2025-26 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

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Implementation & Exploration Track

Service-Learning Ecosystem (Year 3)*

The project connects university students in the Grainger College of Engineering, pre-licensure education students, and K–12 partners in a service-learning ecosystem to develop and deliver new STEM education modules, with emphasis on the Entrepreneurial Mindset Learning (EM) framework, to K-12 students across Illinois.

Blake Johnson (MechSE), Yuting Chen (ECE), Hyena Cho (Education), Yael Gertner (CS), Lara Hebert (GCOE & FACES Center), Joshua Katz (Education), Sihui Ma (Food Science and Human Nutrition), Marcia Pool (BioE/Illinois Cancer Center), Saadeddine Shehab (SCD) Liaison: Katy Huff

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

This team plans to incorporate an entrepreneurial mindset (EM) framework in the design process by incorporating HumanCentered Design (HCD) elements into capstone projects to 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), Blake Johnson (MechSE) Jessica A. Krogstad (MatSE), JC Stinville (MatSE), Saadeddine Shehab (SCD), Taylor Parks (SCD) Liaison: Chandrasekhar Radhakrishnan

Intervention After Failure and Success in ECE Circuits Courses (Year 3)

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: Katy Huff

Using a Human-Centered Engineering Design Framework to Co-Design Aerospace Engineering Courses (Year 3)*

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.

Timothy Bretl (AE), Elle Wroblewski (AE), Saadeddine Shehab (SCD), Taylor Parks (SCD) Liaison: Chandrasekhar Radhakrishnan

Game for Community Resilience-Based Decision-Making Education and Entrepreneurially Minded Learning (Year 3)*

This team is advancing an engineering decision-making game as an instructional module on societal impact–based structural engineering risk management. Building on earlier pilot testing, the project now includes refined board and computer game versions with integrated instructional materials. Current efforts focus on: (1) expanding dissemination through board game distribution, AWS-hosted computer games, and outreach events; (2) strengthening assessment to evaluate learning outcomes across diverse student populations; and (3) formalizing a reusable design framework for broader adoption. Aligned with the KEEN Network's 3C's - Curiosity, Connections, and Creating Value - the project fosters entrepreneurially minded learning while promoting systems thinking, community resilience, and equitable decision-making.

Eun Cha (CEE), Eric Shaffer (ECE), Luc Paquette (Edu) Liaison: Jay Mann

Enhancing Project Management Skills in Engineering Curricula and Beyond (Year 3)*

This team aims to better understand the current level of project management knowledge and skills of engineering students and non-engineering students both early and late in their programs of study. Individual students will be tracked over time and throughout their program of study to assess what is most impactful for project management learning. 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: Matt Goodman

TheorieLearn: Autograded Resources for Theoretical Computer Science (Year 3)

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: Chris MIgotsky

Computational Tools for Dynamics and Control (Year 3)

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. This includes flexible Colab/Python exercises and homework projects in ME 340 and ME 360 with the intention of presenting more realistic problems to students (e.g. signal processing of acoustic signals, interactive visualization of dynamical systems), as well as the development of Condynsate, a combined physics simulation and 3D visualization tool for use in AE 352 and AE 353. Both approaches incorporate programming elements designed to enhance student understanding beyond running pre-programmed tools. Major year-3 taks are the documentation, sustainability, dissemination, and expansion to new fields of application of these tools.

Sascha Hilgenfeldt (MechSE), Timothy Bretl (AE), Wayne Chang (AE), Siegfried Eggl (AE/Astronomy), Thomas Golecki (MechSE), Prashant Mehta (MechSE), Melkior Ornik (AE), Srinivasa Salapaka (MechSE), Matthew West (MechSE) Liaison: Katy Huff

Test Anxiety and the CBTF (Year 3)

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: Jay Mann

Exploring the Impact and Potential of Generative AI in Engineering Education (Year 2)*

This project aims to explore the impact and potential of generative AI in engineering education. In particular, the team seeks to integrate generative AI into STEM higher education curricula to cultivate the entrepreneurial mindset advocated by the KEEN 3 C's: curiosity, connections, and creating value.

Abdu Alawini (CS), Volodymyr Kindratenko (NCSA), Sotiria Koloutsou-Vakakis (CEE), Tomasz Kozlowski (NPRE), Meredith Blumthal (ACE), Maryalice Wu (CITL) Liaison: Sascha Hilgenfeldt

Enabling the Learning and Practice of Effective Teamwork Behaviors using Cross-Tool Log Data (Year 2)

This project will ensure every graduate of the Grainger College of Engineering learns the necessary skills to become a successful team player in industry. Teamwork is important in engineering classrooms to satisfy industry demand for proficient team players and harness the pedagogical benefits of collaborative learning, and the team plans to leverage log data captured by digital collaborative tools to enable students to view, compare, and reflect on their teamwork behaviors using visual evidence and support instructors to diagnose and provide evidence-based feedback for improved teamwork at scale.

Brian Bailey (CS), Darko Marinov, (SCDS), Hari Sundaram (SCDS), Wendy Shi (SCDS), Yifan Song (SCDS), Emma Mercier (Curriculum and Instruction) Liaison: Rebecca Reck

Designing a New CS1 Course for Engineering Students (Year 2)
This project is the second year of a comprehensive redesign of CS 101, focusing on re-establishing basic programming fundamentals (CS1) during lectures while integrating diverse engineering applications into lab sections and bi-weekly mini-projects to improve the rigor and relevance of the course for all students. Year two is predominantly focused on ensuring cohesion between direct instruction and the updated labs/projects, exploring collaboration mechanisms for labs, and boosting Matlab/Octave resources for projects and labs to serve interested student populations.
Max Fowler (SSCDS), Mariana Silva (SSCDS), Nico Ritschel (SSCDS), Wayne Chang (AE), Brian Mercer (MechSE), Ke Tang (MechSE), John Popovics (CEE) Liaison: Jacob Henschen

Incorporating Entrepreneurial Mindset into Circuits Curriculum (Year 2)*
This project will incorporate Entrepreneurial Mindset (EM) based methodology across the curriculum that uses circuit concepts both in the Department of Electrical and Computer Engineering as well as the Department of Mechanical Engineering. The project goal is to enable students to go beyond problem solving, and develop a creative mindset. This project will bring instructors together to create modules, activities, demonstrations, and reflection exercises that will make students curious, help them connect knowledge gathered from different courses, and create an aspiration for lifelong learning.
Chandrasekhar Radhakrishnan (ECE), Chris Schmitz (ECE), Arjit Banerjee (ECE), Jonathon Schuh (ECE), Olga Mironenko (ECE), Nenad Milijkovic (MechSE), Victoria Shao (ECE) Liaison: Chris Migotsky

Adopting an Entrepreneurial Mindset via the Lab and Design Community of Practice (Year 2)*
This project 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. All of these courses have significant experiential learning components that closely align with objectives of curiosity, connections, and creating value, the 3Cs of EM.
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: Chris Migotsky

Design Choices You Can "Feel": Creating Value with Structural Systems in Virtual Reality (Year 2)*
This team will develop a set of VR immersive experiences within structural systems and reinforced concrete modules with design options and consequences. This proposal builds on three years of work by the PIs on VR to now better support students' curiosity and ability to make connections and create value through learning experiences in VR modules.
Ann Sychterz (CEE), Marci Uihlein (Architecture), Jacob Henschen (CEE), Eric Shaffer (CS), Mohamad Alipour (CEE) Liaison: Jay Mann

Crystal Vision: "A Video Game to Enhance Student Learning Outcomes on Engineering Materials" (Year 1)
This project proposes the development of a cloud-based 3D educational video game to enhance student engagement and learning in CEE 300: Behavior of Materials and MSE 280: Engineering Materials at UIUC. Building on prior VR-based educational tools, which improved learning outcomes but faced scalability and user comfort challenges, the new platform will be built on WebGL for broad accessibility and incorporate machine learning algorithms to adapt difficulty based on user performance. The game will cover key materials science topics, including stress-strain behavior, fracture mechanisms, phase diagrams, and XRD analysis, with a narrative-driven, exploratory structure to promote systems thinking, critical analysis, and entrepreneurial mindset habits.
Nishant Garg (CEE), Jacob Henschen (CEE), Jenny Amos (BioE), Matthew Goodman (MatSE), Eric Shaffer (CS) Liaison: S. Lance Cooper

SIIP and Share: Podcasts to Connect to Engineers to Grainger COE (Year 1)*
This team will convene a faculty community of practice to advance excellence in teaching methods through a podcasting (digital storytelling) medium. The team plans to establish a Grainger COE-based podcast that engages Grainger community members (faculty, staff and students) to share best practices.
Holly Golecki (BioE), Jenny Amos (BIOE), Wayne Chang (Aerospace Engineering), Ramez Hajj (Civil and Environmental Engineering), Blake Johnson (Mechanical Science and Engineering), Colleen King (Journalism, College of Media), Saadeddine Shehab (Siebel Center for Design), Ashleigh Wright (IDEA Institute), Lewis Lehe (CEE) Liaison: Yael Gertner

Developing an Advanced Integrated Engineering Course on Community Resiliency and Disaster Planning (Year 1)*

This team will continue to integrate the PrairieLearn platform in two core CEE courses– facilitating new approaches in content and best pedagogical practices..

Sotiria Koloutsou-Vakakis (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) Liaison: Yael Gertner

Artificially Successful? Investigating and Responding to Generative AI's Capability to Solve Course Assignments (Year 1)

This project will launch a comprehensive redesign of CS 101, focusing on re-establishing basic programming fundamentals (CS1) during lectures while integrating diverse engineering applications into lab sections and bi-weekly mini-projects to improve the rigor and relevance of the course for all students.

