Megan Elise Selbach-Allen

Phone: (509) 760-9157 • Email: megan@selbachallen.com

EDUCATION

PhD in Mathematics Education *2024*
Stanford University
Dissertation title, "It's Not Just About the Math: Enacting Caring Instruction in a Community College Mathematics Classroom "

MPhil in Mathematical Science *2013*
University of Liverpool, United Kingdom
Research Dissertation titled, "A survey of epidemiological modeling on networks and investigation of the relationship between the fraction of epidemics that take-off and the endemic level in a network"

MSc in Mathematical Science *2011*
University of Liverpool, United Kingdom

B.S. in Applied Mathematics *2009*
United States Naval Academy

ACADEMIC POSITIONS

Education Research Scientist *Summer 2024-present*
Harvard University, Math Department

RESEARCH INTERESTS

Undergraduate Mathematics Education, Inquiry-based Math Education, Standards Based Grading, Conceptual Mathematics Instruction

RESEARCH PROJECTS

Harvard University

AI Tutor
Mixed methods study of the use of an AI tutor to support student problem solving and reasoning with data in a multivariable calculus class.

Novice Repeater Experience in Introductory Math Courses
Work primarily based on student surveys, interviews and institutional data to understand varied outcomes between students with prior exposure to course content and those with no prior exposure.

Stanford University

Student Success in Calculus Pathway
Interviewed students and faculty in a successful community college pre-calculus to calculus pathways program. Observed and filmed the classroom over the course of one year.

Elite College STEM Pathways Study

Analyzed public information and conducted interviews to understand STEM pathways for students entering Ivy+ universities.

Explorations in Calculus Study
Coordinated and implemented data collection from 99 students enrolled in calculus summer course. Conducted qualitative analysis of 99 student course reflections and collaborated with team on mixed methods analysis. Independently developed deeper analysis of student trajectories in the course.

Youcubed Summer Camp Expansion Study
Helped coordinate data collection and evaluation from multiple research sites and with external partners which allowed for a full mixed method study including over 2000 participants.

Youcubed Mathematics Teacher Leader Fellowship
Collaborated with district to design fellowship for elementary teachers on implementation of California Mathematics Framework. Collected and analyzed qualitative data: teacher interviews, professional development recordings, student work artifacts, and classroom observations.

Groupitizing and Number Flexibility Study
Coordinated data collection and analysis for a study of 1-5 student use of number flexibility and groupitizing to better understand how these skills are tied to mathematics achievement.

Integrated STEM Study
Collaborated with two colleagues to develop theory around the concept of integrated STEM in K-12 curriculum. Followed theory development with interviews of secondary STEM teachers to understand their understanding and views about teaching STEM in an integrated manner.

TEACHING EXPERIENCE

Harvard University

Calculus w/ Precalculus Support, Instructor *Fall 2024*
Taught calculus one for students who required additional support for pre-calculus subjects

Stanford University

Pre-calculus - Leland Scholars Program, Instructor *Summer 2023*
Taught pre-calculus to incoming first year students as part of a 4-week summer bridge program.

Stanford Teacher Education Program Math Elective, Instructor *Spring 2021, 22, 23*
Taught the math education elective to teacher candidates in the Stanford Teacher Education Program.

Linear Algebra - Stanford Summer Engineering Academy, Instructor *Summer 2020, 21, 22*
Working with 3 colleagues created a conceptual, accessible version of the first 2-weeks of a linear algebra course for undergraduate students attending a 4-week summer bridge program.

Learning, Making, Crafting Creating, Teaching Assistant *Winter 2021, 22*
Assisted with class preparation, facilitation, student projects and held office hours to support students in engaging course content for this course supporting masters students in the learning, design and technology program.

Introduction to Data Analysis and Interpretation, Teaching Assistant *Fall 2020*
Assisted with class preparation and facilitation, graded papers and held office hours to assist students with understanding the content of this course for masters students in the education policy program.

Explorations in Calculus, Co-instructor *Summer 2019*
With 3 colleagues and supervising professor, designed and taught a 4-week course centered around projects created to help students engage conceptual ideas in calculus.

US Naval Academy *May 2015-June 2018*
Master Instructor, Mathematics Department
Taught courses in Calculus, Discrete Mathematics, and Matlab based programing.

