

## **The Use of Hands-On Robotics Activities to Share Information about IT and Engineering Careers to 9<sup>th</sup> Graders**

Stacey Bolin

East Central University

sbolin@ecok.edu

### **The Use of Hands-On Robotics Activities to Share Information about IT and Engineering Careers to 9<sup>th</sup> Graders**

In Pontotoc County, Oklahoma, students in the eighth and ninth grades engage in an annual Career Discovery Day. The program began in 2011, after State Senator Susan Paddock and Mike Southard, CEO of the Ada Jobs Foundation, discussed the need for student awareness of available careers, the training required for these occupations, and what the existing programs are to prepare the students. The intent of this paper is to share information about the Career Discovery Day and the use of robotics education to assist students in understanding information technology and engineering careers.

Pontotoc County Career Discovery Day began with eighth graders from each of the county's seven schools. The students completed a career assessment at their respective schools and the results formed a guide used by the planning committee to structure the event to be held in January of 2012, at East Central University (ECU). Each of the over five hundred students attended a general session about communication skills as well as three sessions corresponding to the top three career clusters identified in their career assessment. Local professionals from each occupation delivered a presentation covering typical daily activities and the requirements to enter the profession.

In October of 2012, roughly the same group of attendees, now ninth graders, came to another Career Discovery Day. These students from the seven schools enjoyed an opportunity to spend an entire day engaging in in-depth, hands-on activities associated with their top career field choice. Programs planned ranged from heavy equipment operation for construction and manufacturing students to a mock trial at the courthouse for legal students.

The ninth graders and their school representatives met at the ECU football field on Wednesday morning, October 10, 2012. They broke into career cluster groups, reloaded the busses, and traveled to the designated day sites. The information technology and engineering cluster was taken to the Chickasaw Nation Science, Technology, and Mathematics (STM) Academy where the thirty students engaged in various robotics activities.

The Chickasaw Nation STM Academy staff and students planned a program of hands-on robotics exploration that kept the students interested all day. The thirty students split into eight groups of four and rotated through eight stations. Four stations allowed the students to participate in the operation of working robots. Students guided the robots to complete tasks, play games, and carry each other. Figure 1 shows several students learning about the controls for a tracked robot. Figure 2 shows a student enjoying the ride controlled by a fellow student in the *Lounge-Bot*. Figure 3 shows the operator and two anxious onlookers waiting for the results of

the bowling throw. Figure 4 shows five students ready to take on the robot in a game of basketball. Each of the robots shown in the images utilized different programming, control devices, and structural elements. The differences allowed students to examine and experience different ways to accomplish various tasks using robotics.



Figure 1: Students Learning about the Controls of a Working Robot from a Student from the Chickasaw Nation STM Academy



Figure 2: Riding in the *Lounge-Bot*

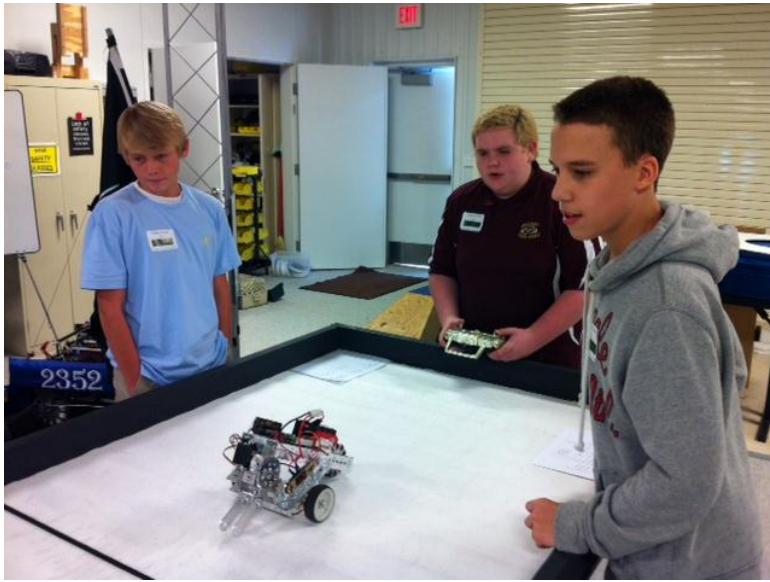


Figure 3: In Control of the Bowling Robot



Figure 4: Ready to Shoot Some Hoops with a Robot

During the other half of the day, the students had the opportunity to design, build, and operate their own robot. Each team of four worked together with a LEGO® Mindstorms® NXT 2.0 kit to build a wheeled robot to navigate an obstacle course. Figure 5 shows students focusing on their creation. Participants experimented with different wheel types, frame and robot design necessary to navigate the course as shown in Figure 6. Students in the robot lab were introduced to basic programming, and immediate results of design choices could be seen in practice runs.