Melkior Ornik (AE), Abdussalam Alawini (SSCDS), Jennifer Cromley (EdPsy), Siegfried Eggl (AE), Max Fowler (SSCDS), Kellie Halloran (MechSE), Bin Hu (ECE), Keilin Jahnke (TEC), Tawnya Means (Gies), Jamie Nelson (CITL, Gies), Abhishek Umrawal (ECE), Lav Varshney (ECE) Liaison: Olga Mironenko

Active Learning for Entrepreneurial Mindset at Scale (Year 1)*

This project is working to create demos connected to real-life applications for courses in the TAM 2XX curriculum chain. These demos will be focused specifically on engaging students in large lecture-style courses, and will be used multiple times in each course, each time highlighting a different course concept or problem. The team will also evaluate ways to engage students in lecture halls and discussion sections with demo content. Both the active learning activities and demos will be focused on guiding students to develop entrepreneurial-minded habits that last beyond the TAM 2XX courses.

Kellie Halloran (MechSE), Tom Golecki (MechSE), Mariana Kersh (MechSE), Brian Mercer (MechSE), Emma Mercier (Curriculum and Instruction, Educational Psychology), Mariana Silva (CS), Kevin Wandke (MechSE), Matt West (MechSE) Liaison: Sascha HIlgenfeldt

Automatic Short Answer Grading at Scale Using Large Language Models (Year 1)

This project supports the development and integration of a scalable ASAG system into the PrairieLearn platform, initially targeting a diverse array of disciplines. The team hopes to enable instructors, irrespective of their familiarity with LLM technology, to utilize our ASAG system for grading free-form textual short answers. The system will leverage pretrained models such as OpenAI's GPT variants, as well as specialized locally trained models, to provide accurate, fair, and timely feedback on student submissions.

Mariana Silva (CS), Matthew West (MechSE), Jeff Erickson (CS), Yael Gertner (CS), Seth Poulsen (USU) Liaison: Mattox Beckman

Highlighting Course Connections (Year 1)*

This team's goal is to improve students' interdisciplinary problem-solving skills by highlighting the dense web of connections between courses across Grainger, noting that courses across disciplines rely on very similar concepts, tools, applications, methods, learning objectives, etc. The project will make these or connections across the engineering curriculum more widely known, discussed, and highlighted by faculty.

Ke Tang (MechSE), Tom Golecki (MechSE), Jennifer Amos (BioE), Jacob Henschen (CEE), Abdussalam Alawini (CS), Matthew Goodman (MatSE), Molly Goldstein (ISE), Jason Merret (AE), Eliot Bethke (BioE) Liaison: Jay Mann

X70i (Re)Design (Year 1)*

This team seeks to integrate core design thinking principles from the Entrepreneurial Mindset as an integral part of the Mechanical Science and Engineering (MechSE) design sequence, known as the X70 sequence. In addition to targeted learning activities across the design sequence, the project will work to unify expectations and procedures across the sequence, enhancing cohesion. A final focus will be to develop standardized design challenges that will be used to directly assess student learning across the course sequence.

Kevin Wandke (MechSE), Kellie Halloran (MechSE) Lee Clemon (MechSE), Blake Johnson (MechSE), Brian Mercer (MechSE), Keilin Jahnke (TEC) Liaison: Matt Goodman

Startup Track

Developing Conceptual Problems for Instruction in Foundational Computer Science Courses

This team will devise and implement early instructional materials that focus on conceptual understanding. They will use interviews to assess students' conceptual understanding and using a compare and contrast approach to instructional design to create new materials.

Yael Gertner (CS), Eric Kuo (physics), Nirvaan Khera (physics), Chandra Chekuri (cs), Lance Cooper (physics), *Liaison: Mattox Beckman*

Engineering Mentorship Program: A Scalable Model for Undergraduate and Graduate Students
This project offers a course with training and guided feedback on mentoring practices, drawing from both academic and industry contexts to help students build the interpersonal and leadership skills essential to being effective mentors. By focusing on mentorship theory, hands-on skill development, and reflective practice, this course bridges the gap between academic learning and professional growth. Participants will gain practical experience in areas such as trust-building, communication, goal-setting, and inclusive engagement skills that can be applied in research labs, student organizations, and future workplaces.
Hadi Meidani (CEE), Maryam Ghadiri (CEE), Jacob Henschen (CEE), EJ Ignacio (CEE) Liaison: S. Lance Cooper

Grainger Engineering First-Year Course Harmonization and Infusion of Entrepreneurial Mindset Learning*
This team seeks to create a more cohesive community of practice among the first-year instructors to identify best practices in EML for first-year courses and disseminate them across the College.
Brian Woodard (AE), Molly Goldstein (ISE), Kellie Halloran (MechSE), Jacob Henschen (CEE), EJ Ignacio (CEE) Liaison: Olga Mironenko

Adaptation Track

Developing Online Reference Pages for Structural Mechanics, Dynamical Systems, and Control Systems Courses in Aerospace Engineering
This team will develop comprehensive reference sheets for CS/ECE 374: Introduction to Algorithms and Models of Computation. The project will create three different sets of reference sheets: one per midterm content (four midterms), one per lecture, and small reference sheets (cheat sheets) for the four midterms and the final exam. These reference sheets will enhance student learning by providing quick access to key concepts, formulas, and examples, fostering an entrepreneurial mindset by stimulating curiosity, building connections, and creating value.
Wayne Chang (AE), Timothy Bretl (AE), and Siegfried Eggl (AE)

Context Rich Reference Pages for Mechanical Design
This team will develop Engineering Design reference pages following the model and practices established in the "Developing Open Educational Resources for Fundamental Engineering Mechanics Courses" SIIP project, which provided content reference pages for students in the TAM 2XX sequence. Student engagement with these resources shows strong success in providing a utilized tool (Raymond-Bertrand, 2025)
Lee Clemon (MechSE), Kevin Wandke (MechSE), Kellie Halloran (TEC), Brian Mercer (MechSE), Blake Johnson (MechSE)

Creating an Introductory MatSE Online Reference Page
MSE 280 is an introductory materials science and engineering course for non-majors. Aerospace engineering students, as well as those minoring in MSE and a few other specializations (e.g., System Engineering), make up the majority of the course population, typically 150 in the fall semesters and 100 in spring semesters. Due to the non-major nature of the course, the majority of students do not engage with the textbook, especially due to the online nature of assessments via PrairieLearn. By adapting the previous SIIP project and developing reference pages for MSE 280, the hope is to further engage the students outside of formal class time. I plan to implement these reference pages by focusing on the KEEN Entrepreneurial Mindset (EM), specifically promoting the EM habits,
the first being curiosity. Colloquially, there is a term named "wiki rabbit hole" where one starts looking into a reference (typically on Wikipedia) and then continues further exploration via clicking links on the original webpage. On subsequent pages, another link is clicked and thus creates a repeating pattern. I aim to replicate this pattern, as the creation of these online reference pages enables one's natural curiosity through clicking on related topics. The important aspect of this mindset is the ease with which students can navigate different topics. By utilizing the previous SIIP team's framework of pages, this should naturally enable their curiosity.
Matthew Goodman (MatSE)

Adapting Open Education Resources for Fundamental Bioengineering Courses (ILLINOISref Pages for BIOE)

BIOE Reference Pages will serve to streamline the BIOE curriculum and show students where reinforcement and reiteration occur for each concept. In doing so, instructors can point to prerequisite classes where students may have learned the material, or to future classes where they will use this concept again. As courses may change instructors and therefore notations and nomenclature, providing a constant throughline between the courses would be a great benefit to the department as well as the Grainger College of Engineering as students from other disciplines connect their work to the ever-growing field of Bioengineering. Both BIOE faculty and their hundreds of students would benefit from this solution, and as such, would be users of this system. Moreover, as this resource will support students who transfer into our program from others on campus or other institutions, BIOEref pages will help students in our department to see connections among courses and to their future careers.

Caroline Cvetkovic (BIOE), Holly Golecki (BIOE), Jenny Amos (BIOE), Ali Ansari (BIOE)

Adaptation of Web-based Reference Pages: The Cheat Sheet Your Students Didn't know they Needed to CS 199 CSX: CS Beyond STEM w/ Python

The project will adapt Web-Based Reference Pages. The idea behind this project is to create reference pages for material that goes together with a course. Usually, instructors use a textbook or create lecture notes for a course that contains many examples and exercises along with accompanying narrative that includes motivation and applications. When students wish to review this material when studying for an exam they would benefit from a reference page that contains the topics that will be covered for an exam along with the relevant definitions and examples of worked out exercises. This reference page can be created via making a more concise version of the lecture notes. The Web-based reference pages project designed an efficient model for how to create such reference pages. In addition, this project created a simple way for creating a webpage from the reference pages. The website can be used on a phone and is not behind a firewall which makes it easier for students to access. The Web-based reference page project encourages EM based content development. The EM framework focuses on 3 Cs: Creating Value, Connections, Curiosity.

Yael Gertner (CS)

Developing Reference Sheets for Undergraduate Algorithms Course: Enhancing Student Learning through Entrepreneurial Mindset

This project will develop comprehensive reference sheets for CS/ECE 374: Introduction to Algorithms and Models of Computation. The project will create three different sets of reference sheets: one per midterm content (four midterms), one per lecture, and small reference sheets (cheat sheets) for the four midterms and the final exam. These reference sheets will enhance student learning by providing quick access to key concepts, formulas, and examples, fostering an entrepreneurial mindset by stimulating curiosity, building connections, and creating value.

