Women Engineers Take on BattleBots

by Marie Moran

Marie Moran is a Mechanical Engineering graduate from the University of Tulsa and a founding member of the first collegiate all-women BattleBots team. BattleBots IQ asked Marie why she and her friends decided to build a BattleBot.

Rise to the Challenge

In the Spring Semester of 2001, Doug Jussaume, an Electrical Engineering professor at the University of Tulsa , challenged his female students to ".. create an all-women's BattleBots team". In the 18 months following the first team meeting, the TU Women's Robotics Team has built four fighting robots, competed twice in BattleBots tournaments, convinced several high school students to think about studying engineering, and transformed a room full of smart college girls into a formidable and effective engineering group.

Why Battlebots ?

BattleBots is a TV show built around the sport of robotic combat. Competitors build remote controlled robots ranging from 60lbs to 330lbs and bring them to San Francisco to fight in a bi-annual, ten-day-long tournament. Picture a glassed-in arena, a real boxing announcer in a tuxedo, flashy lighting, and some thunderous music and you have the phenomenon that has captured a national audience.
BattleBots attracts a variety of competitors, and anyone from rocket scientists to garage hobbyists can compete. Our professor saw this as a challenging design project with a unique opportunity for an exciting, metal crushing final design review.

Doug Jussaume first mentioned the idea of the BattleBots competition to two of his students who were building small robots for an independent study class. Since the first two team members were both girls, he suggested they start the first collegiate all-female team.

Starting an All-Female Design Team

The students who volunteered for the project knew that in order to compete successfully in the BattleBots competition, we would need, money, a committed group of women, and a well-organized plan of attack.

Traditional research projects rarely receive the attention they deserve. Student research projects are appreciated by the students and professors directly involved and they are funded on handouts. Significant student achievement in engineering and technology deserved more visibility. We decided to viciously pursue funding and turn our robotics team into a visible presence on campus. We established TU Women's Robotics as an official student organization with bank accounts, officers, and a faculty sponsor, Doug Jussuame. Finding enough (Women) participants for the work at hand was more difficult than we had anticipated. We recruited every girl we could find from every engineering and science discipline (we even recruited an accounting major) and set up weekly meetings.

Soon after TU Women's Robotics began holding meetings, some male students began asking if they could join the team. The group talked it over and decided to keep it an exclusively female (with the exception of our professor). We didn't want to be the affirmative action robot team, but we did want to take this chance to see what it would be like to work exclusively with women engineers. This was a perfect opportunity for female students who had studied theories but had little hands-on experience to build a working vocabulary of machining terms, become familiar with industrial supplies, and learn how to turn concepts into reality.

Perhaps the most important reason we decided to keep the team full of women was to teach everyone how to take on responsibilities and develop leadership skills. While most of the team members knew how to assert their ideas, some let themselves be drowned out. It's an old pattern among women and we decided this was a good time to break it.

Young girls in grade school and women in college share stories of being pushed to the back in a group project while more assertive people (usually boys) push to the front. But when you ask them what they did about the situation, too many perfectly intelligent girls will say they just sat there and took it. Even in college, it is not uncommon for a woman in a team to be volunteered for, and accept the writing, editing, and secretarial duties in an engineering project. One of the greatest things all of the members have learned in TU Women's Robotics is how to speak up, own your ideas, and put them out for public praise or criticism or whatever may come.

Robot Boot Camp

To spark some design ideas and get everyone familiarized with what our robots would be up against, we researched hours of BattleBots taped shows. Afterwards, we compiled our notes on what types of robots typically win or lose and why. The design process was slow, in part because the team was made up people with different levels of experience, different majors, and different ideas about what would work.

Our professor , Doug Jussaume, chose a smart way of leading us. He offered his expertise when asked, but typically stepped back and made us work out all of our disagreements on our own. Jussaume prodded us to make check lists so we could understand the chronology of what we accomplished. He came in early every morning and stayed late into the night so he could meet with us and help focus our efforts. He did not, however, offer to show us the easiest way of doing something or bail us out with design solutions. The result is that he kept the building and designing momentum going for months and we felt a real personal investment in every piece of the robot.

