Miller Faculty Fellowship Grants Academic Year 2021-2022

Longitudinal assessment and experimental design for project-based learning in ISUComm Foundation Courses (ENGL 150/250), $15,000

Abram Anders, English (College of Liberal Arts and Sciences), and Amy Walton, English (College of Liberal Arts and Sciences)

What if we could assess students' foundational communication skills across the ISUComm Foundation Courses sequence and understand the impact of these courses on students' academic performance and capacities for professional success? Even better, what if we could assess and validate new experimental approaches to instructional design and delivery as well as instructor training? The ISUComm Foundation Courses program offers a sequence of 2 required courses (ENGL 150/250) that enroll around 6000 students each academic year. These courses are designed to support multimodal communication skills (written, oral, visual, electronic). The goals of this project are two-fold: 1) Design and implement longitudinal assessment study using a mixed-methods approach addressing both communication and writing skills and broader impacts on student learning capacities and academic success; 2) Design, implement, and test innovative instructional strategies through the direct comparison of assessment data for standard and experimental sections of both courses (ENGL 150/250).

ISU Spaceflight Operations Course, $15,000

Clayton Anderson, Tomas Gonzales-Torres, and Colonel Robert Martin, Aerospace Engineering (ENGR), and Nir Keren, Ag Biosystems Engineering (ENGR)

The ISU Aerospace Engineering Department is "putting space back into aerospace" and fully realizes the need for developing students destined to be operationally thinking commercial industry/spaceflight professionals. The Spaceflight Operational Course (entering its 8th year) seeks the maximum Miller Faculty Fellowship grant of $15,000 to implement real-world application via extreme environments. Uniquely designed in such a manner as to utilize nuances of NASA astronaut training, the improved course will help student participants develop a different–an operational style—thought process. The course continually seeks multi-discipline engineers (aerospace, mechanical, electrical, etc.) and educational students (middle, secondary, post-secondary, etc.) to take advantage of the existing synergy showing educators how engineers think and engineers how educators think. The idea of exposure to this "operational thinking" methodology provides added "tools for their toolbox" as they pursue their careers in education and engineering with skill sets previously not imagined.

A History of Genocide: Collaborative Approaches to Teaching about Race, Violence, and the State, $15,000

Jeremy Best and Brian Behnken, History (LAS)

We seek a Miller Fellowship to develop a new course that examines racial and genocidal violence within a comparative framework. A History of Genocide compares the experiences of Black, Latino/a/x, Native, and Asian peoples in the United States with Jewish people in Europe. The course uses racial violence as a lens to interrogate the relationship between state power and racism to understand questions about nationalism and social exclusion/marginalization. Integral to the course is an innovative approach to team teaching and experiential learning through collaboration with museums and public scholars in Iowa and Washington, DC. Our course will open a dialog at Iowa State about the historical dimensions of racial violence and enable students to join a broader conversation about race and power. The class will demonstrate that the history of anti-Semitism and racism are representative of global patterns at work in the nineteenth, twentieth, and twenty-first centuries.

Does Top Hat Improve Student Performance? $3,000

Brian Hornbuckle, Agronomy (AGLS), Liz Griffin, Materials Science and Engineering (ENGR), Audrey McCombs, Statistics (LAS)

Personal response systems, such as Top Hat, allow both instructors and students to receive immediate feedback during class via electronically-posed questions. Even though each semester approximately 300 classes at Iowa State University use Top Hat as a pedagogical tool, there has been no quantitative evaluation of its effect on student performance. More broadly, Top Hat is just one formalized method of active learning in the classroom. We propose to analyze data from over 3000 students enrolled over a 14-year period in an introductory science class and test the hypothesis that more thinking in the classroom (as measured by students answering a higher percentage of Top Hat questions) results in more learning (as measured by exam performance). Our goal is to publish our findings to improve pedagogy and instructional delivery and ultimately increase student performance.

Pressing Letters: Integrating Printmaking into Graphic Design and Creative Writing, $15,000

Raluca Iancu, Art and Visual Culture DSN), Debra Marquart, Charissa Menefee, Barbara Haas, Maurice Meilleur, English (LAS), and Miriam Martincic, Graphic Design (DSN)

Typography is an essential aspect of printmaking, graphic design, and creative writing. Far too often, however, students create in a digital format without understanding the connection between the work on a computer screen and the work as it exists in the world. The software, terminology and even the letter forms that we use as we write are rooted in the history of moveable type and letterpress. While Graphic Design owns limited type and small presses, it isn't integrated into any courses, and there isn't the capability to print broadsides. We propose incorporating hands-on letterpress printmaking into fifteen existing and two proposed courses in three departments within two colleges (450 students). With the acquisition of letterpress equipment, the development of instructional manuals and class modules, students in these courses will gain experiential learning in the design process, allowing them to slow down and grasp –literally and metaphorically –the tangibility of words.

Enhance Lab Learning Through a New OPERA (Online Platform for Equipment and Remote Assistance) System, $15,000

Shan Jiang, Materials Science and Engineering (ENGR), Ann Gansemer-Topf, School of Education (HSCI), Hantang Qin, Industrial and Manufacturing Systems Engineering (ENGR), Greg Curtzwiler, Ag Biosystems Engineering (AGLS), Xiaolei Shi, Food Science and Human Nutrition (AGLS), and Lingyao Yuan, Information Systems and Business Analytics (IVYCOB)

We propose to build a sustainable, adaptable online platform to prepare students for and enhance their lab learning experiences while accommodating diverse learning styles. It will integrate lab assistance in multiple formats, including videos, computer simulations, and virtual reality experiences. The platform enables students to preview and rehearse lab procedures before collaborating on data collection and analysis during or outside regular lab hours. It helps instructors assemble learning materials, minimize equipment mishandling and reinforce data analysis skills. The platform will synergize efforts and share resources from multiple manufacturing and material processing courses in MSE, IMSE, ABE, and FSHN. Our interdisciplinary team has extensive expertise in teaching labs, developing digital tools, and assessing learning outcomes, and this effort builds upon individual modules developed under prior grants. The OPERA platform is a timely response to the urgent virtual learning need that will apply to many other lab courses.

Enhanced learning and skill-building by using state-of-the-art CALPHAD software to apply fundamental principles in the thermodynamics and kinetics of materials, $15,000

Ralph Napolitano, Materials Science, and Engineering (ENGR)

Two core courses in Materials Engineering will be transformed through the comprehensive integration of CALPHAD methodologies into active-learning exercises aimed at applying fundamental principles to complex problems in materials design and control. The thermodynamics and kinetics of materials constitute two central pillars of Materials Engineering, but MatE 311 (Thermodynamics)and MatE314 (Kinetics) remain two of the most challenging courses for students. This project addresses the heart of the problem: applying basic principles to real materials can be quite complex, often obscuring for students the fundamental nature of important principles and relationships. By including some empiricism, the CALPHAD (Calculation of Phase Diagrams) methodology offers a data-centered approach to solving real-world problems in phase stability and transformations. Here, commercial CALPHAD software will provide a central backbone for an active-learning approach in these foundational courses and provide students with an opportunity to develop high-value technical field competencies.