Miller Faculty Fellowship Grants Academic Year 2017-2018

A better peer assessment: Designing a peer assessment protocol to maximize fairness, $15,000

Jane Rongerude, Community and Regional Planning; Cassandra Dorius, Human Development and Family Studies; Michael Dorneich, Industrial &Manufacturing Systems Engineering; Sandra Gahn, School of Education; Lisa Orgler, Horticulture; Kajal Madeka, CELT; Holly Bender, CELT; Craig Ogilvie, Physics

Fields as diverse as psychology, sociology, and law recognize that people have implicit biases that negatively impact how they perceive people from disadvantaged groups. Although active learning pedagogies such as TBL are promoted as a strategy for engaging underrepresented students, research suggests that women and students of color do not have the same classroom experience with TBL as their male and white counterparts (Hetter, 2015; Wayland, Walker, and Ferrara, 2014). Little research exists that investigates how these differences play out in the peer assessment process. TBL practitioners have little guidance on how to create peer assessments that are fair for all students. This project seeks to identify the extent to which bias affects peer assessment scores, and to develop peer assessment protocols that maximize fairness. This study will provide immediate, practical suggestions to faculty using peer assessment in their classrooms, thereby enhancing the classroom climate and improving student learning potential.

"Save us" Online general microbiology students as post-apocalyptic plague survivors, $12,725

Nancy Boury, Plant Pathology and Microbiology; Lesya Hassall, CELT; Gaylan Scofield, Brenton Center for Agricultural Instruction and Technology Transfer

We propose designing a general microbiology course to serve over a hundred Micro 302 students each year. This course will use game-based teaching methods including a compelling narrative, student choice, and multiple and varied assessment methods. This course will be designed using backwards design principles, with the learning objectives and assessments determined prior to designing multiple methods of engaging with the course content as well as multiple methods of assessment. Students will learn the basics of real microbial structure and function, microbial genetics, antibiotic resistance, virulence and infection, the immune response and public health as they work through solving a complex problem: developing a cure for a fictional civilization-ending plague.

Finding a CURE: Course-based undergraduate research experiences for industrial engineering students as a model for the College of Engineering, $15,000

Leslie Potter, Industrial and Manufacturing Systems Engineering; Richard Stone, IMSE; Devna Popejoy-Sheriff, IMSE

Since 2013, the Industrial and Manufacturing Systems Engineering (IMSE) Department has supported 10-20 students/semester with one-on-one undergraduate research assistantships (URAs), but faculty resource constraints have plateaued this number. Implementing Course-based Undergraduate Research Experiences (CUREs), where students address research problems in the context of a class, would significantly increase how many students gain this kind of experience. CUREs benefit students in numerous ways, including developing critical thinking skills and improving professional skills like teamwork and communication (Harris, et. al., 2015). They also increase retention in STEM fields and interest in graduate study (Bauer and Bennett, 2003). IMSE proposes implementing a pilot CURE, reaching 150 students/year with a research experience. A successful model could then be expanded to other College of Engineering departments, potentially reaching thousands of students/year, and supporting ISU's strategic goal (http://strategicplan.iastate.edu/) of ensuring that students receive an exceptional education, increasing both retention and graduate school enrollment.

Preparing pre-service teachers for makerspace communities in PK-12 education, $14,781

Denise Schmidt-Crawford, Yi Jin, Dennis Culver, School of Education

Pre-service teachers are eager to learn about the maker movement in education. As an emerging topic in the PK-12 educational landscape, it must be part of the educator preparation curriculum at ISU. Our program is tasked with preparing pre-service teachers who can design makerspace areas and learning activities, which will transform existing PK-12 curricula and provide student access to STEAM fields. We propose to develop an instructional module for ~150-200 pre-service teachers every semester in C I 2013. Our goal is to design instructional materials (f2f and online) to improve pre-service teachers' understanding of makerspaces and the maker movement in schools. This topic is unique and costly because it does require specific technology and materials to create learning opportunities within the context of design thinking, distributed creativity, and technological pedagogical content knowledge (TPACK).

Exploring the potential of augmented reality applications to teach structural analysis, $14,971

Aliye Karabulut-Ilgu, Civil, Construction, and Environmental Engineering; An Chen, CCE; Rafael Radkowski, Mechanical Engineering

Students join engineering programs because they are interested in the field, and they want to design and build buildings, towers, bridges, and aircrafts. Yet, the current engineering education practice does not provide distinct opportunities for engineering students to understand their profession on a larger, application-based scale because of the limitations of the traditional teaching methods, disconnections between classroom implementations and real-life practice, and lack of opportunities for hands-on experiences. In this proposal, we propose an innovative teaching pedagogy using mobile and interactive Augmented Reality (AR) technology to teach structural analysis. The purpose of this project is to explore the potential of AR in enhancing student learning by (1) preparing an AR application to teach Structural Analysis, which incorporates the fields of applied mechanics, material science and applied mathematics, and (2) assessing the effect of AR on student learning.

Development of new teaching material and visual tools to enhance student learning in the general chemistry laboratory courses, $14,870

Sara Pistolesi, Chemistry

Large attendance laboratory courses are divided into many sections taught by different TAs, which inevitably leads to differences in teaching styles and learning outcomes. With the proposed project, teaching material to be used in all the sections of the General Chemistry Laboratory courses Offered at ISU will be developed to ensure that all the students receive comparable instruction. Also, visual tools such as videos and animations will be developed and provided to students before the lab activity to explain and clarify instrument assembly and handling. This will ensure that pre-lab discussions are spent on the big-picture ideas of the experiments rather than on how to perform the tasks. The visual tools and teaching material will impact roughly 2400 and 1200 students in the Fall and Spring semesters, respectively.

Engaging students through online testing modules for a high-enrollment engineering economics course, $15,000

Cameron MacKenzie, Industrial and Manufacturing Systems Engineering

Engineering students are trained to study for exams, be able to apply a few formulas to specific types of questions, and answer questions well enough to receive at least some partial credit. The purpose of this project is to engage students more directly through online testing modules that more closely reflect a professional engineering environment. This project will design these testing modules for an engineering economics course which attracts hundreds of students in each semester. A testing module will randomly select questions, and no question will be repeated exactly. A student can continue to take a test until he or she passes the module. Students who pass a module will have demonstrated proficiency in that subject. Students will be required to pass six online testing modules in order to pass the course. A student will need to pass two additional testing modules to earn an A.