Once we finally agreed on the design, we divided the duties of hunting down components and raising the necessary funds. Support from the university was graciously and generously provided through the efforts of University of Tulsa's President, Bob Lawless, and the Dean for the College of Engineering, Steven Bellovich. These visionary educators saw our student organization as an opportunity to support student achievement in the engineering sciences. TU is among the rare breed of school that is willing to risk a great deal of faith and money on organized and well thought out student initiatives.

Our responsibilities were clear. In return for the faith and support offered us, we had to ensure the educational success of our project and field a robust robot competitor. We had

to work on a tight timeline and deliver a functioning robot that could withstand the other ingeniously destructive BattleBots at the competition. We accepted the challenges.

Getting it Done: Building the Bot

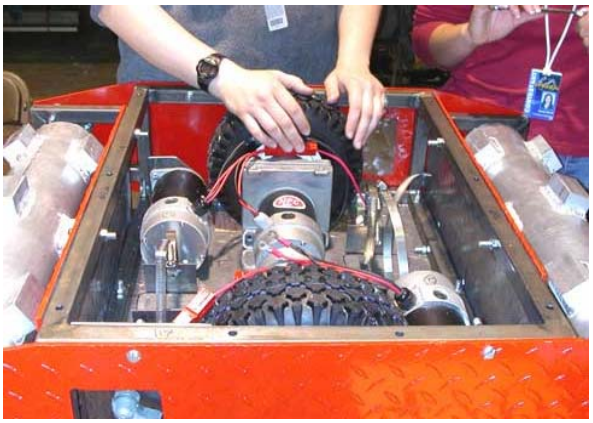
"Talk is cheap, if you have an idea……build it, test it and refine it."

Turning a concept into reality is a priceless experience because you learn early on that theory and practice are two different things. Nothing ever works right the first time, but that only sparks the inventor to try to make it better. We found that as soon as one person learned even a small building skill, the ability to create inspired them to start racing up the learning curve. For most of the women on the team, the machine shop started out as foreign territory but it quickly became home. Team members from every discipline spent all of their time between classes learning the right way to drill, cut, tap, mill, and assemble.

Terry Hutson and Dave Jones, TU machinists, also spent a lot of time answering dozens of our questions and worked with the shifts of girls that came through at all hours of the day. Near the end, they put aside other projects to help us pull everything together when our timeline was running short. But even though we had help, we did all of the machining and circuitry for the four robots ourselves. Finally, after months of hard work and numerous redesigns we reached the point where it was time to crate everything up and head to San Francisco.

We Left Our Parts in San Francisco

Figuring out the logistics of getting a dozen students, two professors, and several hundred pounds of robots to San Francisco twice in one school year was tough, and the actual competition was even tougher. At our first tournament in November of 2001, a veteran robot builder defeated us in the first round. Our disappointment was cushioned, however, when we heard how many robots never made it past the initial safety and technical inspections and had to be sent home without competing. We spent the rest of the tournament watching hours of robot bouts, taking notes, and asking the other builders a lot of questions. We learned that there are no engineering failures in BattleBots, only opportunities to analyze the results of destructive testing, and make the necessary improvements.



The following May we competed again with three new, redesigned robots. The learning curve within the group was dramatic considering it took seven months to make the first robot and only three months to make three new, superior robots. In the second competition we won two of our bouts and these victories were even more impressive when we found out that several other universities were beaten in their first rounds.

After our victories, we realized we had to fix everything that had been damaged so we could compete again the next day. That night we wheeled our robots and toolboxes through our hotel lobby, up to our rooms and spent the night rebuilding. Our professor Doug Jussaume drove for hours shuttling us to every Radio Shack, bearing supply store, and Home Depot in the Bay area during that trip. But seeing us work like engineers on a mission during those long building sessions made up for it all. We slept only a few hours amongst piles of electrical components and power tools that night, but the next day we competed again and gave it our best.

Each time we went to the BattleBots tournaments we were some of the only women there. Builders from all over the US and England stopped by to ask about our team and look at the robots. We had nothing but positive responses from everyone we met. In fact, all of the competitors we talked to welcomed us to the competition and were excited to see what kinds of robots an all-female team would build.

What Kind of a Girl Becomes an Engineer?

Amazingly, with all of the team members juggling tough course loads, the project was successful both times we loaded up our crates and headed off to San Francisco. The important question is: Why did it all work out? Why, with the huge time commitment required for building four robots in one school year did we still get everything done?

