



IMPACT STORY

Xavier University

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Understanding the Process of Innovation: A Xavier U. Class Uses Design Thinking to Help a Disabled Service Dog Walk on All Fours

The Center for Innovation at Xavier University

Xavier University's Center for Innovation (CFI) provides capabilities and resources to ignite, inspire, connect and transform three distinct communities—Healthcare, Education and Innovation— while simultaneously supporting both the local Connector Community (Startup/Entrepreneurs) and Xavier University.

Challenge

Anyone who's ever seen or experienced the work of a service dog in action knows that these special canines will bend over backwards to help people with disabilities become more independent. But when the tables are turned, where can a service dog with a disability go for support?

That was the question faced by Tiny, a friendly 8-month-old golden retriever and service dog in training for Xenia, OH-based nonprofit, 4 Paws for Ability. Born with a partial front right leg, Tiny's disability presented a mobility challenge, but her handler, Laurie Maier, was convinced that if the right solution could be found, Tiny would be well on her way to making a huge difference in someone's life.

At nearby Xavier University, no one was thinking about prosthetics for dogs when the school's Center for Innovation was launched in February of 2015. One of only three universities with a MakerBot 3D printing center on campus, Xavier was making history as the home of 31 3D printers—more than

any other private institution in the United States—with a full-service 3D printing Innovation Center located next to the classrooms where students would be learning how to design and make things to solve a variety of user problems.

So it was a bit of a surprise when they got the call from Maier that March.

Maier was determined to help Tiny become a working dog and to improve her quality of life, and she knew that her best hope would be to find her a prosthetic leg. Having seen a news report about a dog with no front legs who received a prosthesis that was built on a 3D printer, she thought it was worth a shot to reach out to Xavier.

Within hours, she heard back from the university. The CFI's Introduction to Making class was ready to take on Tiny's challenge.

The Introduction to Making class introduces students to the tools they'll need to go out and make things—whether digital or physical—to solve a problem in the community, while also giving them the opportunity to learn from the community at the same time. Xavier Professor Gary Lewandowski says this was just the kind of project the class was designed for.

"Our reaction was, 'Sure! Why not?'"

There were plenty of unknowns and practical obstacles, however. For starters, as Tom Merrill, Director of Xavier's School of Arts and Innovation, points out, none of the students had any type of medical or prosthetic background. But the team behind the new Center for Innovation, including Tom and Gary Lewandowski, a Professor of Computer Science and Director of Human-Centered Making, realized early on that no matter how cool the latest technology might be, innovation projects have to be framed by an effective process—and if you have a good process in place, there are no limits to what you can do.

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Gary Lewandowski
Professor of Computer Science
and Director of Human-
Centered Making

Because they believed that the most innovative solutions start with understanding the problem clearly and tackling it from a human (or in this case, canine)-centered point of view, when they learned about IDEO’s *design thinking* approach, it seemed like a natural fit as the innovation process to use in the Introduction to Making course.

“A big part of making something to solve a problem is the process of figuring out what it is you really want to make, and what the problem is that you’re trying to solve,” Gary says. “That’s really the *design thinking* process. You want to solve the right problem, and you want to have a process to start working on that to make sure that you’re approaching the problem in an agile way and doing the prototyping and getting feedback.”

The next step was figuring out the best way to teach that process.

Solution

In the fall of 2014, Tom and Gary attended ExperiencePoint’s ExperienceInnovation™ certification event.

“Within the Introduction to Making Course, we kick off the semester with ExperienceInnovation™. Its the perfect primer for what we want student to understand as they go through the course,” says Gary. “They go through the entire *design thinking* process, from prototyping, making a pitch, talking about experiments and getting feedback. Then we refer back to it as we go through the course.”

For the 22 students enrolled in the 2015 spring semester Introduction to Making course, the **ExperienceInnovation training and *design thinking* process would serve as the foundation for every project**, whether the innovation tools they ultimately used to complete the project were 3D printers, like in Tiny’s case, or “found materials,” as was the case with another nonprofit the students helped, Crayons to Computers.

"I didn't want to be seen as the manager of the whole thing, because the danger is that then it becomes my project instead of theirs. And some of those decisions they have to make and get wrong. There were times when I thought, I'm not sure that design is going to work, but instead I would say, 'OK, what can we do to learn whether this is going to work?'"

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"Crayons to Computers provides materials to underfunded schools," Gary explains. "Companies donate all kinds of supplies to them, but they're not obviously usable in a school in any way. The students used the *design thinking* process—idea stage, pitch, move forward with ideas, rapid prototyping—to turn these donated items into needed classroom materials."

Before the 3D printers could be put to use, the training was the essential first step in designing a workable prosthetic leg for Tiny. Having experienced the importance of observing and keeping observations separate from opinions, students were deliberate about focusing in on the dog, watching what it was doing and taking notes on those observations. By combining those insights with research they were also conducting at the same time, they could begin to see what designs should actually be pushed forward.

That research included talking with a prosthetics specialist who builds prosthetics for children. Through those discussions, the students were able to determine the four different parts that would be required to build Tiny's prosthetic leg. While they worked in groups to build these individual parts, they eventually recognized the need for some broader coordination to make sure all those ideas worked together.

