What is CREATE for STEM?

Collaborative Research in Education, Assessment, and Teaching Environments for the fields of Science, Technology, Engineering and Mathematics

a collaboration between the MSU colleges of Education, Natural Science, Engineering, and the Lyman-Briggs residential college in coordination with the Office of the Provost

A collaboration between researchers, science educators, technologists, and teachers and districts in Michigan, across the U.S., and around the world.





Information and some Key Personnel

University focused Institute

Jointly managed by the College of Natural Science and the College of Education Funded by the College of Natural Science, College of Education and the Provost Office

Personnel

Joe Krajcik – Director Bob Geier – Deputy Director Aman Yadav – Associate Director of Computing Education Kristen Bieda -- Associate Director of Mathematics Ligita Espinosa – Executive Assistant and HR Administrator Mary Luba – Financial Administrator Sue Carpenter – Communications Cory Miller – Professional Development Renee Bayer – Engagement Colter Starr – Technology

And a host of others: Melanie Cooper. Kevin Haudek. Danny Caballero, Clausell Mathis,

Christina Schwartz, Namsoo Shin, Peng He, Consuelo Morales......





CREATE for STEM Goals

- To Improve the teaching and Learning of STEM K- 16
 - College teaching and learning
 - K 12 Efforts (PBL and NGSSaligned materials and professional learning)
 - Sustained professional learning
 - Highly digital materials
 - International Engagement: CREATE
 Global
 - Policy

- Innovate developing new curriculum materials, use of technology, professional development, policy approaches, and research methods to improve teaching and learning
- Investigate by researching the effectiveness of innovations in the fields of STEM education
- Inform by publishing research and other materials to support improvement in the field of K-16 STEM education.





Vision

- A springboard and hub for innovation, research and intellectual collaborations
- Help bring to fruition the ideas and projects that will make a difference in the teaching and learning of science and mathematics for all learners regardless of their cultures and experiences.
 - Improve teaching and learning K 16
 - Provide research support for our work





A Sample Current Research Projects

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- 1. NIH SEPA: Health in Our Hands: Building and sustaining student engagement in genomic and environmental health sciences through a community-school partnership PI: Renee Bayer 2019-2024
- 2. NSF: Collaborative Research: Supporting Instructional Decision Making: The Potential of Automatically Scored Three-dimensional Assessment (PASTA), PI: Joe Krajcik 2021-2025
- IES: Exploring Students' Progression in developing Quantitative Knowledge-in-Use about Energy, PI: Bob Geier 2023-2027
- 4. NSF: Evaluating Effects of Automatic Feedback Aligned to a Learning Progression to Promote Knowledge-In-Use, PI: Kevin Haudek – 2022-2026
- 5. NSF: Collaborative Research: Modeling inclusive computational thinking instruction: Video cases for developing teacher knowledge, PI: Aman Yadav 2023-2027
- 6. Detroit Public Schools: Detroit PS Professional Development Modification 006, PI: Cory Miller 2023-2024
- NSF: Developing and Testing a Learning Progression for Middle School Physical Science incorporating Disciplinary Core Ideas, Science and Engineering Practices, and Crosscutting Concepts, PI: Peng He – 2022-2025

CREATE for STEM has had research projects funded through the George Lucas Educational Foundation, the Chan-Zuckerberg Foundation, NSF, NIH, IES and multiple collaborations with private institutions. Our research has reached children across the country and around the world with our diverse group of collaborators and researchers.





Professional Learning

Aligned with our research-based, high-quality three-dimensional, open source, science curricula, typically through organized teacher support networks. Involves helping teachers understand phenomena-based classroom science instruction in ways that support students' equitable science classroom engagement and science identity development.

Goals:

- engage teachers in phenomena-based experiences in ways that help them make sense of core science ideas, practices, and crosscutting concepts to support their build their science understanding.
- 2. support teachers in figuring out a classroom-focused driving question, so that teachers are able to engage in professional conversations about assessing and scaffolding students' three-dimensional engagement within real-world classroom contexts.

We have team-members who support MSU developed curricula including ML-PBL, Carbon TIME, Health in our Hands, PIRE and Interactions.







Development and Research K-12

K–12 Efforts (materials and professional learning efforts)

- Crafting Engaging Science Environments
- Multiple Literacies in Project-Based Learning: Elementary mathematics and literacy through science
- Next Generation Science Assessments
- Health in Our Hands: Middle school genomics and environmental interactions
- Interactions: High school physical science
- Understanding Energy: MS physics/chemistry
- Building scientific models: online interactive tool for MS/HS with curricular units
- Build curriculum to support students understanding of energy.





R&D Higher Education

Higher Education Efforts (including MSU's participation in the AAU Undergraduate STEM Education Initiative)

- Automated Analysis of Constructed Response Project
- Introductory Chemistry courses (Chemistry, Life, the Universe, & Everything)
- TEAM (Teacher Education And Mathematics) Project
- Projects and Practices in Physics (P-Cubed)
- LEVERS: Leveraging Engagement and Vision to Encourage Retention in STEM)





Since 2013, DBER researchers in NatSci have received numerous grants that have impacted STEM teaching and learning at MSU





Engagement: Local, State, and Beyond

Engagement can be as simple as a visit to an individual or organization, or more goaloriented, such as planning joint activities and events, or developing an ongoing partnership.

Engagement - developing relationships, identifying common agendas, and working towards common goals leading to improvements in STEM education.

Engagement with – science/STEM leaders, classroom teachers, school administration, family and community members, and business leaders concerned with improved STEM education, in Michigan and globally.

Engagement Activities (select)

- Next Generation Science Standards Rollout day-long conference to introduce the proposed NGSS to school administrators, science teachers, and other educational leaders
 - Health in Our Hands Flint/Genesee Partnership (community-connected curriculum)
- MiSciPLN quarterly meetings of PK-20 science education professional learning community (with MMSLN, MDE, MSTA), founding member
- Kellogg Biological Station Teaching Science Outdoors for elementary teachers, KBS/Gull Lake Schools Partnership (with K12 Outreach)
- International Collaboration grad student exchange with Weizmann Institute/ Technion
- MiSTEM Science and Engineering Consortium member
- Yearly presentations at Michigan Science Teachers Association, MSU Science Festival, National Science Teachers Association









International



Seminar Series and Annual Mini-Conference Sue



STEM education research scholars from around the country and world visit each academic year to give presentations on their work and meet with colleagues. MSU faculty are invited to present to foster discussion around research at Michigan State University and to support possible collaborations. CREATE also co-hosts the Co-Integrate mathematics speaker series with PRIME.

Our Mini-Conference has attracted at least 100 participants each year. The event includes poster presentations, lunch, and keynote addresses from nationally known STEM education researchers. Past presenters include Megan Bang, Heidi Schweingruber, and Jim Pelligrino.





create4stem.msu.edu

Main site – read about our research projects Community site – events and news





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What makes CREATE Unique

- Working with partners to create sustainable change
- Interdisciplinary focus
- At the K 12 level, a focus on doing science and knowledge in use through PBL
- Changing the STEM education at the college level
- Development of highly specified and developed systems of change – simultaneous focus on high-quality learning materials, professional learning, and assessments
- International collaborations





Questions?

Visit our website for more information: <u>https://create4stem.msu.edu</u>