Why did all of these girls who had plenty of other things to do, keep showing up for months on end?

Everyone on our team gave essentially the same answer to that question. They stuck with it because it gave them a chance to learn how to actually build things, it taught them about aspects of engineering outside their own specialty, and interestingly, TU Women's

Robotics gave them a chance to be the kind of girl they wanted to be, but rarely knew.

We realized that we had accomplished something beyond the accepted expectations for the majority of women in this country. We also understood that we had an obligation to share what we had learned. We accepted the opportunity to make a difference in the lives and attitudes of young women. We wanted to share the empowerment of engineering achievement with other girls who might be interested.

We took our original robot on the road to try to show kids how interesting science can be. We realized that the BattleBots competition inspires kids to try to out-think each other. We wanted to foster that kind of thinking and we talked to any group of people that would listen. Our robots were shown at local Brownie Girl Scout conventions, TU open houses, college preparatory high schools, street school, and a school for young mothers. Somehow, when the girls we talked to saw women just a few years older than themselves teach a demonstration and say that they were a scientist or an engineer, the apprehensions they may have had about math and science, evaporated. They were interested and engaged.

Our team learned something about women in general: Girls don't go into fields where they don't know what to expect or when they feel unwelcome. Few girls go into mechanical engineering or electrical engineering because they never got introduced to those fields. Instead, if girls do go into the sciences, they typically go into chemical engineering, biology, and chemistry because they took those classes in high school and they know they can succeed in them. We saw some great opportunities for women, and we wanted to provide the portal for their involvement.

Looking Ahead

In the future, TU Women's Robotics plans to do even more to change things for the girls who come after us. The team's efforts are going to expand to more robotics competitions. With the help of Nola Garcia, BattleBots' educational director and member of the very first all-women's BattleBots team, we're going to start up and mentor several high school teams for the student only competition, BattleBots IQ. We plan on using the introduction to engineering curriculum developed by BBIQ to teach the fundamentals of robotics and design to high school students.

Looking back just a year and a half after our first meeting, Doug Jussaume still marvels that we've changed the way we talk, the way we answer questions, and some of us have even changed our career goals. The future TU Women's Robotics members will have the chance to improve the educational benefits of the program and they will have the expectation of success. The expectation of success is something we want for every young girl in this country. Someday we hope to have the robotics program so large it requires its own building but until then, we'll keep our sights on November and our next chance to test our newest robots at the BattleBots competition.

Marie Moran

Bio-Notes

I was born and raised in Tulsa, OK in a heavily science-oriented family. My father is a PhD physicist who taught for eighteen years at the University of Tulsa. My mother, who studied chemistry in college, worked at home and raised our family. My sister is soon to receive her PhD in Chemistry and my brother recently earned his masters degree in Mechanical Engineering. I recently received my undergraduate degree in Mechanical Engineering.

Growing up in a family of scientists was a lot of fun because everyone asked hundreds of questions every day. It was not until I entered high school that I finally decided I wanted to be an engineer. I was attracted more to engineering than pure science because engineering is a great place for people who like to solve problems that have more than one right answer.

I was interested in things like designing and inventing and I enrolled in the University of Tulsa as a Mechanical Engineering major. I also decided to spend five years in college instead of four, in order to earn an additional degree in Art. It may sound like a strange combination, but most engineers have really interesting hobbies. As much as the world would like to joke about engineers being lifeless, antisocial people who only like math problems, they're not like that at all.

College was amazingly different from high school. I could chose whatever classes I wanted to take and the students really wanted to be there and really wanted to learn. I think one of the most valuable things I learned in college was something I didn't learn from text books; I was worried that everyone in my classes would master everything the first time they saw it and I wouldn't be able to keep up. What I found was that few people get everything right all the time and that hard work will get you farther in life than raw intellect alone.

Now that I'm a degreed ME., I'll soon starting looking for a challenging and fun job. I plan on going to graduate school in a couple of years, maybe even emphasizing in robotics (thanks to BattleBots). Looking back on my own educational career, I think I found my way to engineering because I kept trying different hobbies and I figured out by trial and error what I was really interested in and what I wasn't interested in. I might offer advice to some young woman in high school, it would be to try out things you never thought of trying before and talk to people you've never talked to before in order to gain the insight and experience you'll need to make important life decisions.