Students' designs give prosthetics a new look

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This "skin" for a prosthetic is called "Skin." It was designed by Kansas State University interior architecture & product design student August Atzenweiler.

A project by Kansas State University interior architecture & product design students is giving individuals with prosthetic limbs a chance to add some personality to their prosthetic and show the students that their discipline goes beyond creating products or designing spaces.

Using his interest in bio-augmentation through 3-D printing, Dustin Headley and the 27 students in his second-year undergraduate product design studio class worked with six clients who are leg amputees to design a cover—or "skin"—that could become part of their prosthetic.

Headley, an assistant professor of interior architecture & product design in the College of Architecture, Planning & Design, specializes in digital design, including 3-D printing, and uses it in his product, furniture and interior design courses.

"This project really was looking at things from an empathetic standpoint on how can we use design to actually make people's lives better, and then executing that design to get something tangible," Headley said. "I think a lot of design at an undergraduate level ends up being abstraction and conceptual. We don't really ever get to the actual making of something real until later down the road. There's really no reason for that—the technology can support it if we're really willing to push the agenda."

For the project, groups of four or five students were assigned to each client. The clients were interviewed by the students to find out how they feel about their prosthetics and what they would like for their "skins."

Each client also had his or her intact leg scanned so the students could mirror that leg's geometry in their "skin" designs for the prosthetic limbs .

The interview process was an important lesson for the students, Headley said.

Called "Molecular Reconstruction," this prosthetic "skin" was designed by Kansas State University interior architecture & product design student Malia Young and is for a wounded warrior.

"They got to see that these people are not broken, which is, I think, a perception that society has," Headley said. "These people are really powerful personalities and have a lot of energy to put out there. It was great working with all of them."

To create and develop their visions for their clients, Headley helped the students learn new digital design techniques using a computer. They also had to consider how their designs would be manufactured and, perhaps even more important, how they could attach their "skins" or covers to the prosthetics in a way that was not invasive and would not impede their functionality.

"It was a real problem that needed to have a real solution," Headley said. "One of the students came up with a connection that attaches to the prosthetic's pylon and clamps the cover in pace. Since the connection is unobtrusive, it doesn't stick out in the design and, best of all, doesn't hamper any of the prosthetic's functions."

The students presented their designs to their clients, with each client getting to select the design best suited for him or her. The clients were really excited about the students' designs and the chance to wear them once completed, Headley said.

Among the clients is a mom with two children who is getting two "skins": a durable one to wear for her outdoor activities, including

fishing, hiking and playing soccer with her kids, and a more decorative "skin" for formal activities, such as going out to dinner. Headley said the mom was very excited about getting the skins because of her kids, who notice how people will stare at her prosthetic when's she's out in public. He said the mom and her kids know the "skins" will show just how active her life is.

Another client is a double amputee who is a student in college and takes part in many physical activities. "He makes everybody who has legs embarrassed because he is so active," Headley said. "He rock climbs, mountain bikes, wrestles, does jiujitsu." Headley said this client was interested in a design that would allow him to cross his legs in a job interview—despite the long pylons in his prosthetics. The design also had to be suitable to wearing shorts.

It was up to Headley to act as engineer of the designs, taking them from concept to reality using 3-D printing. The "skins" were made from flexible resins and plastics.

Along with providing people with the opportunity to personalize their prosthetic with their new "skins," Headley said the project showed students how design skills can be used to solve problems—and lead to new career possibilities as well.

"The design discipline is a generalist endeavor anyway," Headley said. "You are taking these disparate problems and issues and trying to create logical solutions. You have to select variables and find ways to engage. That's the skill set all of the students are getting trained for. It doesn't need to be limited to making products that go to market or making architectural space. We can do way more."

Provided by Kansas State University