
2022-2023

**MATHEMATICS AND
STATISTICS LEARNING
CENTER**

ANNUAL REPORT

ABOUT THE MSLC

MSLC Mission: To create and implement an efficient and effective model of support services for student learning and to provide training and support to tutors, instructors, and administrators of lower-division mathematics and statistics courses.

Tutor Mission: MSLC tutoring provides support for mathematics and statistics students by undergraduate peer tutors and teaching assistants who give students individual attention and share their own learning experiences. We are committed to helping students persist in their career path and gain confidence in their mathematical understanding and problem-solving ability.

ABOUT THE MSLC

Embedded within the Mathematics Department, the Mathematics and Statistics Learning Center (MSLC) is a central hub of departmental expertise in undergraduate mathematics education. Focusing primarily on first- and second-year mathematics courses, the MSLC is part of a broad network which spans the department, university, and peer institutions. Within the department, the MSLC maintains positive and collaborative relationships with a variety of individuals including staff, instructors, and administration. The MSLC brings these departmental stakeholders together to form a community of practice focused on improving undergraduate mathematics education. At the university level, the MSLC partners with other units with similar missions. Through memberships in national-level networks, the MSLC has developed relationships with like-minded individuals at peer institutions, affording the exchange of ideas and expertise. Further, the MSLC provides leadership in organizations and contributes research to the mathematics education community through publication of journal articles.

The MSLC provides a wide range of instructor and student support. We support over 15,000 students a year with services such as drop-in and appointment tutoring, online resources, and outreach to special-populations programs. We provide support for instructors through professional development opportunities, consultation, and the support of instructional technology and online teaching. The educational mission of the department is advanced through MSLC acquisition and implementation of course improvement grants, development of new courses and course materials, collaboration with faculty on educational initiatives, and the analysis of project data. MSLC's leadership and research in the global undergraduate math education community supports the introduction of discipline-specific research-based educational practices and teaching innovation in both the department's courses and MSLC services.

MSLC is designed to be the innovation center for undergraduate mathematics education in the mathematics department. This intentional design includes allotment of a designated budget and physical space for its staff to collaboratively generate and implement cutting edge initiatives. Over time, these initiatives are integrated into the everyday fabric of the department, allowing the MSLC to move on to further innovation to promote excellence in undergraduate mathematics education.

CAMPUS COMMUNITY ENGAGEMENT

TUTORING SERVICES RESOURCE GROUP

Led group brings together leaders of tutoring-type services across OSU's main and regional campuses.

ACADEMIC SUPPORT SERVICES

Group of academic support leaders which co-present on services during Orientation, FYE, and STEP.

CROSS-UNIVERSITY SUPPORT NETWORK

Group led by David Graham which discusses the academic success of specific populations.

ASC ACCESSIBILITY COMMITTEE

A new committee formed to advise on accessibility concerns across the college.

EQUITY INSTITUTE

Collaboration across the university to improve equity for students. Participated in groups related to tutoring and STEM majors who start math below Calculus.

CARMEN AFFILIATES

Instructional Technology experts across the university who support the Carmen Toolset and advise and consult with Carmen Leadership.

HHMI DRIVING CHANGE GRANT

Large team implementing OSU's HHMI Driving Change Grant to help all students succeed in STEM gateway courses.

COLLABORATION WITH MANY UNITS, INCLUDING:

- Arts and Sciences Office of Distance Education
- Office of Technology and Digital Innovations
- OSU Academy
- College of Engineering Community, Access, Retention and Empowerment Office (CARE)
- Office of Diversity and Inclusion

MEET A MSLC TUTOR: JAKOB BEHRENDT



What is your major and how has tutoring impacted your learning and prepared you for your future career?

- Major: Industrial and Systems Engineering
- Post-grad plans: Deloitte's Government and Public Service Consulting Practice as a Business Technology Solutions Analyst
- I have absolutely loved tutoring. It's allowed me to become a better communicator and increased my adaptability working with a variety of individuals. Helping students tackle wide ranges of math problems, providing them with new toolsets to continue to succeed, guiding them with general college advice, and seeing students succeed have all truly made this job impactful and meaningful.

What advice would you give to students taking their first math course?