- Implemented standards-based grading across courses in order to directly tie topical knowledge and skills to course grades. Change incentivized students to address specific weaknesses in a topic or skill.
- Collaborated with three colleagues to develop a parallel curriculum for the integral based calculus course that revolved around projects and inquiry-based learning. These projects provide an alternative for instructors moving away from traditional textbook based lectures and have continued to be refined and adopted by additional instructors.
- Students consistently performed in top third on common multiple choice final exam.
- Nominated by department for school wide Apgar Award for excellence in teaching.
- Led new instructor orientation program.
- Served as course coordinator for core calculus course of over 500 students.

University of Maryland University College *June 2013-Oct 2013*
Adjunct Instructor
Taught three sections of College Mathematics, which combined basic number theory and algebra with practical financial mathematics and statistics. Classes taught while forward deployed on Camp Leatherneck, Afghanistan to fellow service members and contractors stationed at the base.

University of Liverpool *Oct 2010-May 2011*
Teaching Assistant
Worked as a teaching assistant for multiple courses. Independently developed and delivered tutorials for Numerical Programing course, including 10 sessions attended by over 150 students.

INSTRUCTOR PROFESSIONAL DEVELOPMENT WORK

Additional Calculus for Engineers Instructor Support *Fall 2019-Fall 2020*
Worked to support masters' students leading additional support classes for undergraduate math and computer science classes. Met with instructors weekly to discuss pedagogy, class planning, increasing engagement and active learning strategies. Also visited classes and met with instructors one-to-one to help them address individual challenges.

STEM-Core Professional Development Workshops *Summer 2020-Fall 2020*
Worked with a colleague to design and implement a series of four virtual workshops for community college faculty members about how to implement mathematical mindset practices in online classroom environments.

PUBLICATIONS

*Co-first author ~Names listed alphabetically

Fushida-Hardy, S.*, Nuti, P.*, & **Selbach-Allen, M.*** (2024). Engaging activities for teaching linear algebra. *PRIMUS*, *34*(4), 413-427.

Boaler, J., Conte, K.˜, Cor, K.˜, Dieckmann, J. A.˜, LaMar, T.˜, Ramirez, J.˜, & **Selbach-Allen, M.**˜ (2024). Studying the Opportunities Provided by an Applied High School Mathematics Course: Explorations in Data Science. *Journal of Statistics and Data Science Education*, 1-36.

Boaler, J.*, Brown, K.*, LaMar, T.*, Leshin, M*., **Selbach-Allen, M.*** (2022). Infusing mindset through mathematical problem solving and collaboration: Studying the impact of a short college intervention. *Education Sciences*, *12*(10), 694.

Boaler, J., Dieckmann, J. A.˜, LaMar, T.˜, Leshin, M.˜, **Selbach-Allen, M.**˜, & Pérez-Núñez, G. (2021, December). The transformative impact of a mathematical mindset experience taught at scale. In *Frontiers in Education* (Vol. 6, p. 784393). Frontiers.

Selbach-Allen, M. E., Williams, C. A., & Boaler, J. (2020). What Would the Nautilus Say? Unleashing Creativity in Mathematics!. *Journal of Humanistic Mathematics*, *10*(2), 391-414.

Reynante, B. M.*, **Selbach-Allen, M. E.*,** & Pimentel, D. R.* (2020). Exploring the Promises and Perils of Integrated STEM Through Disciplinary Practices and Epistemologies. *Science & Education*, 1-19.

Ksir, A. E., Allman, J. M.˜, Hetherington III, N.˜, **Selbach-Allen, M. E.˜,** & Skipper, D.˜ (2021). Activating Calculus to Command the Seas: Reflecting on Ten Years of Active and Inquiry-Based Learning at the US Naval Academy. *PRIMUS*, *31*(3-5), 449-466.

Selbach-Allen, M. E., Greenwald, S. J., Ksir, A. E., & Thomley, J. E. (2020). Raising the Bar with Standards-Based Grading. *PRIMUS*, 1-17.

Allman, J.*, Hetherington III, N.*, Ksir, A.*, & **Selbach-Allen, M.*** (2018). Coordinating IBL and non-IBL Calculus II. *Mathematica Militaris*, *23*(1), 4.