Abhishek Umrawal (ECE)

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Implementation & Exploration Track

Designing Early Interventions to Facilitate Student Study Skills in Introductory Problem-Solving Classes (Year 3)
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: S. Lance Cooper*

Redesigning Design: Incorporating HCD and the 3 C's in Capstone Design Courses (Year 3)*
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 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), Blake Johnson (MechSE) Jessica A. Krogstad (MatSE), JC Stinville (MatSE), Saadeddine Shehab (SCD), Taylor Parks (SCD) Liaison: Paul Davidson

Developing Open Educational Resources for Fundamental Engineering Mechanics Courses (Year 3)*
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), Tom Golecki (MechSE) Shelby Hutchens (MechSE), Brian Mercer (MechSE), Nikhil Admal (MechSE), Callan Luetkemeyer (MechSE) Liaison: Abdu Alawini

Redesigning CEE courses to Teach Computational Thinking and Engineering in Societal Context (Year 3)
This team will continue to integrate the PrairieLearn platform in two core CEE courses– facilitating new approaches in content and best pedagogical practices.
Sotiria Koloutsou-Vakakis (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) Liaison: Chandrasekhar Radhakrishnan

Developing Collaborative Online International Learning (COIL) and COIL+ Projects in Engineering Education (Year 3)
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 (IPENG), Zuofu Cheng (ECE), Hannah Dougherty (IPENG), Ivan Favila (UPO), Gretchen Forman (Student Success and Engagement), Molly Goldstein (ISE), E.J. Ignacio (CEE), Marcia Pool (Cancer Center), Luis Rodriguez (ABE) Kate Abney (IPENG), Kimberly Powers (UPO), Jim Stubbins (NPRE), Joan Brown (UPO) Liaison: Olga Mironenko

Response to Failure and Success in ECE Circuits Courses (Year 2)*
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: Mattox Beckman

Using a Human-Centered Engineering Design Framework to Co-Design Aerospace Engineering Courses (Year 2)*
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Tim Bretl (AE), Saad Shehab (SCD), Taylor Tucker (SCD), Elle Wroblewski (AE) Liaison: Matt Goodman

Game for Community Resilience-Based Decision-Making Education and Entrepreneurially Minded Learning (Year 2)*

This team will develop and implement an engineering decision-making game as an introductory course module on societal impact-based structural engineering risk management. The project builds on an existing pilot version of the game and the results of an initial pilot test. It addresses several key objectives, including: (1) developing a dissemination plan for the project outcomes, such as the board game, computer game, instruction module, and the development/deployment process; (2) advancing the game design to improve its effectiveness and engagement; and (3) developing and implementing the instruction module. With strong alignment 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 (ECE), Luc Paquette (Edu) Liaison: Paul Davidson

Enhancing Project Management Skills in Engineering Curricula and Beyond (Year 2)*
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: Ashlynn Stillwell

TheorieLearn: Autograded Resources for Theoretical Computer Science (Year 2)
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: Mattox Beckman

Expanding a Near-Peer Mentoring Framework to Develop Entrepreneurial Mindset Learning Across a Curriculum (Year 2)*
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: Matt Goodman

Computational Tools for Dynamics and Control (Year 2)
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), Wayne Chang (AE) Matthew West (MechSE) Liaison: Yael Gertner

Test Anxiety and the CBTF (Year 2)
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: Yael Gertner

Exploring the Impact and Potential of Generative AI in Engineering Education (Year 1)*
This project aims to explore the impact and potential of generative AI in engineering education. In particular, the team seeks to integrate generative AI into STEM higher education curricula to cultivate the entrepreneurial mindset advocated by the KEEN 3 C's: curiosity, connections, and creating value.
Abdu Alawini (CS), Volodymyr Kindratenko (NCSA), Sotiria Koloutsou-Vakakis (CEE), Tomasz Kozlowski (NPRE), Christopher Tessum (CEE), Meredith Blumthal (ACE), Maryalice Wu (CITL) Liaison: S. Lance Cooper

Enabling the Learning and Practice of Effective Teamwork Behaviors Using Cross-Tool Log Data (Year 1)
This project will ensure every graduate of the Grainger College of Engineering learns the necessary skills to become a successful team player in industry. Teamwork is important in engineering classrooms to satisfy industry demand for proficient team players and harness the pedagogical benefits of collaborative learning, and the team plans to leverage log data captured by digital collaborative tools to enable students to view, compare, and reflect on their teamwork behaviors using visual evidence and support instructors to diagnose and provide evidence-based feedback for improved teamwork at scale.
Brian Bailey (CS), Darko Marinov (CS), Emma Mercier (Curriculum and Instruction), Hari Sundaram (CS), Wendy Shi (CS), Yifan Song (CS) Liaison: Ashlynn Stillwell

Designing a New CS1 Course for Engineering Students (Year 1)
This project will launch a comprehensive redesign of CS 101, focusing on re-establishing basic programming fundamentals (CS1) during lectures while integrating diverse engineering applications into lab sections and bi-weekly mini-projects to improve the rigor and relevance of the course for all students.
Mattox Beckman (CS), Mariana Silva (CS), Sotiria Koloutsou-Vakakis (CEE), Haidi Meidani (CEE), Wayne Change (AE), Brian Mercer (MechSE), Ke Tang (MechSE) Liaison: Rebecca Reck

SIIP and Share: Podcasts to Connect to Engineers to Grainger COE (Year 1)
This team will convene a faculty community of practice to advance excellence in teaching methods through a podcasting (digital storytelling) medium. The team plans to establish a Grainger COE-based podcast that engages Grainger community members (faculty, staff and students) to share best practices.
Holly Golecki (BioE), Ashleigh WRight (IDEA Institute), Saadeddine Shehab (Siebel Center for Design), Wayne Chang (AE), Blake Johnson (MechSE), Ramez Hajj (CEE), Colleen King (Journalism, College of Media) Liaison: Chris Migotsky

Incorporating Entrepreneurial Mindset into Circuits Curriculum(Year 1)
This project will incorporate Entrepreneurial Mindset (EM) based methodology across the curriculum that uses circuit concepts both in the Department of Electrical and Computer Engineering as well as the Department of Mechanical Engineering. The project goal is to enable students to go beyond problem solving, and develop a creative mindset. This project will bring instructors together to create modules, activities, demonstrations, and reflection exercises that will make students curious, help them connect knowledge gathered from different courses, and create an aspiration for lifelong learning.
Chandrasekhar Radhakrishnan (ECE), Chris Schmitz (ECE), Arjit Banerjee (ECE), Jonathon Schuh (ECE), Olga Mironenko (ECE), Nenad Milijkovic (MechSE) Liaison: Rebecca Reck)

Automatic Short Answer Grading at Scale Using Large Language Models (Year 1)
This project supports the development and integration of a scalable ASAG system into the PrairieLearn platform, initially targeting a diverse array of disciplines. The team hopes to enable instructors, irrespective of their familiarity with LLM technology, to utilize our ASAG system for grading free-form textual short answers. The system will leverage pretrained models such as OpenAI's GPT variants, as well as specialized locally trained models, to provide accurate, fair, and timely feedback on student submissions.
Mariana Silva (CS), Matthew West (MechSE), Jeff Erickson (CS), Yael Gertner (CS), Seth Poulsen (USU), Firas Moosvi (UBC) Liaison: Chandrasekhar Radhakrishnan

Virtual Reality as a Vehicle for Education in the Domains of Building Systems and Construction Materials (Year 1)
This team will develop a set of VR immersive experiences within structural systems and reinforced concrete modules with design options and consequences. This proposal builds on three years of work by the PIs on VR to now better support students' curiosity and ability to make connections and create value through learning experiences in VR modules.
Ann Sychterz (CEE), Marci Uihlein (Architecture), Jacob Henschen (CEE), Eric Shaffer (CS), Mohamad Alipour (CEE) Liaison: Olga Mironenko

Startup Track

Highlighting Connections Between Undergraduate Engineering Courses for Interdisciplinary Education
This team's goal is to improve students' interdisciplinary problem solving skills by highlighting the dense web of connections between courses across Grainger, noting that courses across disciplines rely on very similar concepts, tools, applications, methods, learning objectives, etc. The project will make these or connections across the engineering curriculum more widely known, discussed, and highlighted by faculty.
Ke Tang (MechSE), Tom Golecki (MechSE), Molly Goldstein (ISE), Jenny Amos (BioE), Jacob Henschen (CEE), Matthew Goodman (MatSE), Jason Merret (AE), Ashley Hallock (Grainger UPO) Liaison: Abdu Alawini

**Funded by a grant from the Kern Family Foundation*

2022-23 Strategic Instructional Innovations Program

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Implementation & Exploration Track

FACA Project: Facilitating Adoption of Collaborative Activities using Computer-based Tools *(Year 3)*
This team will further develop and improve existing computer-based tools to facilitate collaborative and active learning work inside and outside of the classroom.
Mariana Silva (CS), Abdussalam Alawini (CS), Geoffrey Herman (CS). Liaison: Molly Goldstein (ISE)

Expanding PrairieLearn *(Year 3)*
In Years 1 and 2 of this project the team made many improvements to PrairieLearn to support remote learning and hybrid online/offline courses, and support large course staff and instructor communities. In Year 3 they will focus on two key objectives: (1) improving the support of computational education using PrairieLearn, and (2) expanding the use of PrairieLearn in foundational science and mathematics courses that are taken by engineering students.
Mariana Silva (CS), Tim Bretl (AE), Geoffrey Herman (CS), Craig Zilles (CS), Mariana Silva (CS), Dave Mussulman (Engr IT), Matt West (MechSE). Liaison: John Popovics (CEE)

Improving Undergraduate Writing Instruction and Feedback through Professional Development of STEM Graduate-Student Teaching Assistants *(Year 3)*
This team will continue to advance a graduate-level course to introduce pedagogical tools for teaching writing in STEM and to assist graduate students in understanding STEM writing and improving as writers themselves and will further assess the impacts of the course.
S. Lance Cooper (Phys), Celia Elliot (Phys), John Gallagher (English), Aaron Geiger (MechSE), Megan Mericle (Phys & English), John Popovics (CEE), Julie Zilles (ABE). Liaison: Abdu Alawini (CS)

Introducing Peer Mentorship via Undergraduate Learning Assistants in PHYS 100 Discussion Sections *(Year 3)*
This team will continue to develop a program for undergraduate learning assistants as a core component of the Physics 100 student experience and will assess the impact of this addition on student learning, sense of social belonging, and motivation.
Eric Kuo (Phys), Gary Gladding (Phys), Morten Lundsgaard (Phys) Liaison: Mariana Silva (CS)

Python Working Group *(Year 2)*
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), Jared Bronski (Mathematics), Wayne Chang (MechSE), Mariana Silva (CS), Matthew West (MechSE). Liaison: Blake Johnson (MechSE)

UDL Based Best Practices Including Utilizing Canvas for the Needs of Students *(Year 2)*
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), Chrysafis Vogiatzis (ISE), David Dalpiaz (Statistics), Yun Huang (Information Sciences). Liaison: Yuting Chen (ECE)