- Utilize your professors, TA's, and MSLC tutors. Even if you don't have an immediate question, just come to the MSLC and do homework! When you put yourself in an environment that has the resources to help you succeed then likely as a result you will succeed!
- Form a study group and/or make at least one new friend whenever you start a new math course. Having people you can go to when you have questions is essential to feeling comfortable and prepared.
- Studying for a math exam is more than just memorizing a list of formulas and equations. You need to practice as many problems as possible. Often the best way to do this is to do past exams and reviews!

Tell us about some of your most memorable moments at the MSLC.

- Tutoring around a dozen students at once because they were all working on the same review material. Everyone was participating with answering questions and helping each other understand the problems.
- Having a few students approach me in Thompson library because they recognized me from the MSLC and knew I would be willing to help out.
- Students coming back after tests and letting me know they got a way better grade than they anticipated thanks to our tutor sessions!

MEET A MSLC TUTOR: VICTORIA NGUYEN



What is your major and how has tutoring impacted your learning and prepared you for your future career?

- I am a biology major on the pre-med track.
- I'm taking a gap year to work as a PCA and currently applying to medical school
- Tutoring has prepared me for my future career because it has given me insight on how to meet people where they are at, whether that is in learning or experiences. Every day going into tutoring and meeting different people challenged me to think of better and different ways to explain information since people come from different math backgrounds and experiences. In the medical field, we are continually asked to meet people where they are at in their healthcare experiences and tutoring was a wonderful way to practice.

What advice would you give to students taking their first math course?

Trust the process and yourself. Math can feel frustrating where you go through the steps but it still doesn't make sense. Give it some time, you will have the moment of clarity and everything will have been worth it. If you don't get it the first time around, adjust your process or ask math tutors for help. I used to spend so much time in office hours and the tutor room to just do math homework, even if I didn't go in with prior questions. All of these resources are at your fingertips, you just have to take the steps toward using them.

Tell us about some of your most memorable moments at the MSLC.

- My favorite moments in the MSLC are meeting people and getting to hear about their lives and why they took their math class. As someone in a non-math major, it's nice to connect to other people who also don't have math-related majors but have to take math as a prerequisite. It makes for fun bonding moments :)
- My favorite times are when people realize they have similar questions and form a group to work together, even if they didn't know each other before, and get really excited about getting questions right.
- I loved the moments where I got to talk to students about life outside of math and giving them general advice for college. The MSLC has given a lot to me and I'm so grateful.

MSLC TUTORING AND STUDENT SUPPORT

MSLC tutoring reaches students from a diverse range of major and classification. Of the nearly 10,000 unique students eligible for math drop-in tutoring last year, only 17% are ASC STEM majors and only 2% are math majors. The students we serve are often enrolled in math to meet a GE and many of them have taken a similar course in high school. We offer a variety of student supports to meet their diverse needs.



Drop-In Tutoring

The MSLC offers both mathematics and statistics drop-in tutoring and most courses at the 1000 and select 2000 level. For math, this includes calculus 3 and below.

Conveniently located in Cockins Hall and the Math Building with large spaces suitable for drop-in attendance.



Appointment Tutoring

Appointment tutoring offered for most math classes at the 2000 level and below. Able to include linear algebra and differential equations.

30-minutes on-on-one. Appointment with student-tutor pairing repeats weekly to provide student with structure.

