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Innovation and Entrepreneurship: Students 'nerd out' as they build bionic hand

Note: This article by Whitney Baxter, communications specialist in the [College of Agriculture and Life Sciences \(CALs\)](#), first appeared on the CALS website on May 17, 2022. It is reprinted here with permission from the author.

What do you get when you combine students from life sciences and engineering majors at Iowa State University? A collection of great minds eager to tackle innovative projects in class.

Karri Haen Whitmer, teaching professor and associate chair for teaching in genetics, development and cell biology (GDCB), is one of nine College of Agriculture and Life Sciences faculty who were selected for the new Innovation and Entrepreneurship Faculty Fellows Program. Sponsored by the Dean's Office of Academic Innovation and Start Something College of Agriculture and Life Sciences, the program aims to expand a culture of innovation and entrepreneurship among CALS faculty.

"Fostering an environment where our students feel empowered to innovate, create and explore their interests – in research, entrepreneurship or some other area – and develop their skillset in interdisciplinary teamwork and collaboration is so important within the College of Agriculture and Life Sciences and the university as a whole," said Carmen Bain, CALS associate dean of academic innovation. "By offering the Innovation and Entrepreneurship Faculty Fellows Program to our faculty, we're providing them the resources and support they need to incorporate innovation into their teaching, research or extension activities."

In her proposal, Haen Whitmer submitted an idea for a class that would bring together life sciences and engineering students to learn about bionics technologies. She has been teaching human physiology for nearly a decade and wanted to find a way to help students learn where physiological data comes from and its real-life applications.

"When I saw the IIEFF request for proposals, I knew it was the perfect opportunity to obtain a support network and funds for the materials required to deliver this course," Haen Whitmer said.



From left, Benjamin Freiberg, junior in kinesiology and health, Rebekah Petersen, sophomore in pre-athletic training, and Johnathon Lujan, junior in kinesiology and health, work on a bionic hand they, along with their classmates, built during the spring semester.

This past semester, 11 students involved in the biology and honors programs enrolled in the experimental course. Working in teams, they helped lay the groundwork for what will hopefully become an official class.

The semester started with Haen Whitmer teaching the students about limb differences, prosthetics and different types of bionic arms. Taking what they learned, the students then created a bionic hand using a 3D printer in one of the Student Innovation Center labs. They also learned how to work with electrical circuit boards to operate the hand and make it move certain ways.

"I like the process of learning how to assemble the hand and seeing it come together and work like it should," said Jaden Braden, sophomore in mechanical engineering.

The class is designed to attract students from a variety of majors, opening opportunities for non-engineering students to be exposed to skills taught in engineering courses.

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Karri Haen Whitmer (right photo), teaching professor in genetics, development and cell biology, demonstrates how muscle response can be tracked using electromyography. Students in her experimental class spent the past semester learning about bionics technologies and using that newfound knowledge to build a bionic hand.

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“It is time to bridge the gap between these undergraduate fields so students in life science areas have the opportunity to walk away from Iowa State with knowledge in basic coding, circuits and manufacturing,” Haen Whitmer said. “These abilities will enhance their marketability in a job search, and the technical knowledge will prepare them to be innovators in their own field of study.”

Braden said she has enjoyed being around students who are in different majors than her own.

“Not a lot of us here have a lot in common, but we can nerd out about this project,” she said.

“It’s something everyone in the group can work on, and when we all come together, it’s really fun,” added Zach Rapoza, sophomore in computer engineering.

Bree Beyer, sophomore in kinesiology and health, said she has appreciated how Haen Whitmer has allowed the class to make the project their own.

“She’s been open-ended about the project, allowing us to direct where we want to go with it,” Beyer said.

Now that the semester is over, Haen Whitmer has students lined up to continue work on the bionic hand during the summer. She’s also looking into the possibility of establishing an Enabling the Future student organization at Iowa State, through which students can donate the prosthetic limbs they create to help children and adults in need. All while waiting for the course to be approved by the college curriculum committee.

She sees the course being the first of many to bring together real-world engineering and technical skills to students who previously could not access training in these areas.

“Beyond obtaining the technical skills, I want my students to walk away from this course with an innovation mindset. I want them to understand that we all begin our work as a novice – the only path to expertise is through inevitable criticism and

mistakes,” Haen Whitmer said. “Don’t be afraid to pursue your creative vision, even if you don’t have mastery of all the moving parts. The vision is what’s critical.”

About Karri Haen Whitmer: A member of the Department of Genetics, Development and Cell Biology since 2012, Karri Haen Whitmer has more than 25 years of experience teaching STEM. She specializes in developing and leading high-enrollment university courses and has taught more than 10,000 undergraduate students during that time. She is a 2019 recipient of the CALS excellence in undergraduate teaching by lecturers and adjunct faculty. She created and developed two new online anatomy and physiology courses. She also saves ISU students more than \$50,000 in course fees each spring through the development of original open-access text for teaching Biology 256 laboratory.

Learn more about Haen Whitmer’s work on her [GDCB website page profile](#).

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