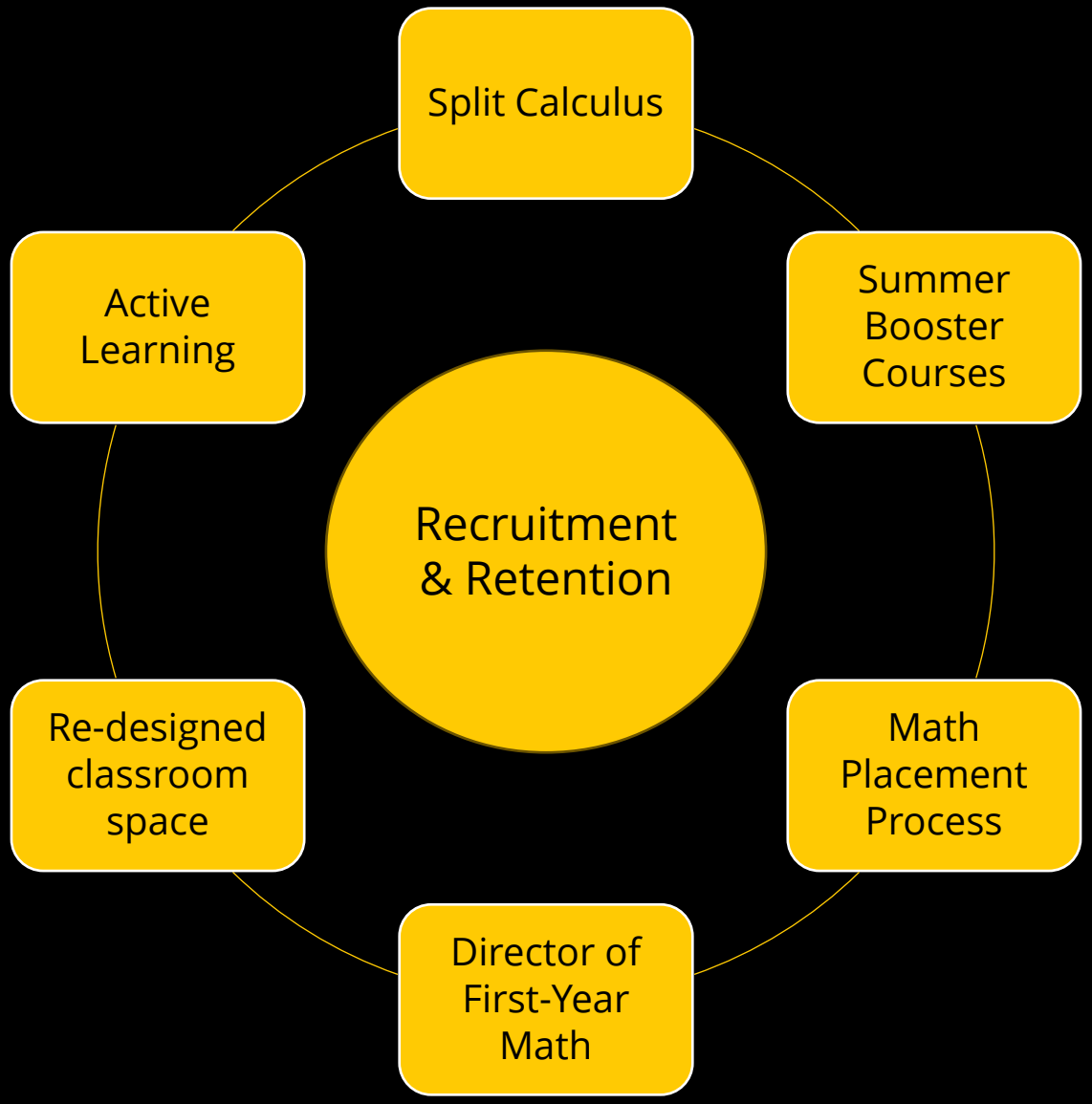
Goals of Presentation

- Original calculus sequence and approach
- New multi-faceted approach
  - Discuss each aspect
- Call to Action and future plans


