

2023-24 Strategic Instructional Innovations Program

The Grainger College of Engineering at the University of Illinois Urbana-Champaign

Competitively awarded grants enable faculty teams to accelerate best practices for teaching, develop new best practices, and reimagine what it means to educate our students.

Faculty communities • Amplifying student learning • Curriculum • Technology • Teaching at Scale • Innovation

Implementation & Exploration Track

UDL based best practices including utilizing Canvas for the needs of students with disability (Year 3)

This team will identify potential course improvement opportunities to help students with disabilities. Inspired by the Universal Design for Learning (UDL), they will seek to understand how students interact with course components and how they perceive the value of multiple representations of course materials and multiple ways of communication.

Hongye Liu (CS) Lawrence Angrave (CS) Chrysaifis Vogiatzis (ISE) David Dalpiaz (Stat) Bobby Hardy (Engr IT) Yun Huang (i-School, CS) Liaison: Mariana Silva

Designing Early Interventions to Facilitate Student Study Skills in Introductory Problem-Solving Classes (Year 2)

This team will devise and implement early intervention methods to help students improve their study skills with the underlying goal of improving retention and inclusion in engineering courses for undergraduates.

Yael Gertner (CS), Juan Alvarez (ECE) Ben Cosman (CS) Jenny Amos (BioE) Liaison: Ashlynn Stillwell

Multi-Disciplinary Service-Learning Ecosystem (Year 2)*

This team will launch a multidisciplinary ecosystem that connects experts from Grainger Engineering with multiple campus units to assist engineering faculty members in producing high-quality multimedia service-learning content for use by Kindergarten through 12th grade educators throughout the State of Illinois.

Blake Johnson (MechSE), Yuting Chen (ECE), Marcia Pool (Bioengineering & Cancer Center at Illinois), Saadeddine Shehab (Siebel Center for Design), Sihui Ma (Food Science and Human Nutrition), Kristin Giglietti (Cancer Center at Illinois), Callan Luetkemeyer (Mechanical Science and Engineering Liaison: Paul Davidson

Redesigning Design: Incorporating HCD and the 3 C's in Capstone Design Courses (Year 2)*

This team plans to incorporate an entrepreneurial mindset (EM) framework in the design process by incorporating Human Centered Design (HCD) elements into capstone projects to complement the core competency learners have developed over their early course of study. Through a growing community of practice, the team will support the department to create a vision and framework for incorporating EM and HCD into future lower-level courses.

Matthew Goodman (MatSE), John R. Abelson (MatSE), Jessica A. Krogstad (MatSE), JC Stinville (MatSE), Saadeddine Shehab (SCD), Taylor Tucker (SCD), Blake Johnson (MechSE) Liaison: Joe Bradley

Redesigning CEE courses to Teach Computational Thinking and Engineering in Societal Context (Year 2)

This team continues integration of computational thinking and student-centered learning in CEE 3xx and 4xx level courses, by including computation in problem solving and teaching CEE fundamentals in their engineering societal context, so that students learn to use computation in the problem-solving process and that technical solutions need to correspond to the needs of the social and environmental context for which they are intended.

Sotiria Koloutsou-Vakakis (CEE), Eun Cha (CEE), Mani Golparvar Fard (CEE), Jacob Henschen (CEE), Hannah Horowitz (CEE), Eleftheria Kontou (CEE), Helen Nguyen (CEE), Megan Matthews (CEE), Hadi Meidani (CEE), John S. Popovics (CEE), Ashlynn Stillwell (CEE), Chris Tessum (CEE), Jinhui Yan (CEE), Lei Zhao (CEE) Liaison: Abdussalam Alawini

Virtual Reality as a Vehicle for Education in the Domains of Building Systems and Construction Materials (Year 2)

This team will work to improve student understanding and excitement for highly 3-dimensional problems in structural systems and construction materials using VR technologies.

Ann Sychterz (CEE), Marci Uihlein (Architecture), Jacob Henschen (CEE), Nishant Garg (CEE), Eric Shaffer (CS) Liaison: Andre Schelife

Developing Collaborative Online International Learning (COIL) and COIL+ Projects in Engineering Education (Year 2)

This team plans to develop assessment tools for courses with Collaborative Online International Learning (COIL) projects and to use them for a series of pilot studies to test the effectiveness of improving global competencies of engineering students.

