U.S. Department of Transportation
Office of the Secretary of Transportation

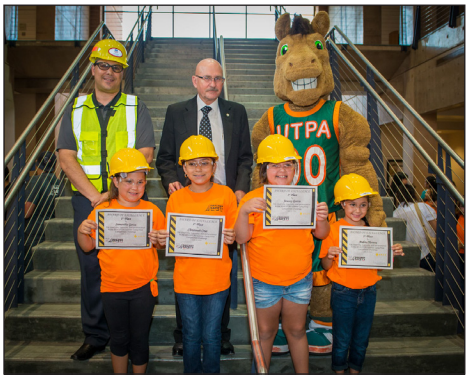
UTC Spotlight

University Transportation Centers Program

This month: The University of Texas-Pan American | December 2014

On the Right Track: UTCRS Raises Awareness of Transportation Engineering and Railway Safety in Rio Grande Valley

Since its October 2013 inception, the University Transportation Center for Railway Safety (UTCRS) at the University of Texas-Pan American (UTPA) and its consortium institutions, Texas A&M University (TAMU), and the University of Nebraska-Lincoln (UNL), have focused on raising awareness of transportation engineering and railway safety. As part of the center's education and community outreach activities, the UTCRS organized in the summer of 2014 the largest STEM camps ever held at UTPA. The camps introduce traditionally underrepresented elementary, middle school, and high school students to careers in science, technology, engineering, and math (STEM) with an emphasis on transportation engineering.

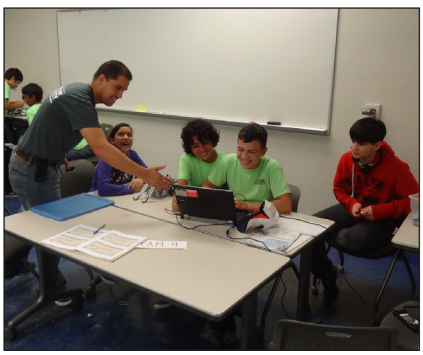


UTCRS

Pictured from left: UTCRS Director, Dr. Constantine Tarawneh, University President, Dr. Robert Nelsen , and school mascot "Bucky the Bronc" stand alongside the elementary winners of the 2014 UTCRS Summer Camp MagLev competition.

The camps served 300 elementary, 300 middle school, and 100 high school students from over 130 schools representing 26 school districts in the Rio Grande Valley. The 700 camp participants attended one of five camps that were run on the UTPA campus from June 16 through July 21. A major goal of the UTC for Railway Safety is to encourage students from groups traditionally underrepresented in transportation to consider careers in transportation-related fields. The summer camps supported this goal in that of the 700 camp participants over 80 percent were Hispanic and over 35 percent were female. The camps were run by faculty and students from the College of Engineering and Computer Science and the College of Education in collaboration with five STEM teachers who participated as part of the Research Experience for Teachers (RET) program aimed at providing K-12 STEM teachers with professional development in the fields of transportation engineering and railway safety. The ultimate goal of the RET program is to provide teachers with educational tools and modules designed to introduce STEM concepts using transportation engineering applications. The RET participants shared their experience with 60 other STEM teachers through two educational workshops. These teachers then serve as ambassadors by bringing the knowledge they gained to their classrooms in the form of hands-on class activities.

Elementary students took part in hands-on and inquiry-based activities to learn about science and engineering concepts as they related to transportation safety. Specifically, they engaged in activities to investigate Newton's laws of force and motion. For example, students experimented with magnets and built their own compasses using simple materials to understand magnetic forces. They also created their own electromagnets using wire, a nail, and a battery and learned that as electrical current flows through the coiled wire, a magnetic field is produced and the nail is magnetized. Applying what they learned, students then designed and built a Magnetic Levitation train system so they could explore what happens during a collision between a MagLev train and a car on the track. They also created an active train control mechanism to prevent collisions.

