Active Learning in Economics: Lessons from SUMMIT-P

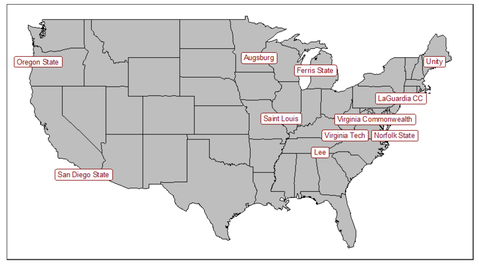
Stella Koutroumanes Hofrenning, Ph.D. Augsburg University
American Economic Association
Committee on Economic Education, New Orleans 2023

INTRODUCTION

Economics uses mathematics as an important tool to understand economic concepts and apply those concepts to real-world problems. However, students often overlook the connections between mathematics and economics and faculty from mathematics and economics don't always engage in intentional conversations on how to best teach quantitative skills needed for economics majors. Addressing this gap requires collaboration across both economics and mathematics to develop an understanding of each other's needs.

SUMMIT-P

A National Consortium for Synergistic Undergraduate Mathematics via Multi-Institutional Interdisciplinary Teaching Partnerships (**SUMMIT-P**) is a consortium of twelve institutions that collaborate to revise the curriculum for lower-division undergraduate mathematics courses. The strength of SUMMIT-P is the interdisciplinary collaboration of mathematics with partner disciplines (such as economics) to incorporate discipline-specific content into curriculum.



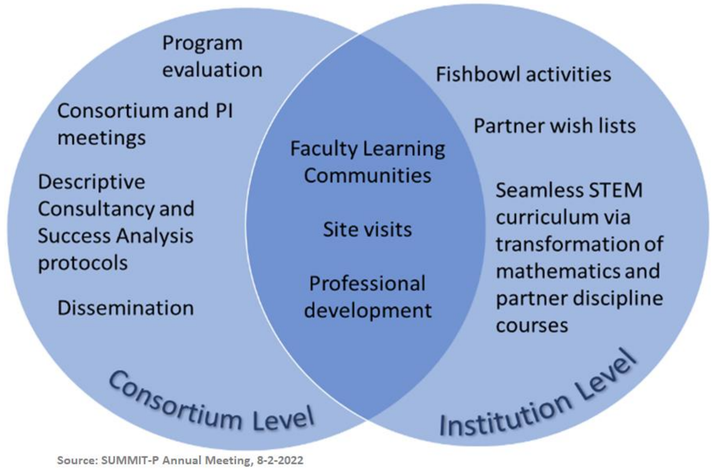
SUMMIT-P is based on research from the Curriculum Foundations Project (CFP), a series of 22 workshops organized by the Mathematical Association of America's Committee on Curriculum Renewal Across the First Two Years (CRAFTY).

Key recommendations include:

- Emphasize conceptual understanding, problem-solving skills, mathematical modeling, and communication skills.
- Encourage the use of active learning
- Improve interdisciplinary cooperation in order for students to see mathematics in discipline-specific contexts to improve knowledge transfer between courses.

SUMMIT-P provides a flexible and sustainable framework to improve student attainment–either in the mathematics course itself or in subsequent classes for which the mathematics course is a prerequisite.

FRAMEWORK



Source: SUMMIT-P Annual Meeting, 8-2-2022

Use CF recommendations to improve the content of selected courses

- Increase the relevance and frequency of applications in the courses
- Adapt and develop materials to make the language, notation, and topics of the courses more directly transferable to the partner discipline courses
- Examine the ordering of topics in the courses to better mesh with the timing needed by the partner disciplines

APPLICATIONS

1. Example of syllabus mapping of college algebra course and introductory microeconomics

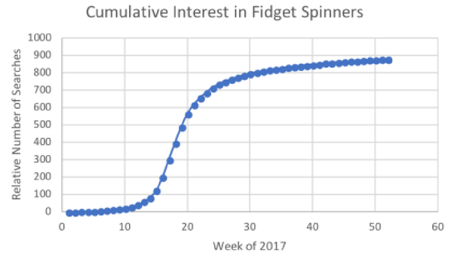
Mapping Curriculum between College Algebra and Introductory Microeconomics

Topics in College Algebra	Topics in Introductory Microeconomics
Linear Equations	Equations of demand and supply
System of Linear Equations	Market equilibrium
Difference Quotient	Marginal Value (marginal cost, marginal revenue, marginal product, marginal utility); elasticity
Operations of Polynomials	Cost functions, production function in polynomial functions
Quadratic functions	Cost and revenue functions
Rational functions	Cost function, production function in rational function
Inverse Function	Converting demand/supply functions where the price depends on the quantity demanded/supplied
Exponential functions	Compound interest; growth in macroeconomic variables such as GDP, price level, and others; exponential consumer utility function
Exponential Equations	Consumer preferences
Logarithmic functions	Compound interest; growth in macroeconomic variables such as GDP and price level; logarithmic production function; logarithmic consumer utility function
Logarithmic Equations	Consumer preferences; production decision

Source: LAGCC SUMMIT-P Fishbowl

2. Interdisciplinary Curriculum Example

- Forecasting the demand for products using logistic functions and the Bass Model
- Rate of change, limit at infinity, derivative rules, and effects of parameters on function behavior



CONCLUSIONS

- Communication between departments is critical
- In-class work helped students develop connections between concepts
- Working in small groups during class time was productive for students
- Need more assessment of student achievement related to curriculum changes

References

Collaborative research: A national consortium for synergistic undergraduate mathematics via multi-institutional interdisciplinary teaching partnerships (SUMMIT-P); proposal funded by the National Science Foundation (NSF-IUSE Lead Awards 1625771). http://www.summit-p.com

Curriculum Foundations Project: Voices of the Partner Disciplines, edited by Susan Ganter and William Barker, Mathematical Association of America, 2004.

Hargraves, Rosalyn H.; Hofrenning, Stella K.; et al., (2020) "Structured Engagement for a Multi-Institutional Collaborative to Tackle Challenges and Share Best Practices," *Journal of Mathematics and Science: Collaborative Explorations*: Vol. 16: No. 1, Article 5.
Available at: https://scholarscompass.vcu.edu/jmsce_vamsc/vol16/iss1/5

Hofrenning, Stella K.; Hargraves, Rosalyn Hobson, et al., (2020) "Fishbowl Discussions: Promoting Collaboration between Mathematics and Partner Disciplines," *Journal of Mathematics and Science: Collaborative Explorations*: Vol. 16: No. 1, Article 3.
Available at: https://scholarscompass.vcu.edu/jmsce_vamsc/vol16/iss1/3

Partner Discipline Recommendations for Introductory College Mathematics and the Implications for College Algebra, edited by Susan Ganter and William Haver, Mathematical Association of America, 2011.

Synergistic Undergraduate Mathematics via Multi-Institutional Teaching Partnerships: Resources from SUMMIT-P for Building Interdisciplinary Collaboration; edited by Susan Ganter et al., Mathematical Association of American, 2022.

This material is based upon work supported by the National Science Foundation under Lead Award No. 1625771. Any opinions, findings, 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.

Many thanks to SUMMIT-P.

NSF-IUSE SUMMIT-P