MOBILE LEARNING

By Teddi Barron

FLEx lab makes design technology more accessible

Sure they flock to 3-D movies and send Instagrams with a frenzy, but can they model a tractor part with a MakerBot? Or test ergonomic design with Oculus Rift?

Although Iowa's K-12 population is tech savvy, students still have more to learn before maneuvering through advanced technology to solve problems in design and manufacturing, says an Iowa State University industrial design professor.

David Ringholz, professor and chair of ISU's Department of Industrial Design, challenged an industrial design graduate studio last summer to create a mobile classroom for technology outreach to Iowa schools.

Throughout the fall and this spring semester, FLEx (Forward Learning Experience) has been on the road, providing K-12 students and teachers with hands-on experiences with virtual reality, Oculus Rift immersive visualization, interactive circuit building with Little Bits and 3D printers.

ISU design faculty and students introduced the trailer full of high-tech workstations during the Science Center of Iowa's Mini Maker Faire in September. Since then, they have traveled to a dozen locations throughout Iowa, engaging about 3,700 students, educators and families in activities designed to help them develop STEM (Science, Technology, Engineering, Math) and design-thinking skills.

In October, they made two stops: for a five-day stint with the Clarion-Goldfield-Dows Middle School; and as part of a STEM educator training and a separate STEM fair, both at Des Moines Area Community College.

Top: Iowa State's Forward Learning Experience (FLEx) lab debuted in September at the Science Center of Iowa's Mini Maker Faire. *Photo courtesy of ...* Above: Industrial design graduate student Dan Neubauer connects Stratford Elementary School students with Little Bits circuit technology.

And in November, the mobile classroom traveled to Stratford Elementary School as part of the school's Maker Space Project kick-off.

"FLEx can be a lot of things," Ringholz said. "We can customize the modules to accommodate different age groups or various advanced technologies."

Five days in Clarion

In Clarion, the FLEx trailer was set up in the showroom at Hagie Manufacturing, an agricultural sprayer manufacturer. Four workstations were rolled out from the trailer, which served as the virtual reality room for object and environment manipulation. In addition to Oculus Rift equipment, other workstations provided electronic circuit experimentation, a CNC (computer numerical control) router for complex-precision material cutting and the MakerBot for 3D printing.

All fourth- through eighth-graders experienced the advanced technologies in groups of 25 for 90-minutes. On Saturday, the Iowa State team worked with a 4-H STEM group.

"Having the students come to Hagie was a fantastic experience," said Pete Evans, a lecturer in architecture and industrial design and FLEx coordinator. His summer studio class created the mobile classroom.

"Hagie uses some of the same software we do for 3-D printing and prototyping. Many of the students' families work there, so they can start to make connections to real-world applications. It's not abstract for them," he said.

"It might seem like a game now, but it will change how you're educated in just two to five years. These technologies will soon be how people solve many problems."

— Pete Evans, FLEx coordinator

The future of solving problems

During the sessions in Clarion, Evans talked to the students about the scientific method, design thinking and engineering cycles as different problem-solving methods. He explained making and breaking prototypes as a way to learn how something works and fails. And he referred to the importance of 21st-century skills such as creativity, collaboration, critical thinking and communication.

"Design and STEM all fit into that same space for learning and thinking," Evans said. "Today we have many tools and ways of thinking that fit into that problem-solving idea. There are different ways to see the world around you."

As he invited the students to experience the Oculus Rift, Evans said, "It might seem like a game now, but it will change how you're educated in just two to five years. Use these tools, see how they work, experience them and then think about problem solving. These technologies will soon be how people solve many problems."

STEM in Stratford

In Stratford, FLEx was part of a full day of activities celebrating the school's new "making" initiative.

The Stratford Community School District received a $10,000 grant from America's Farmers Grow Education to provide students with technology and materials, including a 3D printer, they can use to invent and create in their science and social studies classes.

Evans and Dan Neubauer, a graduate student in industrial design, helped students in pre-kindergarten through sixth grade explore a number of technologies, from "riding" a rollercoaster while wearing an Oculus Rift headset to creating electronic circuits with Little Bits components that light up or make sounds when connected in different ways.

"They did a great job of interacting with the students and getting them excited about the possibilities," said Stratford Superintendent Sarah Binder. "When asked to evaluate the event, students and staff members rated the FLEx lab as the most thought provoking, interesting and just plain fun."

In both Clarion and Stratford, Evans said the students had seen some technologies and heard of others. He was pleased about their ease of use with them.

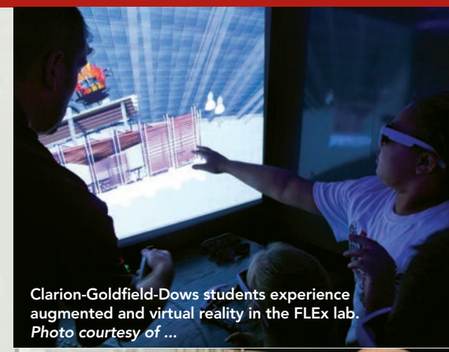
"They're very hands on and really quick to get into it. They're like fish in water. It's been fun to see that," he said. "And they walk away very enthused and excited. To have a student walk away excited about STEM, about design is fantastic. I'm very happy to provide that opportunity from Iowa State."

FLEx moving forward

The FLEx team is busy this spring with workshops for elementary, high school and college students, talented and gifted classes and Area Education Agency instructional technology specialists.

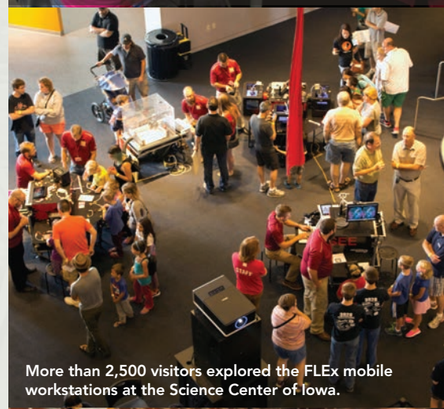
Based on this success, Ringholz plans to expand the pilot outreach program, which has been funded by Iowa State's Strategic Initiative on interdisciplinary design education and research, and the industrial design department. FLEx is a collaboration between the colleges of Design and Engineering in association with ISU Extension and Outreach.

Ringholz and the team are creating curricular materials and resources for teachers to integrate these advanced technologies into the classroom. And they are applying for grant funding through the National Science Foundation's K-12 STEM outreach program.



Clarion-Goldfield-Dows students experience augmented and virtual reality in the FLEx lab. *Photo courtesy of ...*

Industrial design Department Chair David Ringholz engages students in design and STEM technologies. *Photo courtesy of ...*



More than 2,500 visitors explored the FLEx mobile workstations at the Science Center of Iowa.

FLEx coordinator Pete Evans sends Stratford students on a virtual rollercoaster with the Oculus Rift.