Virtual Reality as a Vehicle for Education in the Domains of Building Systems and Construction Materials *(Year 1)*
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 S. Uihlein (Architecture), Jacob Henschen (CEE), Nishant Garg (CEE). Liaison: Andre Schleife (MatSE)

Developing Open Educational Resources for Fundamental Engineering Mechanics Courses (Year 1)
This team aims to develop various online tools into open educational resources that can be adapted by other higher education institutions, including community college partners. The scope of education resource development includes online reference textbook, computation assignments, and engineering design projects. The success of this work will provide greater access to the education innovation from GCOE by the higher education community, as well as improve the readiness of transfer students from GCOE Pathways Program.
Wayne Chang (MechSE), Shelby Hutchens (MechSE), Mariana Kersh (MechSE), Jessica Krogstad (MatSE), Kathryn Matlack (MechSE), Brian Mercer (MechSE), Matthew West (MechSE) Liaison: Mariana Silva (CS)

Identifying Student Profiles to Facilitate Learning Outcomes in Introductory Problem-Solving Classes (Year 1)
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: Molly Goldstein (ISE)

Multi-Disciplinary Service-Learning Ecosystem (Year 1)
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 Everett Johnson (MechSE), Yuting Chen (ECE), Marcia Pool (Cancer Center at Illinois), Saadeddine Shehab (CS) Liaison: Molly Goldstein (ISE)

Redesigning CEE courses to Teach Computational Thinking and Engineering in Societal Context (Year 1)
This team will expand integration of computational thinking and student-centered learning in CEE 3xx level courses, by including computation in problem solving and will aim to teach CEE fundamentals in their engineering societal context, so that students learn that technical solutions relate to the social context for which they are intended.
Sotiria Koloutsou-Vakakis (CEE), Mani Golparvar Fard (CEE), Jacob Henschen (CEE), Hannah Horowitz (CEE), Eleftheria Kontou (CEE), Helen Nguyen, Megan Matthews (CEE), Hadi Meidani (CEE), John S. Popovics (CEE), Ashlynn Stillwell (CEE), Chris Tessum (CEE), Lei Zhao(CEE) Liaison: Andre Schleife (MatSE)

Developing Collaborative Online International Learning (COIL) and COIL+ Projects in Engineering Education (Year 1)
This team continues 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), Meredith Blumthal (Engineering Admin), Hannah Doughtery (Engineering Admin), Gretchen Forman (GFX), Molly Goldstein (ISE), EJ Ignacio (CEE), Luis Rodriguez (ABE), Jim Stubbins (NPRE), Marcia Pool (Cancer Center at Illinois), Abdussalam Alawini (CS), Chrysafis Vogiatzis (ISE) Liaison: John Popovics (CEE)

Startup Track: Implementation & Exploration Track

PrairieLearn for Theoretical Computer Science (Startup)
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 CS 374 and expands this effort to include CS 225 in the first year, and to include CS 277, CS 401, and CS 403 in future years.

Jeff Erickson (CS), Carl Evans (CS), Yael Gertner (CS), Brad Solomon (CS), Tiffani Williams (CS) Liaison: Yuting Chen (ECE)

Entrepreneurial Mindset

Redesigning Design: Restructuring Design Elements in the MatSE Curriculum (Year 1)
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 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 Abelson (MatSE), Jessica Krogstad (MatSE), JC Stinville (MatSE), Saadeddine Shehab (CS) Liaison: Blake Johnson (MechSE)

Creating a Framework for Cross-Course Projects using Entrepreneurial Mindset Learning (Year1)
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), Ramez Hajj (CEE), Arthur Schmidt (CEE), Jeffery Roesler (CEE) Liaison: Mariana Silva (CS)

Pathways to Impact: Introducing Students to Technology Commercialization and the Entrepreneurial Mindset (Year1)
This team will launch 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), Andy Singer (ECE), Jed Taylor (TEC) Liaison: Blake Johnson (MechSE)

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), Christoper Schmitz (ECE), Katie Ansell (Phys), Chandra Radhakrishnan (ECE), Jessica TerBush (MatSE) Liaison: Joe Bradley (BioE)

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Implementation & Exploration Track

Early Instruction in Linear Algebra and Computational Tools in the Curricula of CS, MechSE and the College of Engineering *(Year 3)*
This team will continue the redesign of instruction in concepts of linear algebra and linear structures to provide undergraduates in MechSE, CS, and other departments with substantive, practical knowledge in these essential fields early in the curriculum.
Sascha Hilgenfeldt (MechSE), Jer-Chin (Luke) Chuang (Mathematics), Mariana Silva (CS), Matthew West (MechSE). Liaison: Marcia Pool (Cancer Center at Illinois)

Excellence in Computer Engineering Education (EXCEED): Incorporating Parallel Programming Thinking in ECE Curriculum *(Year 3)*

This team will advance its development, pilot, and assessment of learning modules on parallel and distributed computing in key courses across ECE.
Ujjal Bhowmik (ECE), Zuofu Cheng (ECE), Levchenko Kirill (ECE), Thomas Moon (ECE). Liaison: Matt West (MechSE)

Learning by Immersion: Creating Virtual Reality Labs for Electromagnetism *(Year 3)*
This team will continue to support students who struggle with their understanding of electromagnetism theory by developing 3D visualizations of abstract physics in an immersive, exploratory, and engaging environment.
Raluca Ilie (ECE), Eric Shaffer (CS), Dan Cermak (Informatics), Erhan Kudeki (ECE), Christopher Ball (Journalism), Jacob Fisher (Advertising). Liaison: Tim Stelzer (Phys)

PrairieLearn and Course Redesign for Core CEE Intro Sequence *(Year 3)*
This team will continue to integrate the PrairieLearn platform in two core CEE courses– facilitating new approaches in content and in best pedagogical practices.
Sotiria Koloutsou-Vakakis (CEE), Hadi Meidani (CEE), Eleftheria Kontou (CEE), Lei Zhao (CEE), Chris Tessum (CEE). Liaison: Matt West (MechSE)

Collaborative Learning *(Year 2)*
This team will further develop and improve existing computer-based tools to facilitate collaborative and active learning work inside and outside of the classroom.
Mariana Silva (CS), Abdussalam Alawini (CS), Geoffrey Herman (CS). Liaison: Molly Goldstein (ISE)

Expanding PrairieLearn *(Year 2)*
This team plans to add new functionality to PrairieLearn to focus on the return to campus. In particular, they will integrate PrairieLearn with Canvas to enable a unified online learning experience for students and add instructor features to better support hybrid courses with a mix of on-campus and remote students.
Tim Bretl (AE), Geoffrey Herman (CS), Craig Zilles (CS), Mariana Silva (CS), Dave Mussulman (Engr IT), Matt West (MechSE). Liaison: John Popovics (CEE)

Improving Undergraduate Writing Instruction and Feedback through Professional Development of STEM Graduate-Student Teaching Assistants *(Year 2)*
This team will continue to advance a graduate-level course to introduce pedagogical tools for teaching writing in STEM and to assist graduate students in understanding STEM writing and improving as writers themselves and will further assess the impacts of the course.
S. Lance Cooper (Phys), Celia Elliot (Phys), John Gallagher (English), Blake Johnson (MechSE), Megan Mericle (Phys & English),

John Popovics (CEE), Paul Prior (English), Julie Zilles (ABE). Liaison: Mariana Silva (CS)

Introducing Peer Mentorship via Undergraduate Learning Assistants in PHYS 100 Discussion Sections *(Year 2)*
This team will continue to develop a program for undergraduate learning assistants as a core component of the Physics 100 student experience and will assess the impact of this addition on student learning, sense of social belonging, and motivation.
Eric Kuo (Phys), Gary Gladding (Phys), Morten Lundsgaard (Phys) Liaison: Molly Goldstein (ISE)

Revising the CS Introductory Programming Sequence *(Year 2)*
This team will further enhance its web-based application that serves course content to CS 128 students on-demand, using a daily lesson format similar to CS 125 course that offers new material through a combination of text, video, and interactive walkthroughs.
Geoffrey Challen (CS), G. Carl Evans (CS), Margaret Fleck (CS), Michael Nowak (CS), Michael Woodley (CS), Craig Zilles (CS). Liaison: Yuting Chen (ECE)

Cross-Course Assessment Model for TAM 251: Introductory Solid Mechanics, ME 330: Engineering Materials, and ME 371: Mechanical Design II (Year 1)
This team will establish a strategy for assessing the retention rate of key concepts taught in fundamental introductory engineering courses and identify how this information can be used by instructional staff in their course design and implementation.
Wayne Chang (MechSE), Randy Ewoldt (MechSE), Brian Mercer (MechSE). Liaison: Mariana Silva (CS)

Interactive Code Walkthroughs *(Year 1)*
This team will refine and expand the usage of interactive code walkthroughs, as previously developed for CS 125, to expand the use of this new technology to several other courses and perform data collection to better understand and improve how students utilize these walkthroughs.
Geoffrey Challen (CS), Michael Nowak (CS), Tiffani Williams (CS). Liaison: Tim Stelzer (Phys)

Perpetuating the Computational Research Course *(Year 1)*
This team will continue the development of a course covering computational research skills for researchers across many disciplines and consider sustainability of the course as a long-term collaboration of multiple departments and colleges.
Neal Davis (CS), Jake Bowers (Political Science), Andre Schleife (MatSE), Rich Sowers (ISE), Elizabeth Wickes (Information Sciences). Liaison: Marcia Pool (Cancer Center at Illinois)

Python Working Group *(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), Jared Bronski (Mathematics), Wayne Chang (MechSE), Neal Davis (CS), Mariana Silva (CS), Matthew West (MechSE). Liaison: Blake Johnson (MechSE)

UDL Based Best Practices Including Utilizing Canvas for the Needs of Students *(Year 1)*
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), Jenny Amos (BioE), Lawrence Angrave (CS), Rebecca Reck (BioE), Chrysafis Vogiatzis (ISE), David Dalpiaz (Statistics), Yun Huang (Information Sciences). Liaison: Yuting Chen (ECE)

