

Industrial designers and biomedical engineers address needs of wounded veterans

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Elham Morshedzadeh, Chris Arena, and Pamela VandeVord (left to right) discuss possible fabrication methods for biomedical device prototypes, including 3D printing. Throughout the new course, students will design a device, application, or system to address an unmet health care need of wounded veterans. Credit: Virginia Tech

Getting treatment for a serious injury or ailment isn't simply a matter of taking prescribed medication or showing up for appointments on time. It's also about the little things in between—dealing with complicated billing or insurance processes, for example, or navigating the mental toll of a physical disability that affects quality of life.

Those issues are compounded for wounded veterans, many of whom incur injury under exceptional circumstances, often within battlefield environments. As a special population with unique needs, veterans often struggle to connect with [health care professionals](#), processes, and products in ways that result in adequate care.

With a grant from the National Institutes of Health, Virginia Tech faculty are hoping to better recognize and resolve some of those unmet needs by changing the way designers and engineers are trained. In efforts led by faculty in the industrial design program and the Department of Biomedical Engineering and Mechanics, students will soon be able to enroll in a course that combines the unique skillsets of both disciplines to identify health care needs of wounded veterans in clinical settings.

Students will then design a device, application, or system to address that unmet need—and get feedback from veterans and members of their care team along the way.

"We wanted to bring industrial design and biomedical engineering students together for a project that was more than just an academic experience," said Elham Morshedzadeh, an assistant professor in the School of Architecture + Design who will help lead instructional efforts.

"It's important for them to be in that clinical environment and connect with different stakeholders involved in the health care process. Students know how to do the research in theory, but approaching patients in real-life settings and engaging with their communities is a unique

experience."

Students in the course will interact with wounded veterans along with nurses, physicians, therapists, scientists, and engineers at the Salem Veterans Affairs Medical Center (SVAMC) just outside of Roanoke. They'll also shadow members of the military health care team at the Walter Reed National Military Medical Center in Bethesda, Maryland.

"We are excited to again partner with Virginia Tech faculty as we work together to improve the quality of life of our veterans and their caregivers," said Jessica O'Leary, training and education coordinator for the research service at SVAMC. "By working closely with our veterans, faculty, and staff, these students will gain invaluable insights into the importance that the patient voice and experience plays in developing an optimal plan for healing."

Chris Arena, a collegiate assistant professor of biomedical engineering who will also lead instructional rotations, sees the course's unique benefit in the different approaches of both disciplines to needs identification.



Outcomes of the course might include assistive device prototypes, smartphone apps that better connect patients with providers, or virtual reality systems that enable remote therapy. Credit: Virginia Tech

"Biomedical engineers have a different process than industrial designers," said Arena. "For our senior design projects, we typically rely on physicians or other experts in the field to guide us toward important challenges that need to be solved."

But for special populations like wounded veterans who share a distinctive set of experiences, it may be necessary to take a step back for a more holistic approach to needs assessment.

"In [industrial design](#) courses, we don't start with a pre-identified

problem," explained Morshedzadeh. "We want our students to discover invisible or unknown problems that might exist within dynamic systems. How are these people fitting into a larger community, and where are the connections or areas of overlap between multiple needs?"

By combining this user-centric needs assessment with a strategic approach to technical product development, patients and providers—as well as aspiring engineers and designers—ultimately benefit.

"Engineers can bring value in how we turn ideas into medical devices, especially when it comes to industry standards that may be required for regulatory approvals," said Arena. "We also provide technical knowledge about how to implement solutions across multiple areas, like electronics, mechanics, and biology."

Students will examine both battlefield-specific injuries, like the loss of a limb, and also more common ailments, such as kidney failure, said Arena. They'll also consider designs that could be used by anyone on a patient's care team to address a need or issue. Outcomes of the course might include assistive device prototypes, smartphone apps that better connect patients with providers, or virtual reality systems that enable remote therapy.

Faculty experts from a number of specialties will participate as members of the course's instructional team, lecturing on specific topics and connecting students to their professional collaborators in health care. These grant participants include Pamela VandeVord, the project's principal investigator and the N. Waldo Harrison Professor; research professor John Robertson; and professor of practice Andre Muelenaer, all of the Department of Biomedical Engineering and Mechanics. Brad Hendershot, a senior research biomedical engineer at Walter Reed National Military Medical Center and a Virginia Tech—Wake Forest School of Biomedical Engineering alumnus, will also serve as a

collaborator.

Throughout the course, which will begin in the spring of 2020, students will also have opportunities to volunteer in clinics and spend more time with the patients they're working with.

"This is one way we can give back to that community," said Morshedzadeh. "That's important, because these veterans are doing a lot to provide this learning opportunity for our students and our team."

Provided by Virginia Tech

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