Selbach-Allen, M. E., McIlhany, K. L., and Gentry, S. E., "Optimization and pose selection for a lindy hop partnered spin," *Proceedings of the 2011 American Control Conference*, San Francisco, CA, 2011, pp. 3831-3836.

Selbach-Allen, Megan E. (2009) "Using Biomechanical Optimization to Interpret Dancers' Pose Selection for a Partnered Spin," *Rose-Hulman Undergraduate Mathematics Journal*: Vol. 10: Iss. 2, Article 1.

PRESENTATIONS

Hahn, M., Leshin, M., **Selbach-Allen, M.** & Boaler, J., (2024, November). *Broadening & Connecting Mathematics: Exploring How Elementary Teachers Conceptualize the Big Ideas* [Featured Report]. 46th Annual Psychology of Math Education – North America (PMENA) Conference. Cleveland, OH.

Selbach-Allen, M. Ramirez, J., Zhao, P., Boaler, J., McCandliss, B., & Cordero, M., (2024, November). *Number Sense and Groupitizing: Looking under the hood of elementary math achievement* [Brief Report]. 46th Annual Psychology of Math Education – North America (PMENA) Conference. Cleveland, OH.

Selbach-Allen, M. and Politou, E. (2024, October). *Multivariable Calculus with an AI Tutor: Active Learning of the Future?* [Presentation]. 8th Annual NE RUME Conference. Boston, MA.

Selbach-Allen, M. (2023, November). It's Not About the Math: Enacting Caring Instruction in a Community College Mathematics Classroom [Poster] 45th Annual Psychology of Math Education – North America (PMENA) Conference. Reno, NV.

Selbach-Allen, M. (2023, April). *Examining Contrasting Student Trajectories in an Inquiry-Based Mathematics Classroom* [Roundtable presentation]. Roundtable presented at the annual meeting of the American Education Research Association (AERA). Chicago, IL.

Selbach-Allen, M. (2023, April). *Transforming Student Trajectories in STEM With Acceleration and Support* [Roundtable presentation]. Roundtable presented at the annual meeting of the American Education Research Association (AERA). Chicago, IL.

Selbach-Allen, M. & O'Connell, J. (2022, December). Community Building and 'Off-Topic' Talk [Presentation]. Presentation given at the annual meeting of the California Math Council Community Colleges (CMC^3). Monterey, CA.

Selbach-Allen, M., Pimentel D.R., & Reynante, B. (2022, April). *Exploring K–12 teachers' views of integrated STEM practices* [Roundtable presentation]. Roundtable presented at the annual meeting of the American Education Research Association (AERA). San Diego, CA.

Reynante, B., **Selbach-Allen, M**., & Pimentel D.R. (2022, April). *K–12 math and science teachers conceptions of integrating STEM* [Poster presentation]. Poster presented at the annual meeting of the American Education Research Association (AERA). San Diego, CA.

Selbach-Allen, M. (2022, February). *Changing the Conversation: Building Success in a Community College Mathematics Classroom* [Preliminary Report]. Preliminary report presented at the Research in Undergraduate Math Education (RUME) annual meeting. Omaha, NE.

Wladis, C., Bjorkman, K., Duranczyk, I., **Selbach-Allen, M**., Schaub, B., Tintera, G. (2022, February). *What is College-Level Mathematics? A Proposed Framework for Generating Developmental Progressions in Mathematics up to and through College* [Theoretical Report]. Theoretical report presented at the Research in Undergraduate Math Education (RUME) annual meeting. Omaha, NE.

Selbach-Allen, M., Reynante, B., & Pimentel, D.R. (2021, April). *Exploring teachers' beliefs about disciplinary hierarchies in STEM education: Implications for integrated STEM* [Paper presentation]. Paper presented at the annual meeting of the American Education Research Association (AERA). Virtual Conference.

Selbach-Allen, M. (2021, February). *Examining Student Experience in an Inquiry Mathematics Classroom* [Poster presentation]. Poster presented at the Research in Undergraduate Math Education (RUME) annual meeting. Boston, MA.