Traditional calculus
Traditional lecture pedagogy
Original Foundational Math Courses
No placement process
Traditional classrooms

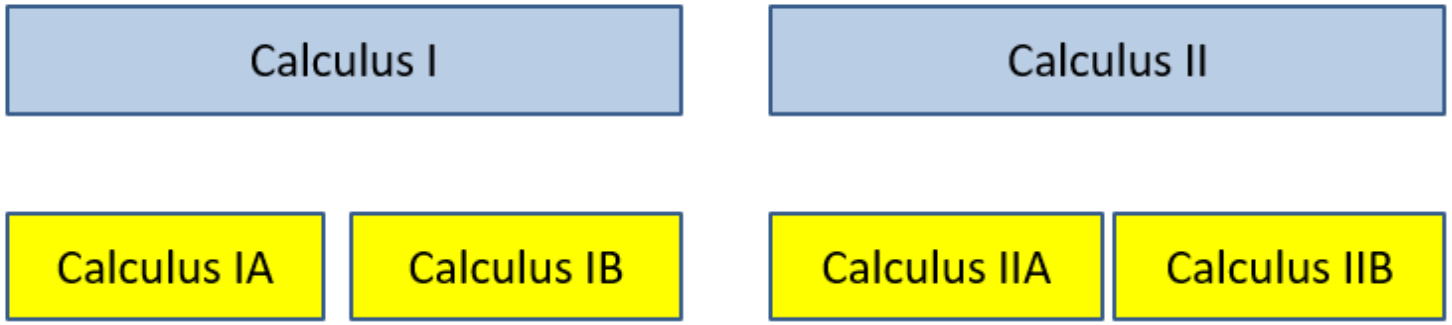
- Research: success in undergraduate mathematics
  - Math = Key indicator for success in STEM majors & programs [1].
  - Influences persistence and completion of engineering degrees more than other courses[2].
- Our data mirrors these trends
  - 79.8% of first year students are successful in mathematics.
  - Negatively impacts retention and persistence.
  - Larger gap with students from underrepresented groups.

- Restructured the messaging, timing, and pedagogical approach to first-year mathematics.
- Student - ready approach to answer the call to ‘fix the classrooms’ [3].
- Aligns with the university’s strategic goals of inclusive excellence and high value learning.


Split Calculus
Summer Booster Courses
Math Placement Process
Director of First-Year Math
Re-designed classroom space
Active Learning
Recruitment & Retention

