Students develop dental chair for rural Mexico

By Holly Ober
SPECIAL TO THE ENTERPRISE

While many students spend spring break on Mexico’s beaches, students in UC Davis professor Angie Louie’s biomedical engineering senior design class spent it preparing for a trip to Mexico in the middle of spring quarter.

Instead of lolling about in the sun, however, Chris Horner, Ryan Seither, Ayla Sessions and Aaron Zajicek planned to join their Mexican counterparts to create a low-cost, portable chair that dentists could use to treat patients in impoverished rural areas.

Biomedical engineering majors take Louie’s BIM 110: Capstone Biomedical Engineering Design as the final project class required to graduate.

Students learn to apply bioengineering theory and experimental analysis to design a unique solution to a problem. Students can gear the design toward current applications in applied biomechanics, biotechnology, etc.

UC Davis student Aaron Zajicek demonstrates a dental chair’s usage to Dr. Jorge Martinez during meetings with potential clients and investors. UCD students partnered on the project with Dr. Ana Cecilia Treviño, director of the dental program of Tecnológico de Monterrey Medical School in Monterrey, Mexico.

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or medical technology. The class has resulted in some innovative potential for widespread use, such as a device to position and hold a dog's head during veterinary procedures.

Dr. Gabriela Ruiz, director of the biomedical engineering department and professor of the Capstone Design class at Tecnologico de Monterrey (ITESM) in Monterrey, Mexico, heard Louise give a talk about her class at a conference and approached her about doing a joint project with her own design students.

They discussed a few possibilities, then decided to offer just one, as a pilot for this year to see how the long-distance collaboration would work.

The two professors developed a project in cooperation with Dr. Ana Cecilia Treviño, who is in charge of the dental program of the ITESM Medical School.

Training for the dental students enrolled in Treviño's program includes traveling to both rural and urban communities and setting up clinics to provide free dental care to the community.

As a nonprofit charity that travels to rural communities in Mexico, Treviño could not afford the chairs currently on the market, which cost upwards of $3,000. Furthermore, she needed a truly portable product — something capable of reaching communities inaccessible by road.

The project's goal was to design a lightweight ($3 pounds) portable, height and angle adjustable dental chair that would not cost under $1,000. When the UC Davis students presented their project, they quickly understood the effect this chair could have on Treviño's organization.

"We chose the project because we wanted to make a global impact," said Zajcic. "I remember looking down the list of potential projects and knowing that was the one I wanted to do, and I think the same goes for my teammates," Zajcic said.

The students designed a chair that uses parts from just two manufacturers and assembly with a single Allen wrench, like IKEA medical furniture. Homers explains that unlike other models, users carry the chair like a backpack, which evenly distributes the load across the user's back and leaves their hands free.

"Although most of us were running on little to no sleep and we had been slaving away for days trying to fix issues with our first prototype, we were all super excited to be traveling internationally for our senior design project," Zajcic said.

UC Davis students and Dr. Gabriela Ruiz's students from Monterrey, Mexico: Aaron Zajcic, Leslie Contreras, Ryan Seither, Chris Hornet, Blanca Flores and Ayla Sessions pose for a group photo in Mexico after going hungry jumping. The cutting was a brief break during a trip to promote a portable dental chair they designed in partnership with a college in Mexico.

Ayla Sessions biomedical engineering senior design class student

Contreras. Thanks to frequent Skype meetings between the UC Davis and Mexican teams, the Davis team received a warm welcome. "It was nice to be treated as old friends instead of foreign new acquaintances," Zajcic said.

The teams got to work, but soon ran into obstacles. They had to make adjustments to improve the chair's stability.

"The first day was rough. Nothing seemed to go as planned and we had to make a lot of changes to our design — sacrificing weight and portability to make a functioning chair. Luckily Blanca and Leslie were able to help us out tremendously," Zajcic said.

"Over Thursday and Friday we replaced some cables with rigid crossbars. That stabilized our chair and made it much more reliable," Seither said.

To boost their flagging spirits, Flores and Contreras took the Davis team to the best taco place in Monterrey.

By Monday, the chair was ready to present not only to the team's client, Treviño, but also to the head of the ITESM biomedical engineering department. Meetings with additional dentists and potential investors followed. The team received positive feedback and some suggestions for refinement of future designs. The team also met with a federal official representing the Secretary of Health. The national coordinator of Mexico's "Caravanas of Health" program had flown from Mexico City to meet the teams and assess the value of the chair.

Thousands of rural zones in Mexico do not have access to medical and dental resources. Mobile healthcare units, called health caravans, travel to these zones to provide free treatment. The minister expressed interest in using the chair for all health caravan dental and medical visits that do not have access by road.

"It felt great to hear that our project might have a much more profound impact than we had anticipated," Seither said.

The trip was not all work, however. The students found time to visit an ecological park in the mountains near Monterrey, attend a party for the graduating ITESM biomedical engineering class and a barbecue with Ruiz and their Mexican hosts, see caves with stalactites and stalagmites, go bungee jumping and enjoy lots of the local cuisine.

On Tuesday, April 27, the UC Davis student team returned home.

"Saying farewell to all of our new friends was harder than I had ever imagined, and I didn't want to leave their culture, their city, or their food," Seither said. "This trip taught me more than just about the engineering design process; it taught me about a whole new culture. Everybody in Mexico was gracious and welcoming.

"It was a great experience and a learning experience," Zajcic agrees, saying, "the project was more than just our senior design. It was about cultural differences and international collaboration as well as global philanthropic efforts."