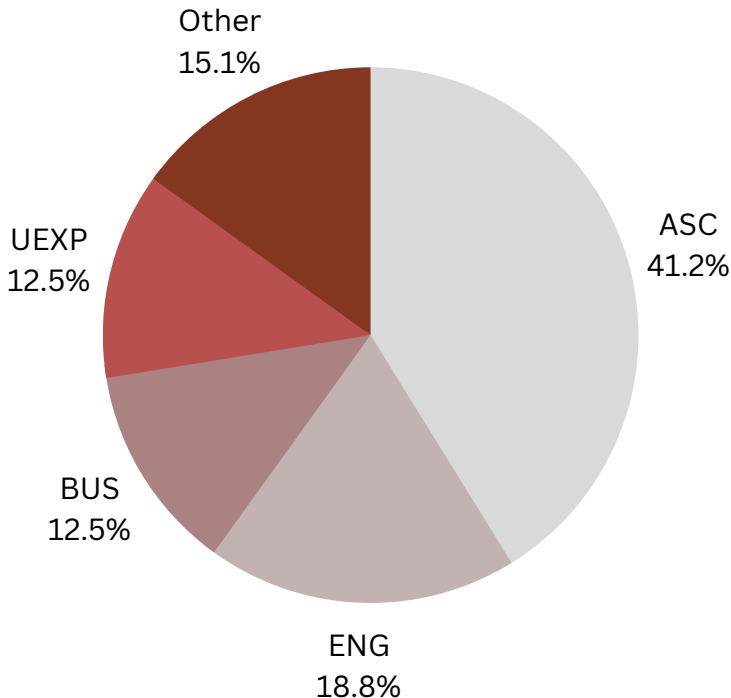


Other Support

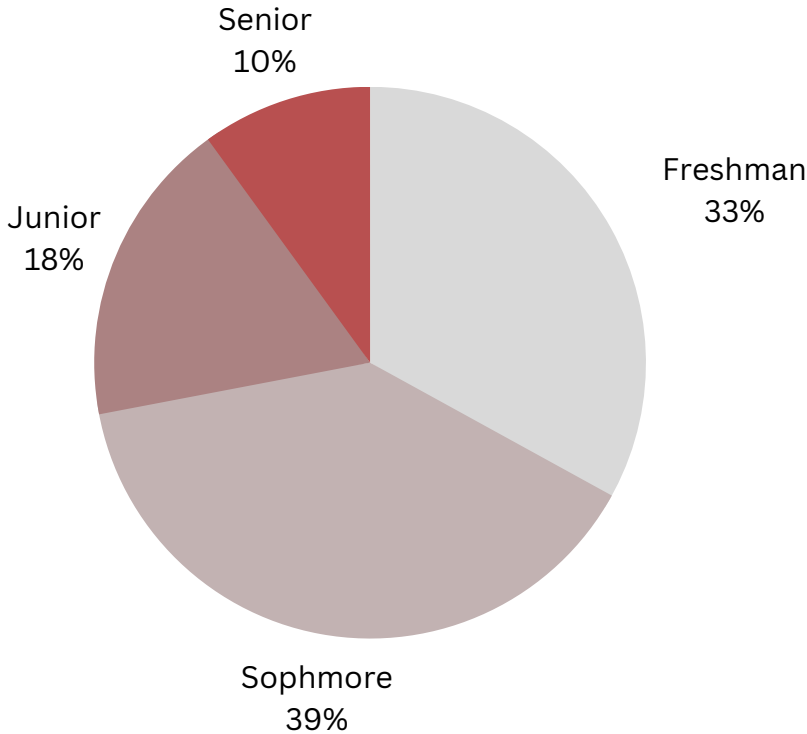
Online and in-person workshops provide review and synthesis of common difficult topics. Students can either attend in-person to work in groups or work on asynchronous interactive online materials.

TUTORING BY COLLEGE AND CLASSIFICATION

Below is a demographic breakdown of attendance for all tutoring services for AU22-SP23. Percentages are out of 2996 unique students attending.