"One of my seniors jumped in and became the de facto project manager by laying everything out on a white board," Gary says. "So then, every time we came to class, we'd go around and have a callout from each group explaining what they'd done and where they were with their prototype."

Gary adds that his role was more like that of a coach and resource, moving from group to group to make sure they were following the process.

"I didn't want to be seen as the manager of the whole thing, because the danger is that then it becomes my project instead of theirs," he explains. "And some of those decisions they have to make and get wrong. There were times when I thought, I'm not sure that design is going to work, but instead I would say, 'OK, what can we do to learn whether this is going to work?'"

Of course, nothing mattered more than the canine at the center of this user-centric design. Weekly visits from Tiny were critical to the process (and not a bad fringe benefit).

“Tiny came in once a week so we could try it out, and then we’d go back to class and have a meeting, following the process and determining what we’d learned and where we needed to go next,” says Gary. “So even though they were working in separate teams, the white board helped us keep track of where we were at all times, and gave everyone the big picture.”

Gary put tight deadlines in place to make sure the entire process played out and that everyone was staying on track, moving ahead quickly to meet the project’s timeframe of just six weeks.

“We had the dog in, and the next day we were getting a cast, and then it was time for people to start having ideas about what the leg should look like, starting to iterate on that—first testing them on the dog and getting weekly feedback from the dog,” he says. “Then it moved up to twice a week. Eventually, we were coming in every day with a new iteration for the dog. It got really rapid as we went so that we could get everything done.”

Each of the four different parts of the prosthetic (the inner sleeve, the hard external shell, the adjustable screw that serves as the leg and the foot itself) went through numerous iterations to get it just right, and those prototypes were brought to life in the 3D printing center. But while the ideation and iteration processes went remarkably fast, the students soon discovered that 3D printing isn’t quite so speedy. Each individual part took hours to print—up to 13 hours for the outer shell alone—which only added to the pressure to meet the project’s tight schedule.

After four 3D-printed prototypes failed to produce the desired result for the foot, the team came up with an alternative that ended up serving the purpose perfectly: a plunger cut down to the right size for the dog.

Soon enough, Tiny would be arriving at the Center for her big day.

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Tom Merrill
 Director of Xavier's School of
 Arts and Innovation

Results

Tiny's project was completed in just six weeks of the overall 15-week semester course, and in the end, the results were immediately evident as she took her first tentative steps and gave a rousing wag of approval. The students realized that they had not only changed Tiny's life but also that of the child who would be lucky enough to have her as their service dog.

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Gary adds that the ExperienceInnovation™ training gave students the grounding for coming up with lots of ideas and getting feedback on those ideas to get to even better ideas. It also helped them understand that failure isn't the end.

"The prototyping part, where you understand that things are going to fail, that was so important," he says. "They really got to live that as they were repeatedly going back to the prototype stage. And because they understood that this is just the process, it didn't really bother them when they tried something and it was somewhat of a disastrous fail. Two days later they'd been back at that cycle, saying, OK, what did we learn and what are we going to do next time?"

Tom also marvels at the speed in which they were able to get the project completed, especially because this wasn't their only project. Between lectures, labs, other projects and other coursework, they had plenty on their plates.

"The entire class was not devoted to Tiny!" Tom points out, adding, "For them to be able to produce a viable solution by the end of the semester was pretty amazing."

While Tiny's story has made a big splash, it certainly hasn't been the only success story to come out of CFI. Likewise, although 3D printing has received much of the attention, Tom, Gary and others believe *design thinking* deserves a good deal of credit, too.

"You can take on projects—like designing a prosthetic for a dog—where you aren't sure at the beginning how you're going to solve the problem at all," Gary says. "As part of the process, you realize you really are learning. It's not lip service that the cycle of experimentation provides information; you really do learn from it, and in fact, you learn from the whole process of trying to get ideas."

Just as important, he says, was the foundation provided by ExperienceInnovation™.

"Having the training right away let them see that no matter what cool technology we use, we have to have a process. That worked really well."

The ExperienceInnovation™ experience also helped students understand how the cycles work so that they were immediately working the ideation process, looking for and sharing everything they could find related to background information, biomechanics, images of the dog and more, all of which started triggering ideas.

"They remembered that from the training," Gary says. "It pushed them to see how many ideas they could come up with."

CFI's leaders believe the inaugural semester was just a taste of what's to come in terms of the impact the Introduction to Making students will have on the community. Gary says they will continue to move forward with this successful formula, introducing students to the *design thinking* process upfront through the ExperienceInnovation™ training, insisting that they follow the process throughout, and keeping deadlines tight to make sure the entire process plays out.

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And that applies to canines, too, Tiny would likely add.

About ExperienceInnovation™

ExperienceInnovation™ is an energizing workshop that challenges teams to flex their creativity to solve a realistic and complex design challenge. In so doing, they engage with the terms, techniques, and thought patterns of successful innovators.

ExperienceInnovation™ was created in collaboration with IDEO, an award-winning global design firm that takes a human-centered design approach to helping organizations in the public and private sectors innovate and grow.

About ExperiencePoint

At ExperiencePoint, we're passionate about how people work together to get stuff done. We're an award winning training company that develops business simulations for leadership development in the areas of change and innovation. We're known for realistic simulation experiences that challenge people to roll up their sleeves and learn the Whats, Whys and Hows of leading change and innovation.