Brian Woodard (AE), Abdussalam Alawini (CS), Meredith Blumthal (ACES), Zuofu Cheng (ECE), Hannah Dougherty (IPENG), Ivan Favila (UPO), Gretchen Forman (Student Success and Engagement), Molly Goldstein (ISE), E.J. Ignacio (CEE), Marcia Pool (Bioengineering & Cancer Center), Luis Rodriguez (ABE) Liaison: Paul Davidson

Developing Open Educational Resources for Fundamental Engineering Mechanics Courses (Year 1)*

This team will further develop open educational resources motivated by contemporary engineering applications that will enhance student and faculty engagement in both the development and delivery of foundational content, provide greater access to the education innovation from GCOE across the higher education community, and improve the readiness of transfer students from the GCOE Pathways Program.

Mariana Kersh (MechSE), Wayne Chang (Aero), Shelby Hutchens (MechSE), Gabriel Juarez (MechSE), Jessica Krogstad (MatSE), Brian Mercer (MechSE), Nikhil Admal (MechSE), Matthew West (MechSE) Liaison: Blake Johnson

Response to Failure and Success in ECE Circuits Courses: A KEEN/EM Project on Creating Value (Year 1)*

This team seeks to better understand students' ability to navigate and respond to failure as an opportunity for growth and learning through the scientific enterprise. With little engineering education research on how students respond to failure, the team will try to better understand the range of student responses to failure before considering any future work that could help build resilience to failure and ways in which we can help students learn from failure.

Juan Alvarez (ECE), Jessica Gladstone (EPSY), Jennifer Cromley (EPSY) Liaison: Jay Mann

Using a Human-Centered Engineering Design Framework to Co-Design Aerospace Engineering Courses (Year 1)*

This team will utilize the HCD framework to a) build a curriculum map to identify possible HCD activities and learning progressions for aerospace students to develop human-centered engineering design knowledge, skills, and mindsets, b) collaborate with additional faculty members to evaluate existing courses and co-design changes, and c) identify connections between course learning objectives and activities and students' learning outcomes that are defined in the ABET and KEEN frameworks.

Tim Bretl (AE), Saad Shehab (SCD), Taylor Tucker (SCD), Mike Lembeck (AE), Elle Wroblewski (AE) Han Lee (AE) Liaison: Joe Bradley

Game for Community Resilience-Based Decision-Making Education and Entrepreneurially Minded Learning (Year 1)*

This team will develop and implement an engineering decision-making games as an introductory course module for the topic of societal impact-based structural engineering risk management. This project will build on an existing pilot version of the game and the results of an initial pilot test. The project addresses multiple objectives, including (1) Revising the game design based on past playtesting of the board game, (2) Developing a computer-based version of the game, (3) Initial pilot testing and implementation of the game, and (4) Investigating player strategies using interaction log data. With strong links to the 3C's of the KEEN Network's Entrepreneurial Mindset, Curiosity, Connections, and Creating Value, the proposed project promotes entrepreneurially minded learning.

Eun Cha (CEE), Eric Shaffer (CS), Luc Paquette (Edu) Liaison: Abdussalam Alawini

Enhancing Project Management Skills in Engineering Curricula and Beyond (Year 1)*

This team will better understand the current level of project management knowledge and skills of engineering students (ABE and SE) and non-engineering students (ETMAS and FSHN) both early and late in their programs of study. The project also aims to assess the current satisfaction of alumni and potential employers with project management skills of our graduates. This effort will be expanded to other majors at UIUC as well as peer institutions.

Paul Davidson (ABE), Travis Johnson (ABE), Molly Goldstein (ISE) Liaison: Chandrasekhar Radhakrishnan

TheorieLearn: Autograded Resources for Theoretical Computer Science (Year 1)

This team will develop resources on the PrairieLearn platform to support the teaching of algorithms, data structures, and other theoretical aspects of computer science, at several different levels of the computer science curriculum. The project extends an existing effort to develop PrairieLearn resources for CS374 and expands this effort to include CS 225 in the first year, and to include CS277, CS401, and CS 403 in future years.