Split Calculus

Curricular Flexibility



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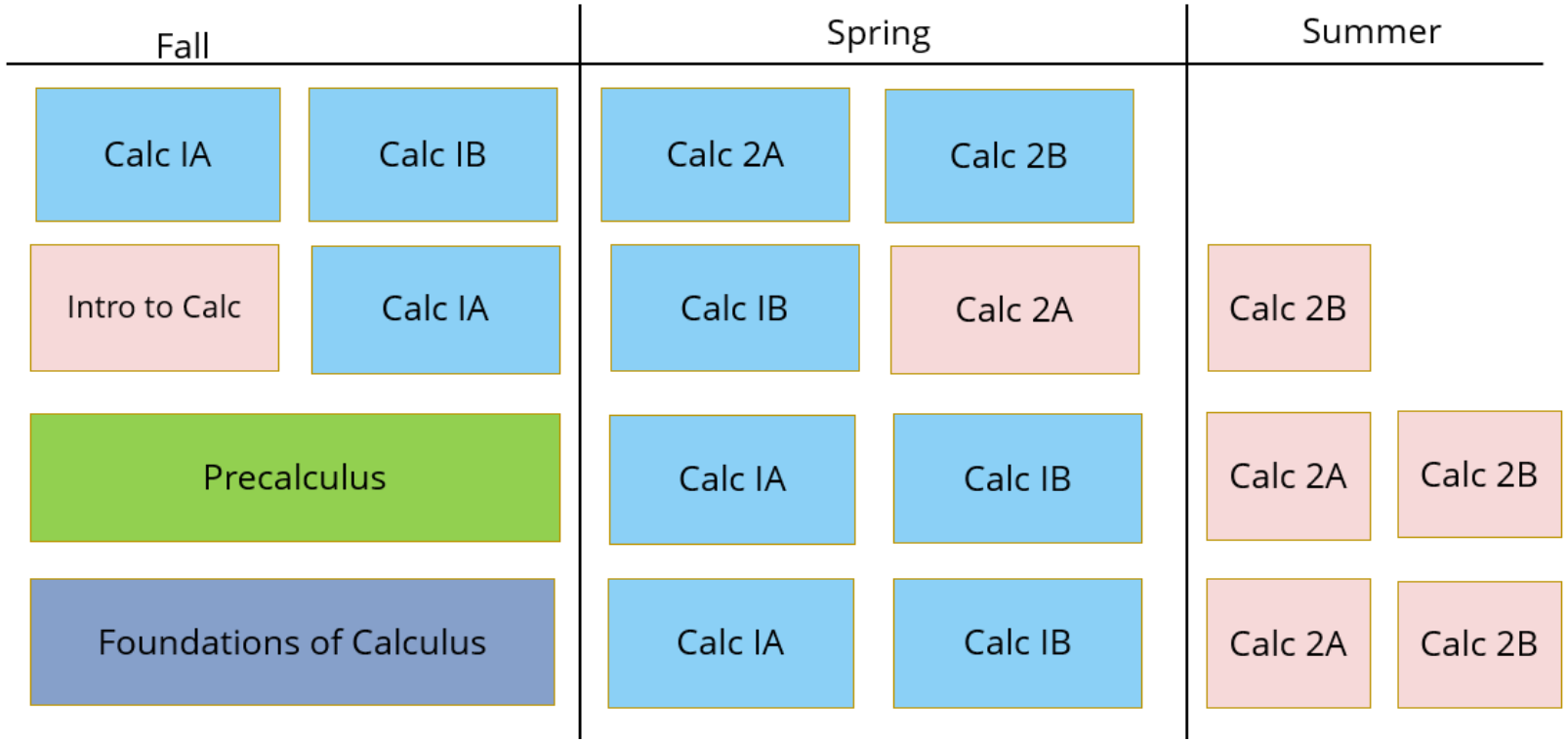
Split Calculus