Selbach-Allen, M. (2020, October). *The what and why behind IBL communities: beginning to build in California, Nevada and beyond* [Presentation]. Presented at the Fall Western Sectional Meeting of the American Mathematical Society (AMS) . Virtual Conference.

Pimentel, D.R., Reynante, B., & **Selbach-Allen, M**. (2020, April). *Integrated STEM practices: Exploring overlap in K-12 STEM education* [Paper presentation]. Paper to be presented at the annual meeting of the American Education Research Association (AERA). San Francisco, CA. (Conference canceled)

Brown, K., Cordero, M., LaMar, T., Leshin, M., **Selbach-Allen, M**. (2020, April). Impact of Mathematical Mindset Teaching of Calculus [Paper presentation]. Paper to be presented in the research symposium at the National Council of Mathematics Teachers (NCTM). Chicago, IL. (Conference canceled)

Pimentel, D.R., **Selbach-Allen, M**., & Reynante, B. (2020, March). *Toward integrated STEM practices: Exploring the intersections of science, engineering, and mathematical practice* [Paper presentation]. Paper to be presented at the annual meeting of NARST. Portland, OR. (Conference canceled)

Selbach-Allen, M., & Ksir, A. (2020, January) *Activating Calculus to Command the Seas: Reflecting on ten years of active and inquiry-based learning at the US Naval Academy* [Presentation]. Presentation given at the Joint Mathematics Meeting of the Mathematical Association of America (MAA) and the American Mathematical Society (AMS). Denver, CO.

Selbach-Allen, M., & Williams, C. (2019, June) *What Would the Nautilus Say?* [Presentation]. Presentation given at the National Inquiry Based Learning Conference. Denver, CO.

Pimentel, D.R., Reynante, B., & **Selbach-Allen, M**. (2019, May). *Mapping disciplinary practices: exploring overlap in K-12 STEM standards* [Paper presentation]. Paper presented at the annual meeting of the Stanford Graduate School of Education SWAYWO Conference. Stanford, CA.

Selbach-Allen, M. E., Greenwald, S. J., Ksir, A. E., & Thomley, J. E. (2018, August) *Raising the Bar with Standards Based Grading* [Paper Presentation]. Presentation given at the Mathematical Association of America(MAA) Mathfest. Denver, CO.

Selbach-Allen, M., & Ksir, A. (2018, June) *Raising the Bar with Standards Based Grading* [Presentation]. Presentation given at the National Inquiry Based Learning Conference. Austin, TX.

Allman, J., Hetherington III, N., Amy Ksir, A., **Selbach-Allen, M**. (2016, Nov) *Inquiry-Based Calculus II at the Naval Academy* [Presentation]. Presentation given at the Mathematical Association of America (MAA) MD-DC-VA Section meeting. Baltimore, MD.

Selbach-Allen, M. & Sharkey, K. (July, 2011) *An investigation of the epidemic threshold phenomenon in complex networks* [Presentation]. Presentation given at the European Conference on Theoretical and Mathematical Biology. Krakow, Poland.

AWARDS AND GRANTS

Dissertation Support Grant ($5,000) *2022*
Stanford Graduate School of Education, competitive grant

International Congress of Mathematicians Travel Grant ($1,500) *2022*
NSF and AMS funded, competitive grant

International Congress on Math Education Travel Grant ($2,750) *2020*
NSF funded, competitive grant

Community Impact Award *2020*
Stanford Alumni Association, nominated by faculty and staff

Rotary Ambassadorial Scholar *2009-11*
University of Liverpool, United Kingdom

Fulbright Scholar *2009-10*
University of Liverpool, United Kingdom

SERVICE

To the University:

GSE Mentorship program leadership team	*Fall 2019 – Fall 2022*
SWAYWO conference committee member	*2019, 2020*
SWAYWO conference co-chair	*2021, 2022*

To the discipline:

COMMIT CAN co-founder	*Summer 2019 – Spring 2022*
COMMIT equity work	*Fall 2021 – present*

PROFESSIONAL ORGANIZATIONS

Mathematical Association of America (MAA)

American Mathematical Society (AMS)

American Mathematical Association of Two-Year Colleges (AMATYC)

California Mathematics Council Community Colleges (CMC3)

National Council of Teachers of Mathematics (NCTM)

American Educational Research Association (AERA)