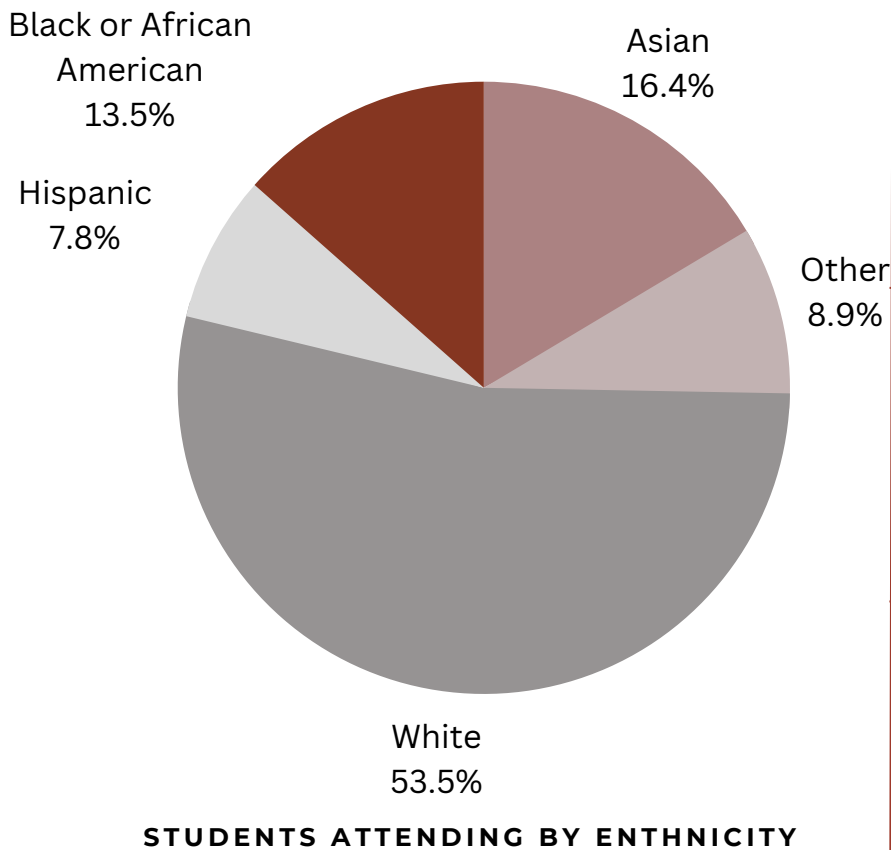
STUDENTS ATTENDING BY COLLEGE



STUDENTS ATTENDING BY CLASSIFICATION

TUTORING USAGE BY UNDERREPRESENTED GROUPS

Demographic breakdown of attendance for all tutoring services for AU22-SP23. Percentages are out of 2996 unique students attending.



26%

of Attendees are First-Generation Students

54%

of Attendees Female or Undeclared

4%

of Attendees are Military/Veteran

MSLC TUTORING: DROP-IN

Drop-in tutoring is often used by students like a library to work on homework and raise their hand for tutor assistance, as needed.

2,500

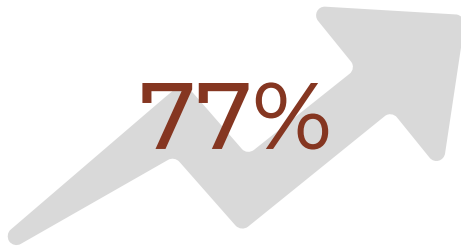
Distinct students using math drop-in tutoring

This count is distinct for the academic year.

16,300

Total student visits at math drop-in tutoring

This is the total number of times students checked into tutoring. Each student is counted once for each time they visit tutoring.



Increase in total math student visits comparing AU21 to AU22 attendance

9,500

Math tutoring hours worked by TA's and peer tutors

4,200 of these hours were worked by MSLC paid peer tutors
TA's work in the MSLC as part of their teaching duties

Statistics tutoring offered in Cockins, Pomerene, and online

290 Distinct students

1000 Total student visits

2100 Tutoring Hours worked by TA's

MSLC TUTORING: MATH APPOINTMENTS

Appointments are 30-minute one-on-one weekly sessions with a peer tutor. A student's appointment recurs each week with the same tutor to build productive study habits.

720

Distinct students using appointment tutoring

This count is distinct for the academic year.

7,700

Total appointments

This is the total number of appointments held.

**3,700 additional
students eligible
to use tutoring**

Through appointments, the MSLC reaches courses not served by drop-in tutoring. These courses are key courses for second year math and engineering students.

3,850

Appointment tutoring hours worked by MSLC paid peer tutors

STUDENT FEEDBACK ON MATH TUTORING

Quotes from students when asked to share positive tutoring experiences

It always felt welcoming and cozy, and I always left feeling like I understood my topics better than when I entered.

Before going to MSLC, I wasn't sure that I was going to pass Calculus. Because of MSLC, I passed with a B!

The MSLC is why I have an A in college algebra right now as someone who is definitely not a math person. The MSLC has made me love math and without it I literally do not know what I would do without it. Incredible service and cannot praise it enough.

Walking away feeling confident when I understood a problem on my own after tutoring when I went in having zero clue how to do it before.

Every time I attended MSLC tutoring I always left feeling like I understood the material better and I credit my success in MATH1172 to the utilization of this program.

I went in to the room scared that I was going to come off as "not that intelligent" but the tutor that I had was very passionate about math and even praised the way that I think and helped me solve my problems in the way I was thinking as opposed to telling me that there is only one way to approach the problem.