Startup Track

A Community of Practice for Rethinking Best Practices in Post-COVID Experiential Learning *(Startup)*
This team will create a Community of Practice (CoP) of Grainger Engineering laboratory and design instructors to develop strategies and best practices across the college for these hands-on undergraduate courses as a new era of teaching and learning is introduced post-COVID.
Rebecca Reck (BioE), Holly Golecki (BioE), Christopher Schmitz (ECE), Katie Ansell (Phys), Chandra Radhakrishnan (ECE), Jessica TerBush (MatSE). Liaison: John Popovics (CEE)

Designing Early Interventions to Facilitate Student Study Skills in Introductory Problem-Solving Classes *(Startup)*
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), Jenny Amos (BioE), Ben Cosman (CS). Liaison: Molly Goldstein (ISE)

Developing Collaborative Online International Learning (COIL) Projects in Engineering Education *(Startup)*
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), Meredith Blumthal (Engr Admin), Hannah Dougherty (Engr Admin), Gretchen Forman (GFX), Molly Goldstein (ISE), EJ Ignacio (CEE), Luis Rodriguez (ABE), Jim Stubbins (NPRE), Ann-Perry Witmer (Applied Research Institute). Liaison: Blake Johnson (MechSE)

Multi-Disciplinary Service-Learning Ecosystem *(Startup)*
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), Brian Johnson (Journalism), Kimberlie Kranich (IPM Administration), Marcia Pool (Cancer Center at Illinois), Saadeddine Shehab (Siebel Center for Design). Liaison: Jay Mann (AE3)

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This team will work to improve student understanding and excitement for highly 3-dimensional problems in structural systems and construction materials using VR technologies.
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Remote testing with PrairieLearn
This team is adding new functionality to PrairieLearn to better support remote learning (instructor and student support, security, provision of resources), to scale to more courses, and to support large course staff and instructor communities
Tim Bretl (AE), Geoffrey Herman (CS), Craig Zilles (CS), Mariana Silva (CS), Dave Mussulman (Eng IT), Matt West (MechSE)

Revising the CS Introductory Programming Sequence
This team will propose curricular changes, including the addition of two newly restructured courses, to improve the CS introductory programming sequence.
Geoffrey Challen (CS), G. Carl Evans (CS), Margaret Fleck (CS), Michael Nowak (CS), Michael Woodley (CS), Craig Zilles (CS)

Cross-Engineering Course Assessment Model for Engineering Mechanics Courses
This team aims to improve engineering student learning experience and academic performance by developing tools that foster continuity between engineering courses in the engineering mechanics series.
Wayne Chang (MechSE), Randy Ewoldt (MechSE), Brian Mercer (MechSE)

Excellence in Computer Engineering Education (EXCEED): Incorporating Parallel Programming Thinking in ECE Curriculum
This team is developing and piloting learning modules on parallel and distributed computing in key courses across ECE.
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This team will develop a graduate-level course to introduce pedagogical tools for teaching writing in STEM and to assist graduate students in understanding STEM writing and improving as writers themselves. The team will also assess the impacts of the course.
S. Lance Cooper (Phys), Celia Elliott (Phys), John Gallagher (English), Blake Johnson (MechSE), John Popovics CEE), Paul Prior (English), Julie Zilles (Crop Sciences)

Interdisciplinary Methods for Research Computing: A Course for New Researchers
This team will create a pilot course covering computational research skills for researchers across many disciplines.
Neal Davis (CS), Jake Bowers (PS/Statistics), André Schleife (MatSE), Rich Sowers (ISE), Elizabeth Wickes (Information Sciences)

Early Instruction in Linear Algebra and Computational Tools in the Curricula of CS, MechSE, and the College of Engineering
This team will redesign instruction in concepts of linear algebra and linear structures, in order to provide undergraduates in MechSE, CS, and other departments with substantive, practical knowledge in these essential fields early in the curriculum.
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Eric Kuo (Phys), Gary Gladding (Phys), Morten Lundsgaard (Phys)

ENgaGement In eNgineering Education (or ENGINE)
This interdisciplinary team is exploring non-traditional teaching methods and learning assignments, such as playful and community-building techniques, for developing student motivation and professional mindsets.
Leon Liebenberg (MechSE), Cheelan Bo-Linn (CITL), Justin Aronoff (Speech & Hearing Sci), Robert Baird (CITL), Tim Hale (Kinesiology & Community Health), Katherine LaBare (Library), H. Chad Lane (Educational Psych), Brian Mercer (MechSE), Alex Pagano (MechSE), Shelly J. Schmidt (FSHN), Saad Shehab (ScD), Ava Wolf (CITL), Taylor Tucker

Understanding the Needs and Learning Pathways of Students with Disabilities
This team will identify potential course improvement opportunities to help students with disabilities. Inspired by the Universal Design for Learning 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 communications.
Hongye Liu (CS), Jenny Amos (BioE), Lawrence Angrave (CS)

Facilitating Adoption of Collaborative Activities using Computer-Based Tools
This team will develop and improve existing computer-based tools to facilitate collaborative and active learning work inside and outside of the classroom.
Mariana Silva (CS), Abdussalam Alawini (CS), Mattox Beckman (CS), David Mussulman (EngIT), Jenny Amos (BioE), Geoffrey Herman (CS), Karin Jensen (BioE), Eric Shaffer (CS), Andre Schleife (MatSE)

Developing Intervention Methods that Improve Visuospatial Skills of Engineering Students
This team is developing computerized training modules to enhance students' visuospatial skills to be implemented in three large engineering design courses.

Brian Woodard (AE), Gretchen Forman (GFX), Molly Goldstein (ISE), Julia Laystrom-Woodard (AE), Tiffany Li (CS), Michael Philpott (MechSE), Angie Wolters (WIE), Ziang Xiao (CS)

Improving the Writing Skills of Undergraduate Engineering Students: Empowering Engineering Faculty and Teaching Assistants*
This team has built interdisciplinary faculty learning communities around writing in engineering, integrating writing instruction and practice within existing technical courses across all four undergraduate years, assessing the effectiveness of the vertical integration, and advancing understanding of effective development of engineering students' writing skills.
John Popovics (CEE), John Gallagher (English), Bruce Kovanen (English), Megan Mericle (English), Paul Prior (English), Nicole Turnipseed (English), Ryan Ware (English), S. Lance Cooper (Phys), Celia Elliott (Phys), Julie Zilles (Crop Sciences), Patrick Coleman (Phys)

iELITE TA Training SIIP Final Report*
This team continues to teach a course to prepare graduate students in Grainger Engineering for their instructional and leadership responsibilities.
Mattox Beckman (CS), Yuting Chen (ECE), Blake Johnson (MechSE)

*Teams in SIIP community after completing standard funding.

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Sascha Hilgenfeldt (PI, MechSE), Philipp Hieronymi (Mathematics), Luke Olson, Mariana Silva (CS), Matt West (MechSE). Education Innovation Fellow liaison: Chris Schmitz

Growing the PrairieLearn Community
PrairieLearn is a framework for online learning built at Illinois. This team is growing the community of instructors who use and think critically about PrairieLearn, in order to extend its positive impact across the College.
Tim Bretl (PI, AeroE), Geoffrey Herman, Mariana Silva, Craig Zilles (CS), Dave Mussulman (Engr-IT), Matt West (MechSE). Education Innovation Fellow liaison: Tim Stelzer

Learning by Immersion: Creating Virtual Reality Labs for Electromagnetism Courses
Targeting students who struggle with their understanding of electromagnetism theory, this team is developing 3D visualizations of abstract physics in an immersive, exploratory and engaging environment.
Raluca Ilie (PI, ECE), Eric Shaffer (CS), Erhan Kudeki (ECE), Cynthia D'Angelo (Educational Psychology), Olivia Coiado (Carle College of Medicine), Lucas Wagner (Physics). Education Innovation Fellow liaison: Marcia Pool

PrairieLearn and Course Redesign for Core CEE Intro Sequence
Two core CEE courses will integrate the PrairieLearn platform for course assessments – facilitating new approaches in content and in best pedagogical practices.
Sotiria Koloutsou-Vakakis (PI), Hadi Meidani, Lei Zhao, Yanfeng Ouyang (CEE). Education Innovation Fellow liaison: Craig Zilles

Excellence in Computer Engineering Education (EXCEED): Incorporating Parallel Programming Thinking in ECE Curriculum
This team is developing and piloting learning modules on parallel and distributed computing in key courses across ECE.
Yuting Chen (PI), Ujjal Bhowmik, DS Choi, Zuofu Chen (ECE). Education Innovation Fellow liaison: Jeff Erickson

Broadening and Evaluating Support for Effective Office Hours in Large Courses Using a Digital Queue system
The Illinois Open-Source Queue allows students to add themselves to a waiting list via a web page and access this page using any computing device. The team will explore and evaluate the impact, and new features of the queue.
Wade Fagen-Ulmschneider (PI, CS), Karle Flanigan (Statistics), Karin Jensen (BioE), Dave Mussulman (EngrIT), Lawrence Angrave (CS). Education Innovation Fellow liaison: Chris Schmitz

ENgaGement In eNgineering Education (ENGINE)

This interdisciplinary team is exploring non-traditional teaching methods and learning assignments, such as playful and community-building techniques, for developing student motivation and professional mindsets.
Leon Liebenberg (MechSE, PI), Blake Johnson, Alex Pagano, Brian Mercer (MechSE), Molly Goldstein (ISE), Chad Lane (Educational Psychology), Candace Martinez (Business Administration), Shelly Schmidt (Food Science & Human Nutrition), Robert Baird, Ava Wolf (CITL). Education Innovation Fellow Liaison: John Popovics

Improving the Writing Skills of Undergraduate Engineering Students: Empowering Engineering Faculty and Teaching Assistants
The focus of this project is on building interdisciplinary faculty learning communities around writing in engineering, integrating writing instruction and practice within existing technical courses across all four undergraduate years, assessing the effectiveness of the vertical integration, and advancing understanding of effective development of engineering students' writing skills.
John Popovics (PI, CEE), Julie Zilles (Crop Sciences), Lance Cooper, Celia Elliott (Physics), John Gallagher (English), Paul Prior, Bruce Kovanen, Nicole Turnipseed, Robert Ware (Center for Writing Studies). Education Innovation Fellow liaison: Elif Ertekin

