



Iowa State freshmen, left to right, Andria Osborne, Matt Hienrichsen, Adam Sunderman and Will Johannes work with Tom Daniels, back right, assistant professor of electrical and computer engineering, to figure out how a Wii Remote can gather useful data from a bike and rider. *Photo by Bob Elbert.*

Iowa State researcher uses Wii Remotes™ to teach lessons in computer engineering

AMES, Iowa - Tom Daniels, after taking a shift pedaling an old bike propped up in the corner of an Iowa State University computer lab, joined a few of his freshmen students back at a computer.

The aspiring computer engineers were huddled over the monitor, tapping away at the keyboard, trying to use a [Wii Remote™](#) to collect data from that bike.

They were using one of Nintendo's handy controllers for Wii video games to track infrared lights attached to one of the bike's pedals. Their project for [Computer Engineering 186](#) ("Introduction to Computer Engineering and Problem Solving II") was to write a program that would use the Wii Remote to collect data about the spinning pedals and turn that into useful information about cadence and maybe even information about a rider's movement and efficiency.

The assignment was all about figuring out how to collect, process and use data, said Daniels, an assistant professor of [electrical and computer engineering](#). And it was about solving the vexing problems that inevitably crop up when working with data as it comes in.

The students were having a hard time making it all work during a recent lab. Try as they might, their data wasn't showing up on the computer screen. But, they weren't frowning about it.

"It's really interesting," said Andria Osborne from Ely. "Most people in computer engineering want to work with numbers and stuff. I want to work with biology and other stuff. And so to work with this is exciting."

But, she said, it's not all fun and games to use a Wii Remote as a data collector.

"There's a lot of learning to do to just get started, much less implementing something," she said.

An award for exciting learning

The [Technology Association of Iowa](#) recently honored Daniels with a [2010 Prometheus Award](#) for Best Innovation in Teaching. The association says the award "recognizes a teacher's use of technology to create exciting learning opportunities."

Larry Brennan, a systems analyst for Iowa State's Information Technology [Security and Policies](#) team, nominated Daniels for the award because students have responded so well to working with Wii Remotes.

"The familiarity of the gaming device coupled with the mystery of how the Wii Remote functions captures the imagination, as well as engages, the freshman students," Brennan wrote in his nomination. "It also provides real-world application of calculus, physics and signal processing courses which are generally taught in abstract."

Daniels said using a Wii Remote as a teaching tool is part of a new take on the department's two introductory, problem-solving classes. The idea was to find new ways to boost student interest and retention in computer engineering. A lot of students are attracted to computers because they like video games and game technology. But they don't always understand why computer engineers have to learn physics and math, too.

So a few summers ago Daniels wrote some software (he calls it Wii Wrap) that allows the Wii Remote to send data from its sensors and buttons to a computer instead of a game console.

Then he equipped a computer lab with Wii Remotes and asked students in computer engineering's two introductory courses to use the devices to propose and complete lab projects.

For one project, students stuffed Wii Remotes inside foam footballs and dropped them two or three stories from an open stairway. The students had to come up with a program that could take data from the remote and calculate how far the device fell, how long it took and even how air resistance affected the fall.

Daniels, who can't talk about the falling football project without showing a [YouTube video](#) of it, said the project accomplishes three big goals for the introductory class: it requires the students to learn some physics and math in addition to programming skills, it asks them to work with real data and it's a meaningful, hands-on way to learn computer engineering.

"We want these projects to be reasonable, but challenging," Daniels said. "I also want to give students a reason to care about the math and physics."

Encouraging students and computer engineering

At the end of a recent lab session, Daniels ran over to two freshmen computer engineering students trying to figure out how to record head movements using a Wii Remote and a device mounted to a pair of eyeglasses. They're using the configuration to develop their own version of a target-shooting game.

"Is it tracking?" Daniels asked James Carey from Warrenville, Ill., and Matt Sievert from Shoreview, Minn.

The students reported their project still needed some work.

But, they also said they're big fans of Daniels.

"He's a great teacher," Carey said. "He really encourages his students. I can tell he really wants to keep computer engineering a strong field. "

And what about using a Wii Remote in a university class?

"It's pretty fun," Sievert said. "It's like we're doing real applications, we're not just doing random things."

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