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Mechanical Engineering Student Teams Design Racing Wheelchairs

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Tammy Smith had a problem.

Smith, a Baxter resident, is an avid runner, competing in half-marathons and other events several times a year. Tammy's 15-year-old son, Austin, also likes to participate; however, Austin has cerebral palsy.

Smith had looked into specialized wheelchairs from mobility equipment suppliers, but the price tags were prohibitively high. That's where Tennessee Tech's mechanical engineering department came in.

"I'm a dental hygienist," said Smith, "and through a friend of a friend I was able to find out about TTU's Capstone program where teams of engineering students can take on projects like this. I was able to connect with [mechanical engineering professor] Dr. Sundaram and his students and explain to them what I was looking for, and before long things were starting to come together."

Smith had some specific requirements for a wheelchair for Austin. It had to be affordable, easy to disassemble, and light enough to be easy to handle and roll. Other factors had to be worked out, such as weight distribution, materials, aesthetics and overall comfort for rider and runner.

"After the design started to take form, we had some different questions, and I stayed in direct contact with Tammy via email and text," said Philip Martin, team member from Johnson City. "She was great to work with. Eventually we needed to finalize our dimensions for the drawings, and in order to do that we needed precise dimensions from Austin. Tammy and I set up a time for her and Austin to meet with our group...[so we could] get all the measurements we needed so we could make this racing wheelchair perfect for him."

In the end, TTU's teams built two very different wheelchairs; one for pavement and one for trails and rougher terrain. The pavement model is lightweight and streamlined, with a fixed front wheel that can easily be "popped" off the ground for turning, while the rough-terrain model is more robust, with a caster-style front wheel that can swivel freely for turns. Both have handbrakes for each individual wheel, for a skid-steer effect.

The end result was something that exceeded expectations for everyone involved.

"The fabrication process turned out to be pretty time consuming. The welding of the frame took up most of the time due to its complexity and the precise angles the tubing needed to be welded," said Martin. "However, the final outcome was almost a spitting image of our drawing design, and for engineering projects that rarely happens. So we were extremely pleased with the way it turned out."

Smith and Austin will be taking the wheelchair on the road again in September, at the Run for Don in Gainesboro.

"Both Austin and Tammy seemed very pleased with it and at the end of the day we gave a mother and son something that could do together that they could not previously and that's all that matters," said Patrick Cox, team member from Mt. Carmel, Tenn. "[In the end] we wanted to show people that engineering isn't just about big business but, it's also about helping people and improving someone's quality of life."



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