Teaching Assistant Training: Integrative Engineering Leadership Initiative for Teaching Enhancement (iELITE)
This team teaches a course to prepare graduate students in Grainger Engineering for their instructional and leadership responsibilities.
Yuting Chen (PI, ECE), Blake Johnson (MechSE), Mattox Beckman (CS), Lucas Anderson and Hannah Choi (CITL). Education Innovation Fellow liaison: Jeff Erickson

Developing Intelligent Online Tools to Improve Visuospatial Skills of Engineering
Computerized training modules to enhance students' visuospatial skills are implemented in three large engineering design courses.
Brian Woodard (PI, AeroE), Molly Goldstein (ISE), Julia Laystrom-Woodard (AeroE), Mike Philpott (MechSE), Angela Wolters (Women in Engineering), Ziang Xiao (CS). Education Innovation Fellow liaison: Marcia Pool

Redesigning Introductory Thermal and Quantum Physics
The goal of this project is to focus PHYS 213 (Thermal Physics) and 214 (Quantum Physics) on core concepts to better prepare engineers for classes that depend on them, and to incorporate best practices in instruction.
Lucas Wagner (PI), Paul Kwiat, Jeffrey Filippini, Bryce Gadway, Michael B. Weissman, Gary Gladding, Jon Thaler (Physics). Education Innovation Fellow liaison: John Popovics

Identifying Leadership Qualities in Students for Improved Capstone Design Project Group Performance
This team is investigating how successful student leadership contributes to design team performance.
Blake Johnson (PI, MechSE), Bruce Flachsbart (MechSE), Joe Bradley (Bioengineering and Grainger First-Year Experience), Fritz Drasgow (Psychology), Molly Goldstein (ISE). Education Innovation Fellow liaison: Jeff Roesler

Aerospace Engineering Communication Skills (Adaptation Track)
This project aims to improve student communication skills by incorporating assignments across the curriculum based on MechSE's iDesign curriculum reform efforts.
Brian Woodard (PI), Philip Ansell, Timothy Bretl, Laura Gerhold, Kai James, Zachary Putnam (AeroE). Collaborator: Blake Johnson (MechSE)

Implementing Process-Oriented Guided Inquiry Learning*
POGIL is a student-centered learning strategy that uses team-based activities that enable students to construct their own understanding of key concepts and apply them. This user community welcomes new members.
Mattox Beckman (PI), Eric Shaffer, Mariana Silva, Lawrence Angrave, Neal Davis, Siwei Shen (CS), Jenny Amos, Karin Jensen, Gabriel Burks (BioE). Pratik Lahiri (ECE), Sotiria Koloutsou-Vakakis (CEE), Angela Barragan, Matteo Mitrano (Physics). Education Innovation Fellow Liaison: Jeff Roesler

iDesign: Integrated MechSE Design Curriculum*
This project is integrating MechSE design courses for freshmen through seniors. Objectives are to: (1) Produce engineers with competitive design skills, (2) Increase student/faculty interaction, (3) Increase student satisfaction with design courses, (4) Enlarge the pool of faculty willing and able to teach design, and (5) Facilitate ABET accreditation for design classes.
Elizabeth Hsiao-Wecksler (PI), Alison Dunn, Bruce Flachsbart, Blake Johnson, Seok Kim, Leon Liebenberg, Brian Mercer, Ralf Moller, Michael Philpott, Joao Ramos, Sam Tawfick, Aimy Wissa, Arend van der Zande (MechSE)

TAM 210/211/212/251*
The gateway theoretical and applied mechanics classes serve approximately 2500 student-enrollments per year. This team applies state-of-the-art pedagogical and technology solutions to improve student engagement and enthusiasm.
Matt West (PI), Wayne Chang, Geir Dullerud, Blake Johnson, Leon Liebenberg, Liz Hsiao-Wecksler, Gabe Juarez, Mariana Kersh, Elif Ertekin, Katie Matlack, Brian Mercer, Vasu Salapaka (MechSE)

*Teams in SIIP community after completing standard funding.

2018---19 Strategic Instructional Innovations Program

College of Engineering, University of Illinois at Urbana---Champaign

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Implementation & Exploration Track

AE3 ACADEMY FOR EXCELLENCE IN ENGINEERING EDUCATION

Nurturing Design Thinking in Engineering Courses
This team is developing multidisciplinary activities that engage students from Mechanical Engineering, Computer Science, and Art & Design in design thinking and the studio critique method.
Sam Tawfick (PI, MechSE), Brian Bailey (CS), Eric Benson (Art & Design). Liaison: Tim Stelzer

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PrairieLearn is a framework for online learning that was built at Illinois. This team is growing the community of instructors who use and think critically about PrairieLearn, in order to extend its positive impact across the College.
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Engineers SPEAK: Just---in---Time Delivery of Presentation Instruction
Graduate students in the Communications department run clinics for senior design students in Electrical and Computer Engineering and Agricultural and Biological Engineering.
Blake Johnson (PI, MechSE), Jacob Bryan (ECE), Grace Giorgio, Ann Bryan, Katie Bruner (Communications), Steve Zahos (ABE), Liaison: Craig Zilles

Developing Instruction in Technical Writing for Freshman Engineering Students
This team is developing and evaluating a co---taught writing---in---the---disciplines course for first---year engineering students and relevant training modules for graduate assistants.
Karin Jensen (PI), Marcia Pool, Mohammad Zahid, Yanfen Li (BioE), Dallas Trinkle (MatSE), James Hutchinson (ECE), Patricia Watts (Linguistics), Evin Groundwater, Amanda Bales (English. Liaison: Craig Zilles

Improving the Writing Skills of Undergraduate Engineering Students: Empowering Engineering Faculty and Teaching Assistants
This team's objectives are to i) build interdisciplinary faculty learning communities around writing in engineering, ii) integrate writing instruction and practice within existing technical courses across all four years of undergraduate engineering curricula, iii) assess the effectiveness of the vertical integration, and iv) advance understanding of effective development of engineering students' writing skills.
Julie Zilles (PI) and John Popovics (CEE), Lance Cooper, Celia Elliott, and John Yoritomo (Physics), John Gallagher, Paul Prior, and Nicole Turnipseed (English and Center for Writing Studies). Liaison: Elif Ertekin

Teaching Assistant Training: Integrative Engineering Leadership Initiative for Teaching Enhancement (iELITE)
This team is developing and evaluating a course to prepare teaching assistants in the College of Engineering for their instructional and leadership responsibilities.
Yuting Chen (PI, ECE), Matthew Goodman (MatSE), Blake Johnson (MechSE), Mattox Beckman (CS), Lucas Anderson and Hannah Choi (CITL). Liaison: Tim Stelzer

Developing Intelligent Online Tools to Improve Visuospatial Skills of Engineering Students
The objective of this project is to develop computerized training modules that enhance students' visuospatial skills, and implement them in three large engineering design courses.
Wai---Tat Fu (PI), Geoffrey Herman, Ziang Xiao, Sanorita Dey (CS), Jim Leake (ISE), Brian Woodard (AeroE), Angie Wolters (Women in Engineering); Mike Philpott (MechSE). Liaison: Marcia Pool

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The objective of this project is to focus PHYS 213 (Thermal Physics) and 214 (Quantum Physics) on core concepts to better prepare engineers for classes that depend on them, and to incorporate best practices in instruction.
Lucas Wagner (PI), Bryce Gadway, Gary Gladding, Taylor Hughes, Paul Kwiat, Michael Weissman (Physics). Liaison: Chris Schmitz

Play in Learning: Cognition, Emotion, and Playful Pedagogy
This SIIP project is an exploration into the relationship between cognition, emotion, and playful pedagogy through the Implementation of playful methodologies that encourage deep learning.
Leon Liebenberg (PI), Emad Jassim, Blake Johnson, Alex Pagano (MechSE), Robert Baird, Ava Wolf (CITL), Geoffrey Challen (CS), H. Chad Lane (EdPsych), Shelly Schmidt (FSHN). Liaison: Elif Ertekin

iDesign: Integrated MechSE Design Curriculum*
This project aims to integrate MechSE design courses for freshmen through seniors. The objectives are to: (1) Produce engineers with competitive design skills, (2) Increase student/faculty interaction, (3) Increase student satisfaction with design courses, (4) Enlarge the pool of faculty willing and able to teach design, and (5) Facilitate ABET accreditation for design classes.
Elizabeth Hsiao---Wecksler (PI), Alison Dunn, Bruce Flachsbart, Emad Jassim, Blake Johnson, Seok Kim, Leon Liebenberg, Ralf Moller, Hae---Won Park, Michael Philpott, Sam Tawfick, Aimy Wissa, Arend van der Zande (MechSE)

TAM 210/211/212/251*
This project focuses on the gateway theoretical and applied mechanics classes, which serve approximately 2500 student---enrollments per year. It has applied state---of---the---art pedagogical and technology solutions to improve student engagement and enthusiasm.
Matt West (PI), Wayne Chang, Geir Dullerud, Blake Johnson, Leon Liebenberg, Liz Hsiao---Wecksler, Gabe Juarez, Mariana Kersh, Elif Ertekin, Katie Matlack, Brian Mercer, Vasu Salapaka (MechSE)

Start---Up Track

Implementing Process---Oriented Guided Inquiry Learning
POGIL is a student---centered learning strategy that uses team---based activities that enable students to construct their own understanding of key concepts and apply them. This project will train instructors in the use of POGIL.
Mattox Beckman (PI), Eric Shaffer, Mariana Silva (CS), Jenny Amos (BioE). Liaison: Marcia Pool

Teaching proofs and computation: Automating problem grading and feedback for scale
This team is creating a platform that supports automatic checking, feedback, and grading of formal computations and proofs in CS classes.
Madhu Parthasarathy, Elsa Gunter (PIs), Mattox Beckman, Margaret Fleck, Sasa Misailovi (CS). Liaison: Tim Bretl

Broadening and evaluating support for effective office hours in large courses using a digital queue system
The Illinois Open---Source Queue allows students to add themselves to a waiting list via a web page and access this page using any computing device. The team will explore and evaluate the utilization, impact, and new features of the queue.
Wade Fagen---Ulmschneider (PI, CS), Karle Flanigan (Statistics), Karin Jensen (BioE), Dave Mussulman (EngrIT), Lawrence Angrave (CS). Liaison: Chris Schmitz

Adaptation Track

Aerospace Engineering Communication Skills
This project aims to improve student communication skills by incorporating assignments across the curriculum based on MechSE's iDesign curriculum reform efforts.
Brian Woodard (PI), Philip Ansell, Timothy Bretl, Laura Gerhold, Kai James, Zachary Putnam (AeroE). Collaborator: Blake Johnson

*Implementation & Exploration teams choosing to stay in SIIP community after completing standard three years of funding.