Curricular Flexibility



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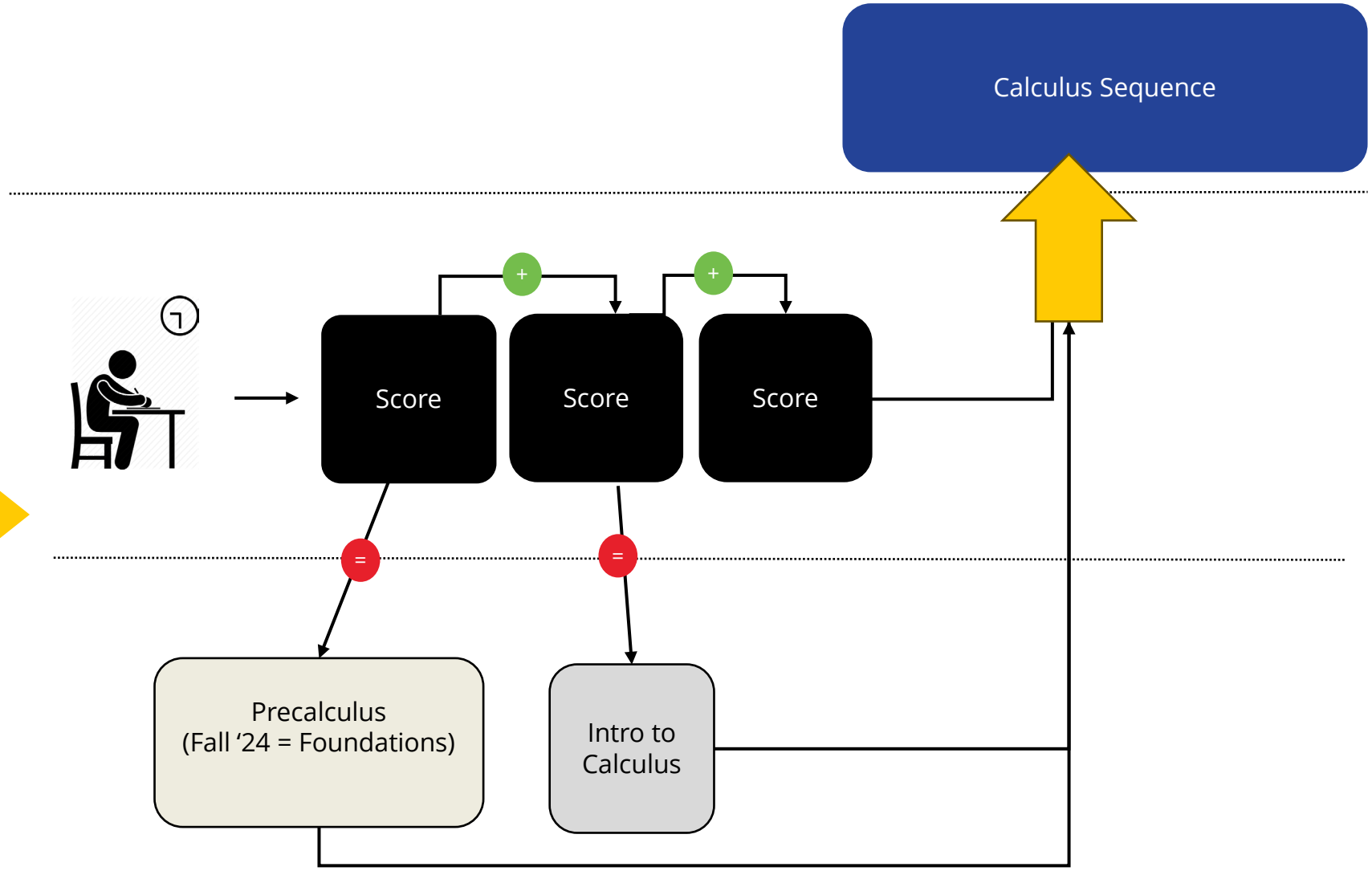
Math Placement Process

- Guiding Principle ⟹ Student Readiness
- Assessment of preparedness for Calculus
  - Prior mathematical knowledge
  - Flexible foundational skills

Math Placement Process



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Summer Booster Courses

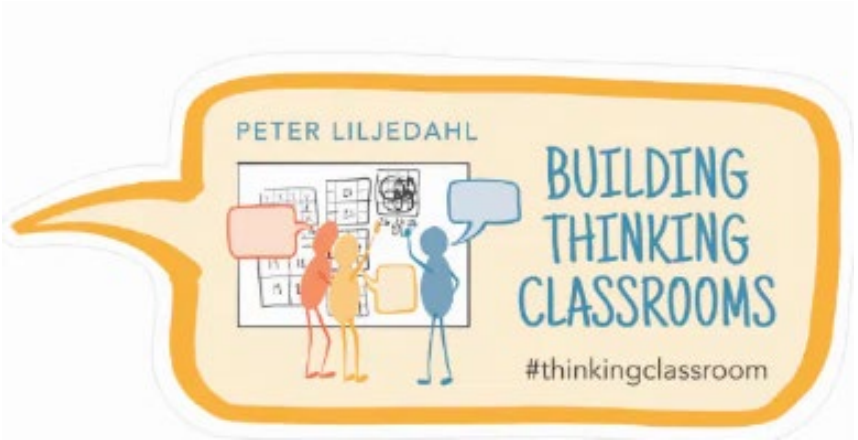
- Free online math courses
  - Course level matches MP placement
  - Optional
  - Multiple modalities
    - online synchronous & online asynchronous
- Enables fall registration for the next level course
- Investment in Student Success
  - Meeting students where they are

Director of First-Year Math

- Math Placement Process
- Curriculum development
- Course coordination
- Data informed decisions to improve processes and curriculum
- Faculty development
  - Active Learning

Active Learning

- DOING mathematics in the classroom
  - Teamwork
  - Discussion and presentation
- Building Thinking Classrooms
  - Author: Peter Liljedahl



Re-designed classroom space

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Preliminary Results

Table 1: Overall Comparison of Withdrawal and Failure Rates from Traditional to Split Sequence.