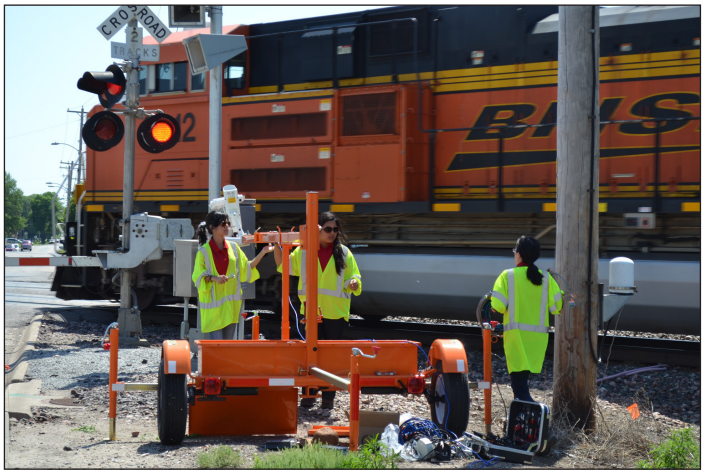


UTCRS

Middle School participants interact with RET Andres Benitez in a discussion about the Fork-lift robotic programing.

Middle school students learned about transportation engineering and railway safety through a hands-on, project-based curriculum that explored concepts

in railway safety in the context of robotics. Students used LEGO® NXT 2.0 robotics kits to build and program a variety of vehicular robots, including a bumper car and a forklift. Students used color, touch, and ultrasonic sensors and programmed their robots to obey traffic lights and railway safety signs and signals. Students also explored Newton's laws of force and motion, and examined the relationship between mass, distance, force, energy, work, and power.



UTCRS

Pictured from left: REU students Gabriela Perales and Cassandra Sias work with Nebraska Transportation Center Ph.D. student, Li Zhao, at a highway rail grade crossing setting up traffic data collection sensors.

For the high school camps, the UTCRS teamed up with TexPrep and an NSF-STEP (Texas Prefreshman Engineering Program and National Science Foundation) grant to broaden the educational impact and benefit. High school students took part in a number of challenging competitions including designing and programming an efficient vehicular robot utilizing the least number of steps, and designing and building a remotely operated vehicle (ROV) capable of navigating an obstacle course. The students were also exposed to STEM concepts using transportation engineering applications and were introduced to ongoing UTCRS research projects performed by graduate and undergraduate students.

Based on data collected through parent surveys, the response to the camps was overwhelmingly positive. Of the parents surveyed, 100% felt the camp was beneficial for their child and that their child enjoyed the camp. All of theses parents indicated that there is a need for more camps like the UTCRS camps in the Rio Grande Valley. In terms of the camps' impact on the academic interests of the students who participated, over 94% of the parents surveyed indicated that their child had developed a greater interest in engineering (97.25%), mathematics (94.50%), and science (98.16%). With regard to the camps' effect on career choices, 87.15% of parents stated that their child was interested in pursuing a career in engineering as a result of the camp. Finally, 97.25% of parents indicated that their child was interested in attending future UTCRS camps.

> "The UTCRS Summer Camp was an excellent, all inclusive, hands-on experience to help put our children on *track* for a bright future."
>
> -Cynthia LiVigni, parent to Rebecca, Jacob & Thomas LiVigni (UTCRS camp participants)

Another very important UTCRS educational initiative featured a summer Research Experience for Undergraduates (REU) program in which a group of eight undergraduates were selected to join the two consortium institutions to work alongside faculty and students on transportation engineering and railway safety related research projects as part of building a bridge to graduate studies. As a result, five of the eight REU participants have already applied for graduate school at the partner institutions and one has already been admitted to the Civil Engineering graduate program at UNL with a research assistantship, signifying a successful beginning to this endeavor.

> "The REU opportunity has influenced my future academic and career path in transportation engineering. I'm incredibly grateful for this great opportunity with the UTCRS."
>
> -Cassandra Sias, UNL REU participant

About This Project

For more information about the activities described here, contact Constantine Tarawneh, Director of the University Transportation Center for Railway Safety (UTCRS) at railwaysafety@utpa.edu or call (956) 665-8878. The following colleagues contributed to this newsletter: Carmen Pena, Educational Coordinator; Wendy Fowler, Diversity Coordinator; Angela Chapman, Curriculum and Instruction Faculty; Robert Freeman, Associate Director; and Bryan Cancel, Undergraduate Research Assistant and Graphic Designer.

This newsletter highlights some recent accomplishments and products from one University Transportation Center (UTC). The views presented are those of the authors and not necessarily the views of the Office of the Assistant Secretary for Research and Technology or the U.S. Department of Transportation, which administers the UTC program.

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