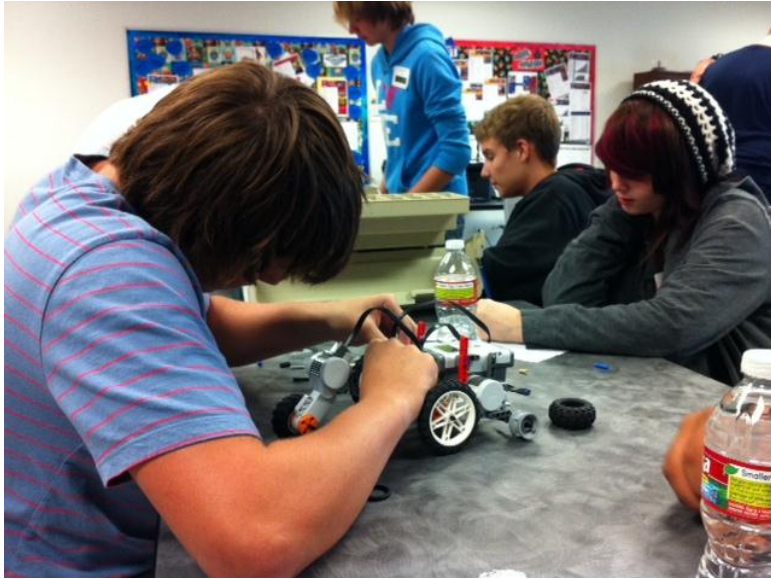


Figure 5: Robot Design Intensity

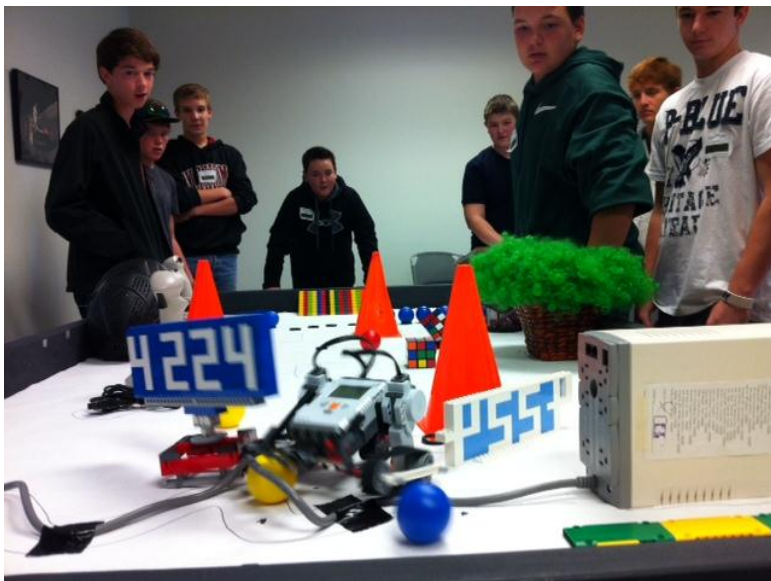


Figure 6: Testing out Their Robot on the Course

The STM Academy students and instructors shared the challenges and the fun of designing, building, programming, and operating the robots with the ninth graders. Figure 7 shows two of the STM instructors visiting with a student about the design of a bowling robot. Design conversations introduced the topic of engineering careers. The career discussions included the different types of engineering, educational requirements to enter the field, and how robotics activities can prepare students for future education and careers in engineering.



Figure 7: A 9<sup>th</sup> Grader Working with Robotics Instructors

In between the robot operation and design experiences, participants enjoyed a career discussion luncheon where vocations related to information technology were highlighted. Students were pleased to learn that many of the *U.S. News & World Report* Top 100 Jobs fall within the range of careers associated with their interest in engineering or information technology [1]. After a time of questions and answers about these occupations, the Chickasaw Nation STM Academy staff shared information about robotics programs available for all students. Students left the event armed with new knowledge about engineering and information technology careers, educational and training requirements for the profession, and opportunities to prepare for a future in one of the many different options among engineering and information technology.

On the bus ride back to ECU, students completed a survey about their experience. Survey results were extremely positive. Figure 8 lists the most commonly occurring responses from participants. The positive responses about the program depict the interest shown in the career field and activities. The replies about food and the lack of girls depict the mostly male participant group. Plans are underway to allow these students, who will be tenth graders in the fall, the opportunity experience another in-depth, hands-on Career Discovery Day. The eighth and ninth grade Career Discovery Days will continue to offer students an introduction to several occupational fields and an in-depth look at their top pick.

This paper was submitted in hopes that others will be inspired to act in a similar manner. While the Pontotoc County Career Discovery Day is still relatively new, feedback from students, parents, and school officials is positive. Time will allow further study of student progression toward career goals and workforce development in the area.

Student Survey Results	
Did you enjoy your experience?      30/30	
Favorite Things: <ol style="list-style-type: none"> <li>1. Robots</li> <li>2. Building Robots &amp; Racing Them</li> <li>3. The Lounge Chair Robot</li> <li>4. The Food</li> <li>5. Talking to the People there</li> </ol>	Least Favorite Things: <ol style="list-style-type: none"> <li>1. Frustration when building the robots</li> <li>2. Not enough food</li> <li>3. Not enough time</li> <li>4. Nothing...I liked it all</li> </ol>
Suggestions for Improvement: <ol style="list-style-type: none"> <li>1. The same...it was pretty amazing</li> <li>2. Get to see how the robots actually work.</li> <li>3. Programming</li> <li>4. Longer</li> <li>5. More lunch</li> <li>6. More girls</li> </ol>	Suggestions for 10 <sup>th</sup> Grade Day: <ol style="list-style-type: none"> <li>1. More hands on.</li> <li>2. Go to another group.</li> <li>3. The same thing.</li> <li>4. More food.</li> </ol>
Other comments: <ol style="list-style-type: none"> <li>1. This was really fun!</li> <li>2. I don't know how I got in this group but it definitely changed my mind, and I look forward to more.</li> </ol>	

Figure 8: A 9<sup>th</sup> Grader Working with Robotics Instructors

## Reference

[1] The 100 best jobs. *U.S. News & World Report*. <http://money.usnews.com/careers/best-jobs/rankings/the-100-best-jobs>, 2013.

*Note: A special thanks to State Senator Susan Paddack, Mike Southard and the Ada Jobs Foundation, Monical Neal, and the rest of the Career Discovery Day committee members for your work to benefit the youth of our county and for inviting me to join the team. I look forward to the many years and many students to come. Thank you to the Chickasaw Nation STM Academy team for your collaboration and hard work on this exciting opportunity for ninth grade students in Pontotoc County.*