	FW Rate
Traditional Sequence	24.2
Split Sequence	21.8
Net Difference	-2.4

Table 2: Overall Comparison of Withdrawal and Failure Rates from Traditional to Split Sequence by Gender.

	Female	Male
Traditional Sequence	20.2	24.9
Split Sequence	19.4	22.5
Net Difference	-.8	-2.4

Table 3: Overall Comparison of Withdrawal and Failure Rates from Traditional to Split Sequence by Ethnicity.

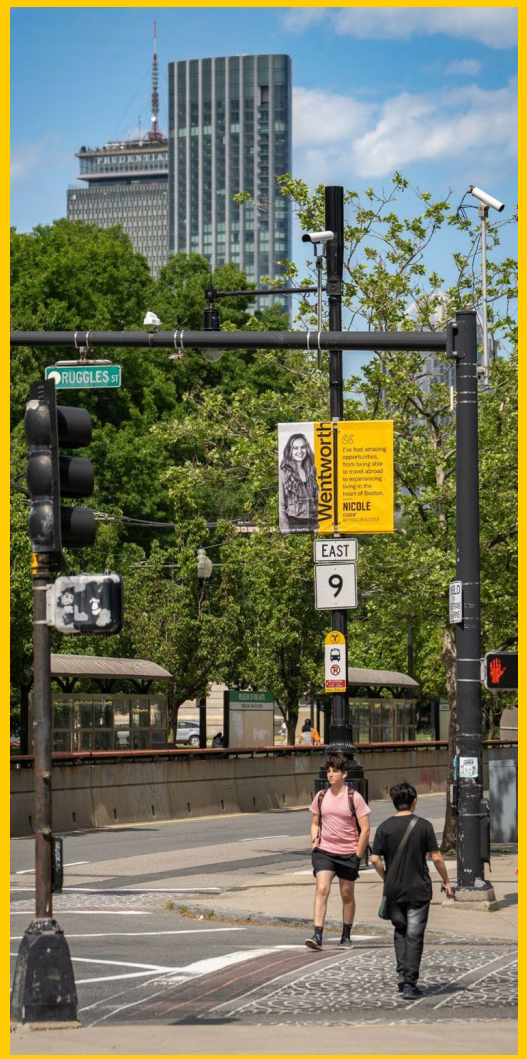
	White	Black/ African American	Asian	Hispanic	Other
Traditional Sequence	20.9	43.1	20.0	32.2	20.2
Split Sequence	23.3	22.9	26.3	6.1	22.2
Net Difference	+2.4	-20.2	+6.3	-26.1	+2.2

Data Informed Decisions

- Failure, Withdrawal, & retention rates
- Surveys
  - Faculty
  - Students
  - Advising staff
- Need to assess sense of belonging
  - Academic and social integration

Issues

- Multi-factor approach:
  - Isolating most influencing factor
- Tight coordination
  - Academic freedom
- Split Calculus
  - Academic calendar timing challenges
- Resources



Call to Action

What's Next?

- Data informed decisions
- Faculty development
- Improve MP process
- Course coordination
- Improve classroom space

Discussion

References:

[1] G. C. Wolniak, M. J. Mayhew, and M. E. Engberg, “Learning's Weak Link to Persistence,” *The Journal of Higher Education*, vol. 83, pp. 795-823. 2012.

[2] M. W. Ohland, A.G. Yuhasz, and B.L. Sill, “Identifying and removing a calculus prerequisite as a bottleneck in Clemson's General Engineering Curriculum.” *Journal of Engineering Education*, vol.93, no.3, pp.253-257. 2004.

[3] J. Handelsman, S. Elgin, M. Estrada, S. Hays, T. Johnson, S. Miller, and J. Williams, “Achieving STEM diversity: Fix the classrooms.” *Science*, vol. 376, no. 6597, pp.1057-1059. 2022.

[4] D.M. Bressoud, V. Mesa, and C.L. Rasmussen, Eds, *Insights and recommendations from the MAA (Mathematical Association of America) national study of college calculus*. MAA Press. 2015.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