INSTRUCTOR PARTNERSHIPS

Meet Dr. Bobby Ramsey, Assistant Professor and Academic Program Specialist in the Math Department

Bobby and the MSLC have partnered on many instructional design projects to improve student success in Calculus. Bobby oversees and teaches both Calculus I and a two semester Stretch Calculus I course sequence. These courses have been heavily influenced by the MSLC's active learning and STEM gateway initiatives and grants. The MSLC's data analysis of student success in Calculus I, along with research into peer university practices, led to the creation of Stretch Calculus I. This course sequence has led to higher pass success rates among students with certain math placement levels.



“I rely on the MSLC staff and their expertise. We are constantly evolving our courses to provide the best class we can offer our students. To do this, I regularly consult with the MSLC on technology available in the classrooms, options for pedagogy modification, large room availability for exam checking, and presentations for student metacognition. During the pandemic lockdown, their support and training allowed us to continue teaching. Their initiatives have been greatly influential while designing new courses. As an instructor resource center, the MSLC is vital to the success of our students.”

TEACHING AT SCALE:

MSLC SUPPORT OF LARGE COURSE COORDINATORS

17 UNIQUE COURSES
PER SEMESTER

126 UNIQUE
INSTRUCTORS
PER SEMESTER

17K NON-UNIQUE
STUDENTS PER
SEMESTER

The MSLC works closely with coordinators of large first-year math courses to enable teaching at scale, supporting all aspects of course delivery, including: course design, pedagogy, and instructional technologies.

This year's unique challenges:

- transition back to in-person exams
- incorporating new practices from online and hybrid teaching

Instructor Professional Development

The MSLC provides various professional development opportunities to course coordinators and all instructors in the Math Department with the goal of building communities of practice in the department, including:



Math Education Reading Group



Active Learning Lunches



Math Instructor Community Chats

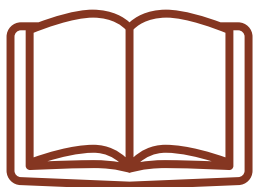


New Instructor Orientation

COURSE DESIGN SPOTLIGHT

MATH 1120/1121: PRE-CALCULUS WITH REVIEW 1 & 2

The MSLC is leading a project to develop and pilot a new course sequence, Math 1120/1121: Precalculus with Review. The textbook and online homework for this course are open-source and were created at OSU in Ximera. The course uses a spiral curriculum to provide multiple opportunities for success. The pedagogy is student-centered and focused on building community.



Textbook

This year we significantly revised the 1120 course, resulting in:

 DEW rates decreased 20%

Enrollment in 1121  increased 50%

Course Design

This course was backward designed from the beginning with an emphasis on the conceptual understanding and skills needed to succeed in OSU calculus courses.

Students

This course sequence is aimed at students who place in precollege math courses and want to be STEM majors.

The course allows students to get to Calculus 1 semester faster while being better prepared and more successful in Calculus 1.

INSTRUCTIONAL TECHNOLOGY SUPPORT

The MSLC provides support to all math instructors in selection, implementation, and troubleshooting of instructional technologies via Individual Consultations and the Math Instructor Community Carmen Course.

All data is for Autumn 22-Spring 23 semesters

Instructor roles: 612
Student roles: 12880
Assignments: 1814

Gradescope Adoption and Support

Collaborative and speedy online grading, More feedback to students, Data for course improvement

New this Year: OSU Single Sign On, Gradescope App for student scanning

iPad loans: 88
(Includes SU23)

iPads for Instructors

The MSLC provides and supports the usage of iPads for math instructors. iPads allow for instructional practices such as: Pre-class scaffolded notes; posting of class notes; recording of class sessions; integration of active learning technologies; integration of digital graphs and charts

Instructors: 13
Student Assistants: 8
Hybrid students: 826
Online Students: 21

Flipped and Flexible Coordination

The MSLC Coordinates the online and hybrid sections of Calculus 1 and 2, including: development and support of online lessons; Coordinate with OSU Academy and High Schools; Hire, supervise, and train undergraduate student assistants; Provide specialized classrooms; Train lecturers and recitation instructors

Spotlight on Accessibility

The MSLC collaborated this year with the College of Arts and Sciences on investigating the best ways of producing accessible digital content containing equations and graphs.

HIGHLIGHTING INCLUSIVE OUTREACH

The MSLC participates in programs offered by other units, focused on diversity, equity, and inclusion in STEM.