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Implementation & Exploration Track

A Project---Based Introduction to Aerospace Engineering
This project is the beginning of an effort to implement project---based learning and student portfolios across the curriculum. Initial changes are in AE100 (Introduction to Aerospace Engineering).
Brian Woodard (PI), Tim Bretl, Phillip Ansell, Laura Gerhold. Liaison: Jeff Roesler

Improving Student Learning Experiences through Algorithmic Methods of Team Formation in Large Engineering Courses
The vision of this project is to integrate, study, sustain, and champion the use of a criterion---based algorithmic method for organizing students into effective teams in large project---based engineering courses. The CATME software tool will provide the team formation testbed.
Brian Bailey (PI), Darko Marinov, Ranjitha Kumar, Wai---Tat Fu, Karrie Karahalios (CS). Liaison: Elif Ertekin

Growing the PrairieLearn Community
PrairieLearn is a framework for online learning that was built at Illinois. This team plans to grow the community of instructors who use and think critically about PrairieLearn, in order to extend its positive impact across the College.
Tim Bretl (AeroE) (PI), Jenny Amos (BioE), Geoffrey Herman, Mariana Silva, Craig Zilles (CS), Dave Mussulman (Engr IT), Tim Stelzer (Physics), Dallas Trinkle (MatSE), Matt West (MechSE). Liaison: Jeff Roesler

Nurturing Design Thinking in Engineering Courses
This team is developing multidisciplinary activities that engage students from Mechanical Engineering, Computer Science, and Art & Design in design thinking and the studio critique method.
Sam Tawfick (MechSE) (PI), Brian Bailey (CS), Eric Benson (Art & Design). Liaison: Elif Ertekin

Engineers SPEAK: Just---in---Time Delivery of Presentation Instruction
Graduate students in the Communications department run clinics for senior design students in Electrical and Computer Engineering and Agricultural and Biological Engineering.
Jonathan Makela (ECE), Grace Giorgio, Ann Bryan, Katie Bruner (Communications), Steve Zahos (ABE), Kelly Cross (BioE), Blake Johnson (MechSE). Liaison: Jeff Erickson

iDesign: Integrated MechSE Design Curriculum*
This project aims to encompass and integrate MechSE design courses for freshmen through seniors. The objectives are to: (1) Produce engineers with competitive design skills, (2) Increase student/faculty interaction, (3) Increase student satisfaction with design courses, (4) Enlarge the pool of faculty willing and able to teach design, and (5) Facilitate ABET accreditation for design classes.
Elizabeth Hsiao---Wecksler (PI), Alison Dunn, Bruce Flachsbart, Emad Jassim, Blake Johnson, Seok Kim, Ralf Moller, Hae---Won Park, Michael Philpott, Sam Tawfick, Aimy Wissa. Liaison: Geoffrey Herman

Developing Instruction in Technical Writing for Freshman Engineering Students through ILEE
This team is developing a co---taught writing---in---the---disciplines course for first---year engineering students and relevant training modules for graduate assistants.
Karin Jensen (PI), Marcia Pool (BioE), Dallas Trinkle (MatSE), James Hutchinson (ECE), Patricia Watts (Linguistics). Liaison: Tim Bretl

Improving the Writing Skills of Undergraduate Engineering Students: Empowering Engineering Faculty and Teaching Assistants
This team is developing and implementing a writing---across---the---curriculum program for Engineering faculty, and preparing an NSF proposal on integrating writing across the engineering curricula.
Julie Zilles (PI) and John Popovics (CEE), Lance Cooper, Celia Elliott, and John Yoritomo (Physics), John Gallagher, Paul Prior, and Nicole Turnipseed (English and Center for Writing Studies). Liaison: Jenny Amos

Teaching Assistant Training: Engineering Leadership Initiative for Teaching Enhancement (ELITE)
This team is developing a course to prepare teaching assistants in the College of Engineering for their instructional and leadership responsibilities.
Yuting Chen (ECE), Matthew Goodman (MatSE), Blake Johnson (MechSE), Mattox Beckman (CS) (co---PIs), Lucas Anderson and Hannah Choi (Center for Innovation in Teaching and Learning, Chris Migotsky (AE3). Liaison: Brian Bailey

Developing Intervention Methods that Improve Visuospatial Skills of Engineering Students
The objective of this project is to develop computerized training modules that enhance students' visuospatial skills, and implement them in three large engineering design courses.
Wai---Tat Fu (PI), Geoffrey Herman, Ziang Xiao, Yuqi Yao, Xu Zhe (CS), Jim Leake (ISE), Brian Woodard (AeroE), Angie Wolters (Women in Engineering); Mike Philpott (MechSE). Liaison: Jeff Erickson

TAM 210/211/212/251*
This project focuses on the gateway theoretical and applied mechanics classes, which serve approximately 2500 student---enrollments per year. This project has applied state---of---the---art pedagogical and technology solutions to improve student engagement and enthusiasm.
Matt West (PI), Wayne Chang, Geir Dullerud, Blake Johnson, Leon Liebenberg, Gabe Juarez Mariana Kersh Elif Ertekin, Vasu Salapaka, Mariana Silva (MechSE)

Creativity, Innovation, and Vision: Online Course Development
This team is creating modules and materials for an online course on creativity.
Bruce Elliott---Litchfield (ABE and TEC) (PI), Esteban Gast, Keilin Deahl, Marianne Alleyne, Arif Nelson. Liaison: Brian Bailey

Start---Up Track

Physics 213 and 214 Data Gathering and Improvement
The objective of this proposal is to focus PHYS 213 (Thermal Physics) and 214 (Quantum Physics) on core concepts to better prepare engineers for classes that depend on them.
Lucas Wagner (PI), Bryce Gadway, Taylor Hughes, Paul Kwiat (Physics). Liaison: Jonathan Makela

Open---Source Curriculum Development
The purpose of this project is to explore the possibility that curriculum development for university courses can operate as well as open---source software development does. Faculty will develop and share materials on GitHub.
Katy Huff (NPRE) (PI), Neal Davis (CS), colleagues across the country. Liaison: Jenny Amos

Adaptation Track

Providing Bi---weekly Assessments with Retake Utilizing the Computer---Based Testing Facility in Physics 100
This project aims to improve the performance of students taking physics 100 by providing them with more frequent exams, including the opportunity to retake an exam to improve their score, and to evaluate the impact of these changes.
Tim Stelzer (PI), Morten Lundsgaard, Gary Gladding, Brianne Guttmann (Physics. Collaborator: Matt West

*Implementation & Exploration teams choosing to stay in SIIP community after completing standard three years of funding.

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This team is developing multidisciplinary activities that engage students from Mechanical Engineering, Computer Science, and Art & Design in design thinking and the studio critique method.
Sam Tawfick (MechSE), Brian Bailey (CS), Eric Benson (Art & Design). Liaison: Luke Olson

Just-in-Time Presentation Skills for Senior Design
Graduate students in the Communications department run clinics for senior design students in Electrical and Computer Engineering and Agricultural and Biological Engineering.
P. Scott Carney & Jonathan Makela (ECE), Grace Giorgio & Ann Bryan (Communications), Steve Zahos (ABE). Liaison: Tim Bretl

Introducing Computational Methods into the Physics Curriculum
This project aims to develop a sequence of courses that integrate computational methods into the curriculum so that students are equipped to solve physics problems that cannot be solved analytically.
George Gollin, Jon Thaler (Physics). Liaison: Luke Olson

A Project-Based Introduction to Aerospace Engineering
This project is the beginning of an effort to implement project-based learning and student portfolios across the curriculum. Initial changes are in AE100 (Introduction to Aerospace Engineering).
Brian Woodard, Tim Bretl, Phillip Ansell, Vicki Coverstone, Steve D'Urso, Laura Gerhold. Liaison: Scott Carney

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Optimizing Collaborative Team Formation and Learning of Team Skills in Project-Based Engineering Courses
The vision of this project is to integrate, study, sustain, and champion the use of a criterion-based algorithmic method for organizing students into effective teams in large project-based engineering courses. The CATME software tool will provide the team formation testbed.
Brian Bailey, Darko Marinov, Tao Xie, Ranjitha Kumar, Wai-Tat Fu, Karrie Karahalios. Liaison: Luke Olson

Adaptive Learning (PrairieLearn)
This project aims to project an Algorithmic Adaptive Learning (AAL) system. This in a computer-mediated learning environment that adapts to a student's performance, giving weaker students the support they need while challenging stronger students with engaging material at an appropriate level.
Matt West, Geir Dullerud, Wade Fagen, Sewoong Oh, and Craig Zilles. Liaison: Luke Olson

Computer-based Testing Facility (CS)
This project is focused on designing and implementing a computerized testing facility to improve the quality of assessment in large courses. Infrastructure includes web-based exam sign-up, random student seat assignment, icard scanning proctor station, PrairieLearn compatibility, and automatic grading.
Craig Zilles, Brian Bailey, Wade Fagen, Bill Chapman, Dave Mussulman. Liaison: Dallas Trinkle

