

# A Crib for CORA

OU senior design teams test their engineering skills with projects that combine technology with compassion.

BY JILL COOMBS HURT

The work of four OU engineering students and their professor has enabled a physically challenged mother to care for her baby independently.

Norman resident Maria Jones suffers from a metabolic disorder that has damaged the motor function portion of her brain. She is confined to a wheelchair, which she maneuvers with only one arm.

When Jones discovered she was pregnant, she contacted her service coordinator, Kim Hayes, for assistance in obtaining equipment to care for the newborn. On a tip from a national organization devoted to assisting disabled parents, Hayes contacted the School of Aerospace and Mechanical Engineering at the University of Oklahoma. She was directed to mechanical engineering professor Kuang-Hua Chang, who agreed to tackle a project to develop equipment for Jones in a senior design class the following semester.

“When I told him that Maria’s baby was due in January,” Hayes recalls, “Dr. Chang offered to organize a team to work on the project immediately.”

Chang quickly sought out four outstanding mechanical engineering students to take on the project at mid-semester. Jon Powers, Shiloe Bear, Chris Sanders and Lantz Newell first met with Chang in late October. The students were eager to get started.

“What attracted me to this project was the ability to help someone,” says Powers.

“This was such a meaningful project,” Newell agrees.

The four students and Chang met several times with Jones to discuss specific equipment needs. With her consent, the team decided to design and fabricate a baby crib with a movable tray and a pair of wheelchair armrests. The purpose of the equipment was to help Jones carry the baby safely on her wheelchair and to care for the baby in its crib both from her wheelchair and from her own bed.

With the concept in mind, the team went to work using computer-aided design (CAD) software. The team ran several tests in a virtual environment. “I think that was my favorite part, designing the crib and then testing it,” says Powers.

After a number of brainstorming sessions, the team developed a design that featured a pair of sliding doors on one side of the crib and a swing door at the front. Where the swing door was attached, the team added a movable tray that could be docked and undocked to the crib and wheelchair. They also developed adaptable arm-

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rests that attach the tray to Jones’ wheelchair. With the crib placed next to her bed, the sliding doors allowed Jones to care for her baby at night without leaving the bed.

With design in hand, Chang and the team visited Jones on December 14 at Baptist Hospital in Oklahoma City, where she had been admitted with early labor pains. She was pleased with the design, and the team moved ahead with construction plans.

Two days later, Jones gave birth to a 5-pound 2-ounce girl. She named the five-week premature baby Cora Michaela. Mother and daughter stayed in the hospital for a week after delivery. The OU engineers’ timeline had been shortened severely.

After the students completed their final exams, the team began fabricating the crib, tray and armrests. Newell and Sanders took the lead in building the equipment with help from Billy Mays and Greg Williams, technicians in the Aerospace and Mechanical Engineering Machine Shop.

“Billy and Greg provided lots of assistance,” Chang says. “In fact, Billy even took the woodwork home over the holiday break to stain and seal with polyurethane.”

“Lantz was the one pushing us to get this project done,” insists Sanders. Bear and Powers laughingly agreed.

“Yeah, I worked on building the crib every day for a week and a half,” admits Newell. “We all designed the project. Chris and I helped finish it, and Shiloe and Jon wrote and presented the report the next semester.”

Sheng-Mei Chang, Professor Chang’s wife, designed and sewed a Velcro harness that holds the baby safely on the tray and a protective sheet that covers the baby when strapped on the tray. Debbie Nelson, Newell’s mother, made the pad that sits on the tray. Jones chose yellow fabric to coordinate with the Winnie-the-Pooh theme of Cora’s nursery.

Two weeks after Cora was born, the equipment was ready. Newell, Sanders and Chang delivered the crib, tray and armrests to Jones’ apartment. After they installed the armrest on the wheelchair and instructed her on how to “dock” and “undock” the tray properly, Jones was able to move her baby around the apartment.

“The crib is great,” says Jones. “Without it, I would not be able to care for my baby. The students were wonderful. We really enjoyed meeting them and working together. I am ever so grateful. They didn’t have to do this [work through the holiday break] but they did.”

“I really enjoyed working with people from other occupations to design the best crib for Maria,” Bear says. “We worked with a housing coordinator, occupational therapist, nurse and caseworker. It was really a team effort.” *continued*

"I agree with Shiloe," Sanders offers. "Working with other professionals and working with the person who is actually going to use the equipment was a great aspect of the project."

Chang found the experience very rewarding. "Maria inspired me. She has the courage and desire to raise her own child against many odds. Our goal was to help Maria make her dream come true. The Bible tells us to love thy neighbor. We were just following God's word."

The crib project was not the first opportunity that Professor Chang has had to introduce his students to the compassionate application of technology. In fall 1998, Gloria Witt contacted the College of Engineering. Her four-year-old grandson, Jacob Pyle, suffers from spinal muscular atrophy (SMA), a disease that caused his legs to be so weak that he could not walk. Witt asked if an assistive walking device could be designed and fabricated for Jacob's special needs.

Chang organized a senior design course in spring 1999 with Jacob's walking device as the core project. Lynn



ABOVE: With help from Aerospace and Mechanical Engineering Machine Shop technicians Billy Mays and Greg Williams, OU senior engineers Chris Sanders, left, and Lantz Newell took the lead in the actual construction of a crib specially designed to assist a disabled mother in caring for her newborn daughter. BELOW: Baby Cora's premature birth shortened the time the design team had allowed for completion of her crib. The design finished, Newell was in the school's workshop every day for a week and a half fabricating the equipment.





Ketcher, Stephanie Lee, Ron Morris and Ganesh Balakrishnan worked closely that semester with Chang, Jacob, his parents and grandmother. The students also talked to Jacob's physician and therapist to learn more about SMA and Jacob's physical condition.


After generating several different designs, the students chose one to build in the school's workshop. In April Chang and the students delivered the device to Jacob's home.

With his parents' encouragement and help, Jacob sat upright on the device with his feet touching the floor. By moving his legs, he was able to "walk." Although, Jacob could barely move the device, it was the first time that he had been able to propel himself. Smiling and shouting, "I am walking! I am walking!" Jacob was on his way.

This past spring, another team was formed from the senior design class to revisit the design of Jacob's walking device. The students—Craig Whaley, Eric Reagan, Will Willis, Shaun Smith and Matt Rodgers—focused the first half of the semester on redesigning the device fabricated a year earlier.

The redesign primarily focused on improving the sitting comfort level and incorporating a balancing device to optimize Jacob's upper body strength. Because improvements included some suggestions from Jacob and his family, the apparatus had to be tested before a final decision was made on a new design.

In March Chang and his students took the redesign to Jacob's house and allowed him to test the new device for the first time. Jacob and his family were ecstatic. Although the device still required some small adjustments, the look on Jacob's face was proof enough that the project was a success. For the second half of the semester, the team modified the model one more time to allow Jacob to have a walking device while the new equipment is being manufactured.

Engineering Dean W. Arthur "Skip" Porter sums up the collective sentiments of those involved in these life-altering projects. "This is the kind of thing that demonstrates the value of technology and the caring nature of our students. Working together, they are meeting the needs of mankind." 



TOP: OU senior engineering students Chris Sanders and Lantz Newell, at left, and Professor Kuang-Hua Chang, far right, deliver the specially designed crib to Maria Jones and daughter Cora. Second from right is Kim Hayes, the social services coordinator who brought Maria's problem to the OU team.

BOTTOM: The ecstatic look on Jacob Pyle's face was reward enough for the OU engineers who designed the walking device that enabled the 4-year-old, who suffers from spinal muscular atrophy, to stand upright and propel himself.