

# enterprise

Finally, summer fruit is plentiful, Page



## 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



BLANCA FLORES/COURTESY PHOTO

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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# CHAIR: Portability was crucial to reach rural areas

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or medical technology. The class has resulted in some innovative products with 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 Tecnológico de Monterrey (ITESM) in Monterrey, Mexico, heard Louie 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 directs 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 \$2,000. Furthermore, she needed a truly portable product—something capable of reaching communities inaccessible by road.

The project's goal was to design a lightweight (under 33 pounds), portable, height and angle adjustable dental chair that, most importantly, cost under \$1,000. When the UCD students saw this 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. 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," Zajicek said.

The students designed a chair that uses parts from just two manufacturers and assembles with a single Allen wrench, like IKEA furniture. Horner 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. The

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**Ayla Sessions**  
biomedical engineering senior design class student

chair is easy to assemble and easy to repair.

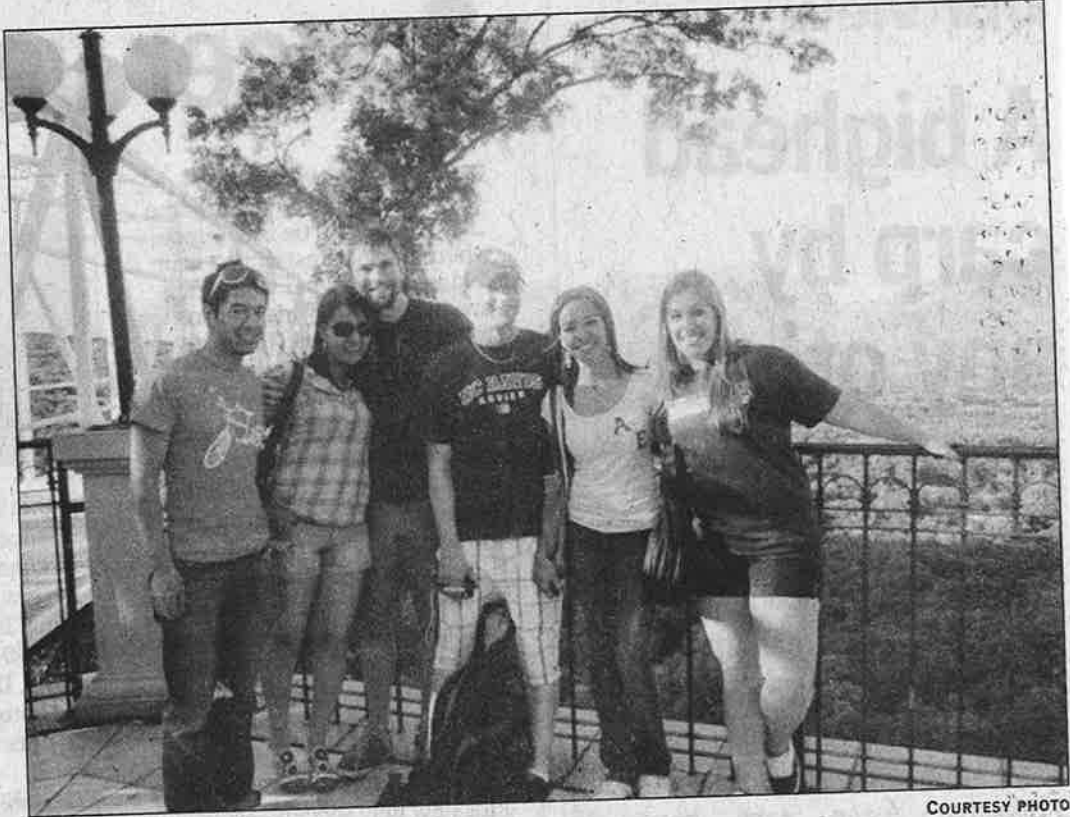
Designing the chair was one thing, but raising money for four students to travel to Mexico was another matter entirely.

"Going into the project we knew it was going to be difficult. Our university budget was only \$400, which would barely cover one plane ticket to Mexico. So we started fundraising very early, holding bake sales and pizza fundraisers with local businesses. By the end of the first quarter, we had already raised more than enough to cover the cost of all four plane tickets as well as the cost of the chair," said Louie, who calls the students' fundraising efforts "heroic."

"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," Sessions said.

Seither added, "An electric feeling pervaded the whole trip to Mexico. We all were excited with the mix of new experiences, new culture, and a sense of accomplishing some good." They left for Monterrey on Thursday, April 22.

At ITSEM, the students met up with Ruiz and her students, Blanca Flores and Lesslie



COURTESY PHOTO

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

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

The teams got right 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 Lesslie were able to help us out tremendously," Zajicek said.

"Over Thursday and Friday we replaced some cables with rigid crossbars. That stabilized our chair and made sitting in it more relaxing," 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 "Caravans of Health" program had flown in from Mexico City to meet the team 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 ITSEM biomedical engineering class and a barbecue with Ruiz and their Mexican hosts, see caves with stalagmites and stalactites, go bungee jumping and enjoy lots of the local cuisine.

On Tuesday, April 27, the UCD 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," Sessions said. "This trip taught me more than just about the engineering design process; it taught me about a whole new culture. Everyone in Mexico was gracious and welcoming."

Zajicek 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."