Improving Students' Learning and Experience in ECE 110
This project focuses on re-designing methods and materials for a large, introductory ECE class. The team will execute research-based instructional strategies to develop a community of instructors who agree on the metrics and goals of the course. Through this course revision, the project aims to excite students about the breadth and scope of ECE.
Geoffrey Herman, Chris Schmitz, David Varodayan, Serge Minin, Lynford Goddard, Michael Loui, Erhan Kudeki, Patricia Franke, Hyungsoo Choi. Liaison: Cinda Heeren

MatSE Curriculum Reform
This project aims to reform the Material Science and Engineering undergraduate curriculum by integrating computational materials modeling in sophomore and junior-level core courses, by developing a capstone senior materials modeling elective, and by recording and disseminating course content online.
Dallas R. Trinkle, Andrew Ferguson, Cecília Leal, André Schleife, Kris Kilian, Shen Dillon, Jessica Krogstad, Pascal Bellon, Robert Maass. Liaison: Tim Bretl

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(BioE Cancer Scholars) Challenge-inspired Learning: A Flipped Apprenticeship Model for Education
In this project, cohorts of undergraduate student scholars complete activities centered on cancer research to stimulate purpose-inspired learning. The scholars' activities include taking classes, meeting with a faculty mentor, conducting research, and participating in clinical immersion.
Rohit Bhargava, P. Scott Carney, Andrew Smith, Dipanjan Pan, Marcia Pool. Liaison: Brian Bailey

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Start-Up Track

Developing Instruction in Technical Writing for Freshman Engineering Students
Karin Jensen, Yanfen Li, Marcia Pool, Andrew Smith (BioE), Athena Lin (MatSE), P. Scott Carney (ECE), Lance Cooper (Physics), Celia Elliott (Physics), Kelly Ritter (English). Liaison: Dallas Trinkle

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Julie Zilles, John Popovics (CEE), Celia Elliott (Physics), Paul Prior and Nicole Turnipseed (Center for Writing Studies). Liaison: Jenny Amos

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Developing Intervention Methods that Improve Visuospatial Skills of Engineering Students
Wai-Tat Fu, Helen Wauck, Yi-Chieh Li (CS), Jim Leake (ISE), Brian Woodard (AeroE), Angie Wolters (Women in Engineering). Liaison: Geoffrey Herman

2015---16 SIIP Teams

Reforming ISE's Stochastics Sequence: IE300, IE400, IE410, IE413
This project focuses on integrating a computational component and challenging, data---driven case studies to advance the critical and creative thinking of students in these courses.
Alexandra Chronopoulou, Runhuan Feng, Doug King, Justin Sirignano, Richard Sowers. Consultant: Dallas Trinkle

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This project is the beginning of an effort to implement project---based learning and student portfolios across the curriculum. Initial changes are in AE100 (Introduction to Aerospace Engineering).
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Matt West, Geir Dullerud, Wade Fagen, Sewoong Oh, and Craig Zilles. Consultant: Luke Olson

CEE398PBL: Project---Based Learning in CEE
This project continues the development of CEE 398, a project---based learning course that develops critical thinking and engineering problem solving skills by identifying and proposing solutions to current civil and/or environmental engineering problems facing the University of Illinois campus community.
Jeffery Roesler (CEE), Bill Cope (EPOL), Arthur Schmidt (CEE), Lance Schideman (ABE), Morgan Johnston (F&S). Consultant: Jenny Amos

Computer---based Testing Facility (CS)
This project is focused on designing and implementing a computerized testing facility to improve the quality of assessment in large courses. Infrastructure includes web---based exam sign---up, random student seat assignment, icard scanning proctor station, PrairieLearn compatibility, and automatic grading.
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Jassim, Blake Johnson, Seok Kim, Michael Philpott, Sameh Tawfick, Aimy Wissa.

Elizabeth Hsiao---Wecksler, Steven Downing, Alison Dunn, Bruce Flachsbart, Emad

Jassim, Blake Johnson, Seok Kim, Michael Philpott, Sameh Tawfick, Aimy Wissa.

Consultant: Scott Carney

Physics 211---212: Improving Test Performance for Struggling Students
This project studies the best methods for providing students with an accurate assessment of their understanding, as well as appropriate materials to improve their understanding. This project includes data analysis from previous years' work, the development of mastery exercises for Physics 100, and the development of an assessment question database for Physics 211 and 212.
Gary Gladding, Jose Mestre, Mats Selen, and Tim Stelzer. Consultant: Jose Mestre

(BioE Cancer Scholars) Challenge---inspired Learning: A Flipped Apprenticeship Model for Education In this project, cohorts of undergraduate student scholars complete activities centered on cancer research to stimulate purpose---inspired learning. The scholars' activities include taking classes, meeting with a faculty mentor, conducting research, and participating in clinical immersion.
Rohit Bhargava, P. Scott Carney, Andrew Smith, Dipanjan Pan, Marcia Pool. Consultant: Brian Bailey

TAM 210/211/212/251
This project focuses on the gateway TAM mechanics classes, which serve approximately 2500 student---enrollments per year. This project has applied state---of---the---art pedagogical and technology solutions to improve student engagement and enthusiasm. The current work is focused on ensuring the sustainability of the implemented changes.
Matt West, Geir Dullerud, Elif Ertekin, Randy Ewoldt, Blake Johnson, Mariana Kersh, Mariana Silva Sohn, Dan Tortorelli. Consultant: Brian Bailey

2014-2015 College of Engineering SIIP Projects

First-year recipients

COMPUTERIZED TESTING: *Craig Zilles, Lawrence Angrave, Brian Bailey, Wade Fagen, Cinda Heeren, and Karrie Karahalios. Consultants: Matt West & Dallas Trinkle.*
This project will conduct a pilot study on the use of a computerized testing facility to improve the quality of assessment in large computer science courses.

IMPROVING STUDENTS' LEARNING AND EXPERIENCE IN ECE 110: *Geoffrey Herman, Chris Schmitz, David Varodayan, Serge Minin, Lynford Goddard, Michael Loui, Erhan Kudeki, Patricia Franke. Consultants: Luke Olson & Dallas Trinkle.*
This project focuses on re-designing methods and materials for a large, introductory ECE class. The team will execute research-based instructional strategies to develop a community of instructors who agree on the metrics and goals of the course. Through this course revision, the project aims to excite students about the breadth and scope of ECE.

COMPUTATIONAL MODULES FOR THE MATSE UNDERGRADUATE CURRICULUM*: Dallas R. Trinkle, Andrew Ferguson, Cecilia Leal, Andre Schleife. Consultant: Matt West.*
This project aims to reform the Material Science and Engineering (MatSE) undergraduate curriculum by integrating computational materials modeling in sophomore and junior-level core courses, by developing a capstone senior materials modeling elective, and by recording and disseminating course content online.

PURPOSE INSPIRED LEARNING: A FLIPPED APPRENTICESHIP MODEL FOR EDUCATION: *Rohit Bhargava, P. Scott Carney, Andrew Smith, Dipanjan Pan, Marcia Pool. Consultant: Leslie Crowley.*
This project will create a scholars program within the Bioengineering Department. The undergraduate student scholars will complete activities centered on cancer research to stimulate purpose-inspired learning. The scholars' activities include taking classes, meeting with a faculty mentor, conducting research, and participating in clinical immersion.

CREATING A GLOBAL TECHNOLOGIES MINOR: *Jennifer Amos, Rashid Bashir, John Abelson, Al Hansen, Richard Cooke, Deanna McDonagh. Consultants: Bruce Elliott-Litchfield & Laura Hahn.*
This project aims to create a minor and certificate program with the goal of providing experiential learning in global technology development in order to create global citizens with strong technical skills.

Second-year recipients

ADAPTIVE LEARNING: *Matt West, Geir Dullerud, Sewoong Oh, Craig Zilles. Consultant: Geoffrey Herman*
This project is creating a computer-mediated learning environment that adapts to student performance, giving weaker students the support they need while challenging stronger students with engaging material at an appropriate level.

CEE 398: PROJECT-BASED LEARNING IN CEE: *Jeffery Roesler, Arthur Schmidt, Lance Schideman, Morgan Johnston. Consultant: Jose Mestre.*
This project continues the development of CEE 398, a project-based learning course that develops critical thinking and engineering problem solving skills by identifying and proposing solutions to current civil and/or environmental engineering problems facing the University of Illinois campus community.

EXTENDING THE CURRICULUM CONTENT OF AN EXISTING SKETCH RECOGNITION TUTORING SYSTEM WITH IMMEDIATE FEEDBACK TO ENGAGE CROSS-DISCIPLINARILY: *Joshua Peschel, Cassandra Rutherford, Megan Konar. Consultant: Geoffrey Herman.*
This project will expand the curriculum content of an existing sketch recognition tutoring system to engage cross-disciplinary instructors in the areas of fluid and soil mechanics. The work includes building a corpus of sketch-based content and developing a set of effective-use and best practices recommendations for instructors.

ME 370-371 RE-DESIGN: *Stephen Downing, Elizabeth Hsiao-Wecksler, Sameh Tawfick. Consultants: Chris Migotsky & Laura Hahn.*
This project brings hands-on design experience to undergraduate mechanical design classes. It aims to make the hands-on student experience a sustainable course change by creating a separate website of resources for instructors.

Third-year recipients

PHYSICS 211-212: IMPROVING TEST PERFORMANCE FOR STRUGGLING STUDENTS: *Gary Gladding, Jose Mestre, Mats Selen, Tim Stelzer. Consultant: Jose Mestre.*
This project studies the best methods for providing students with an accurate assessment of their understanding, as well as appropriate materials to improve their understanding. This project includes data analysis from previous years' work, the development of mastery exercises for Physics 100, and the development of an assessment question database for Physics 211 and 212.

TAM 210/211/212/251: *Matt West, Geir Dullerud, Elif Ertekin, Randy Ewoldt, Blake Johnson, Mariana Silva Sohn, Dan Tortorelli. Consultant: Luke Olson.*
This project focuses on the gateway TAM mechanics classes, which serve approximately 2500 student-enrollments per year. This project has applied state-of-the-art pedagogical and technology solutions to improve student engagement and enthusiasm. The current work is focused on ensuring the sustainability of the implemented changes.