The MSLC partners with the Office of Diversity and Inclusion's Young Scholars program, offering math sessions for the Samuel DuBois Cook Summer Academy

Photo Credit: <https://odi.osu.edu/young-scholars-program>

Partners with the College of Education's Office of Diversity, Outreach, and Inclusion, the MSLC offers math programming for the Engineering Math Pathways (EMPATH) program

RESEARCH FROM THE MSLC

In collaboration with researchers at other universities, Dr. Carolyn Johns has published several articles focused on undergraduate mathematics tutoring. Her findings are then integrated into the daily work of the MSLC, improving our services for students.

One of these articles focused on effective structures of university mathematics learning centers (Byerley, Johns, et al., 2023). Qualitative and quantitative data from 10 universities generated hypotheses such as: (1) The more courses a tutor is responsible to tutoring the more likely it is they'll struggle to answer student questions. (2) Centers with more training for tutors have more return visits per student. (3) Centers with a strong connection to the mathematics department have increased effectiveness.

Applying the Research

To address: (1) The MSLC groups similar courses into one location with tutors specializing in one. Adequate funding is important allow small groupings of courses. (2) The MSLC provides tutor training which is above national average in hours and is research-based (See Johns, 2023). (3) The MSLC is located in a building connected to both the mathematics and statistics departments which allows for collaboration and frequent informal and formal interactions.

A companion article (Johns, Byerley, et al., 2023) examined performance assessment for tutoring centers using a non-profit organization (NPO) framework. Previous evaluations for centers have focused on number of visits, correlating visits to grades), and student surveys that ignore the particular context of a center. The NPO framework takes into account additional performance indicators that provide a more nuanced understanding of a center's performance by bringing to light the interplay among its various indicators. The framework allows centers to look beyond outputs and outcomes to understand why these outputs and outcomes come to be.

Applying the Research

Input measures are a key aspect of performance which impact outputs and outcomes. For the MSLC, increase in tutor funding would reduce student wait time and increase tutor time per student. Funding for higher tutor salaries would improve the ability to hire and retain tutors. While the MSLC has an ideal location and square footage, funding to improve layout, decor, and seating would improve student usage.

Recent Publications

Byerley, B., Johns, C., Moore-Russo, D., et al. (2023). Towards research-based organisational structures in mathematics tutoring centres. *Teaching Mathematics and Its Applications*.

Johns, C., et al. (2022). Research-based training for undergraduate mathematics tutors. *International Journal of Mathematics Education in Science and Technology*. <https://doi.org/10.1080/0020739X.2022.2153759>

Mills, M., Johns, C., & Ryals, M. (2022). An analysis of the observable behaviors of undergraduate drop-in mathematics tutors. *International Journal of Research in Undergraduate Mathematics Education*. <https://doi.org/10.1007/s40753-022-00197-6>

Johns, C. & Burks, L. (2022). A framework for mathematical knowledge for undergraduate mathematics tutors: A framework of knowledge and effective practices. *International Journal of Research in Undergraduate Mathematics Education*. <https://doi.org/10.1007/s40753-022-00165-0>

Johns, C., Byerley, C., Moore-Russo, D., et al. (2021). Performance assessment for mathematics tutoring centres. *Teaching Mathematics and Its Applications*. <https://doi.org/10.1093/teamat/hrab032>

Johns, C. (2020) Self-regulation in first-semester calculus. *International Journal of Research in Undergraduate Mathematics Education*, 6(3), 404-420.

Johns, C. & Mills, M. (2020). Online mathematics tutoring during the COVID-19 pandemic: Recommendations for best practices. *PRIMUS*, 31(1), 99-117. <https://doi.org/10.1080/10511970.2020.1818336>

Miller, E., Fowler, J., Johns, C., et al. (2020). Increasing active learning in large, tightly coordinated calculus courses. *PRIMUS*, 31(3-5). <https://doi.org/10.1080/10511970.2020.1772923>

Fowler, J., Snapp, B., Johns, C., Miller, E., et al. (2020). An open-source calculus textbook on the Ximera platform. *PRIMUS*. <https://doi.org/10.1080/10511970.2020.1781720>

National Affiliations

Mathematics Learning Center Leaders- Assistant Director Carolyn Johns co-leads this national group which focuses on both research and practice of tutoring

Student Engagement in Mathematics through an Institutional Network for Active Learning (SEMINAL)- Instructional Designer Elizabeth Miller was co-lead on the OSU component of this NSF-sponsored national collaborative grant opportunity

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Contributions by: Elizabeth Miller