Jeff Erickson (CS), Carl Evans (CS), Yael Gertner (CS), Brad Solomon (CS) Liaison: Mariana Silva

Expanding a Near-Peer Mentoring Framework to Develop Entrepreneurial Mindset Learning Across a Curriculum (Year 1)*

This team will focus on two CEE courses to integrate the Entrepreneurial Mindset (EM) in students' course projects. Students in the upper-level course will serve as near-peer mentors for the students in the introductory course. Through the inclusion of a denser

network of community and University partners in this new project work, the team will advance a framework for assessing students' EM over multiple learning experiences.

Jacob Henschen (CEE), Arthur Schmidt (CEE), Jeffrey Roesler (CEE) Ramez Hajj (CEE) Ann Sychterz (CEE), E. J. Ignacio (CEE), Jeremy Guest (CEE) Liaison: Blake Johnson

Computational Tools for Dynamics and Control (Year 1)

This team will enhance and modernize key undergraduate courses serving students in the Grainger College of Engineering by incorporating meaningful elements of computational tools and exercises.

Sascha Hilgenfeldt (MechSE), Timothy Bretl (AE), Siegfried Eggl (AE/Astronomy), Prashant Mehta (MechSE), Melkior Ornik (AE), Srinivasa Salapaka (MechSE), Chenhui Shao (MechSE), Mariana Silva (CS/AE3), Matthew West (MechSE) Liaison: Ashlyn Stillwell

Pathways to Impact (Year 1) *

This team will further develop a "Pathways to Impact" course available to all upper-level (i.e. junior- and senior-standing) and graduate students (i.e., MS, MEng, and PhD) in science and engineering programs. The course will expose students to career options for those with advanced degrees including 1) basic and translational research opportunities and 2) non-research roles in academia, industry, consulting, government, and nonprofits. The course will be designed around the KEEN Framework and 3 C's of Entrepreneurial Mindset (EM).

Keilin Jahnke (TEC), Joe Bradley (BioE), Jeff Baur (AE), Jed Taylor (TEC) Liaison: Rebecca Reck

Adopting an Entrepreneurial Mindset via the Lab and Design Community of Practice (Year 1)*

This team will promote and emphasize EM in lab and design courses through (1) growing the GCoE Lab and Design CoP and (2) strategically implementing EM projects and studies into CoP member courses. The CoP will continue to include faculty and staff who teach or support traditional laboratory courses, design courses (e.g., capstone, first-year experience), and similar courses with large design projects.

Rebecca Reck (BioE), Holly Golecki (BioE), Christopher Schmitz (ECE), Katie Ansell (Phys), Chandra Radhakrishnan (ECE), Jessica TerBush (MatSE), Caroline Cvetkovic (BioE), Dave Mussulman (iSchool) Liaison: Andre Schelife

Test Anxiety and the CBTF (Year 1)

This team will explore the state of testing anxiety experienced by students who take their midterm and final exams in the Computer-based Testing Facility (CBTF). The Project will serve multiple objectives: (1) establish baseline data concerning the extent of testing anxiety related to CBTF exams and factors contributing to that test anxiety; (2) inform the development of policies and procedures aimed at mitigating testing anxiety related to CBTF exams; and (3) facilitate the development of educational and training materials for faculty and students that are aimed at reducing testing anxiety in the CBTF.

Mariana Silva (CS), Julie Baker (ATLAS), Geoffrey Herman (CS), Dave Mussulman (iSchool), Jim Sosnowski (CBTF), Matthew West (MechSE), Craig Zilles (CS) Liaison: Lance S. Cooper

Startup Track: Implementation & Exploration Track

Resources for Inclusive and Equitable Teaching (Year 1)

Identify best practices that could make an immediate impact, create concrete tools that translate theory into classroom practice, and encourage adoption of the tools through peer-to-peer interactions.

Theresa Saxton-Fox (AE), Siegfried Eggl (AE), Victoria Shao (ECE), Elle Wroblewski (AE), AbdulGafar Sulaiman (CEE), Brian Woodard (AE), Timothy Bretl (AE), Laura Gerhold (AE) Liaison: Chris Migotsky

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