

UTCRS SPRING 2018 NEWSLETTER



UTRGVTM

SUMMER PROGRAMS
EDITION

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A Message From The UTCRS Director:

Constantine Tarawneh, Louis A. Beecherl, Jr. Endowed Professor



When the UTCRS was established in Fall 2013, the mission of the center was to develop knowledge, diverse human resources, and innovative technology in support of strategic safety plans for the U.S. rail transportation industry. In fulfilling the UTCRS mission, one of the underlying goals was to reverse some alarming trends that persisted in STEM career fields. Hispanics represent 17% of the U.S. population and 2 of every 3 Hispanics in the U.S. are of Mexican descent. About 10 million Hispanics live in Texas alone. Yet in 2010, the percentage of Hispanics working in a STEM field is 6.5% with the number of Hispanic women in these fields even lower. With that in mind, the various research, education, workforce development, technology transfer, and community engagement activities aimed at attracting and recruiting underrepresented groups to pursue careers in STEM fields, with emphasis on transportation engineering and the railroad industry.

We are very proud to report that our efforts have been successful on several fronts as highlighted by this newsletter. Our REU Program engaged 35 students over a three-year period, all of whom were Hispanics and 57% were female. As a result of participation in the REU Program, 26 of the 35 students decided to pursue their graduate degrees at one of the three consortium institutions. The 75% admission to graduate programs as a result of participation in an REU program is well above the national average for these programs. More importantly, some of these students have already graduated with their Master's degrees and accepted jobs in transportation engineering fields. Most recently, Ms. Melissa Martinez accepted a position with BNSF Railway in Denver, CO; Ms. Gabriela Perales accepted a job with Siemens Industries, Inc. within their Mobility Division, Intelligent Traffic Systems; Ms. Cassandra Sias accepted a job with HDR Engineering, Inc. in Austin, TX; and two other female engineers joined the ranks of TxDOT. None of these young ladies envisioned pursuing their MS degrees or working in the transportation engineering field when they started their studies at UTRGV a few years ago. These examples along with the more than 4000 K-12 students, 43% of whom are female, engaged in STEM activities related to transportation engineering during the summer camps serve as prime examples of the wonderful work that the UTCRS is doing to reverse the alarming trends of Hispanics in STEM career fields.

DISSERTATIONS – THESES – JOURNAL PUBLICATIONS

- Allard, A. J., "Vehicle Bourne Autonomous Railroad Bridge Impairment Detection Systems," Doctoral Dissertation, Zachry Department of Civil Engineering, Texas A&M University, May 2017.
- Perales, G., "An Empirical Analysis on Longitudinal and Lateral Tire-Pavement Friction," Master's Thesis, Department of Civil Engineering, University of Nebraska-Lincoln, Lincoln, NE, August 2017.
- Renteria, D., "Discrete Element Analysis of SCB Variability – Asphalt Mixtures," Master's Thesis, Department of Mechanical Engineering, The University of Texas Rio Grande Valley, May 2017.
- Kiani, M. and Fry, G., "Fatigue Analysis of Railway Wheel Using a Multiaxial Strain-Based Critical Plane Index," *Fatigue & Fracture of Engineering Materials & Structures*, pp. 1–13, August 2017. [[Link to PDF \(0.9MB\)](#)]
- Chen, Y. and Rilett, L., "A Train Data Collection and Arrival Time Prediction System for Highway-Rail Grade Crossings," *Transportation Research Records, Journal of the Transportation Research Board*, No. 2608, 2017, DOI: 10.3141/2608-05.

CONFERENCE PUBLICATIONS

- Allen, D.H. and Fry, G.T., "A Model for Predicting Lateral Buckling in Rails," *Proceedings of the 11th International Heavy Haul Association Conference*, Cape Town, South Africa, September 2-6, 2017.
- Fry, G., and Tangtragulwong, P., "Analysis of Rail Grinding as a Means to Optimize Rail Head Fatigue Life under Heavy Axle Loads," *Proceedings of the 11th International Heavy Haul Association Conference*, Cape Town, South Africa, September 2-6, 2017.
- Timmer, D., Tarawneh, C. and Jones, R., "Models for the Residual Life of Railroad Bearing Grease in Laboratory and Industry Applications," *Proceedings of the ASME Joint Rail Conference*, Philadelphia, PA, USA, April 4-7, 2017. [[Link to PDF \(3.3MB\)](#)]
- Rodriguez, O., Fuentes, A. A., Tarawneh, C., and Jones, R., "Hysteresis Heating of Railroad Bearing Thermoplastic Elastomer Suspension Element," *Proceedings of the ASME Joint Rail Conference*, Philadelphia, PA, USA, April 4-7, 2017. [Received Best Paper Award] [[Link to PDF \(1.4MB\)](#)]
- De Los Santos, N., Jones, R., Tarawneh, C., Fuentes, A. A., and Villarreal, A., "Development of Prognostic Techniques for Surface Defect Growth in Railroad Bearing Rolling Elements," *Proceedings of the ASME Joint Rail Conference*, Philadelphia, PA, USA, April 4-7, 2017. [[Link to PDF \(688KB\)](#)]
- Mealer, A., Tarawneh, C., and Crown, S. W., "Radiative Heat Transfer Analysis of Railroad Bearings for Wayside Hot-Box Detector Optimization," *Proceedings of the ASME Joint Rail Conference*, Philadelphia, PA, USA, April 4-7, 2017. [[Link to PDF \(1.3MB\)](#)]
- Banerjee, S., Hempel, M., and Sharif, H., "A Survey of Railyard Worker Protection Approaches and System Design Considerations," *Proceedings of the ASME Joint Rail Conference*, Philadelphia, PA, April 4-7, 2017, DOI: 10.1115/JRC2017-2246.

2017 UTCRS STUDENT OF THE YEAR RECIPIENT



HIGHLIGHTING THE SUCCESS OF THE UTCRS REU PROGRAM

In the picture, from right to left, are: James Aranda, Constantine Tarawneh (UTCRS Director), Tiffany Trevino, and Santos Ramos.

The Council of the University Transportation Centers (CUTC) celebrated the accomplishments of the students involved in the various research and educational activities of their corresponding UTCs during the annual winter banquet held on January 6, 2018 in Washington, DC. During the banquet, Students of the Year (SOY) as selected by their respective UTC were honored by receiving a certificate in recognition of their achievements and contribution to transportation research and education. The University of Texas Rio Grande Valley (UTRGV) is proud of the accomplishments and achievements of its students pictured alongside University Transportation Center for Railway Safety (UTCRS) Director, Dr. Constantine Tarawneh. Mr. James Aranda, a graduate student pursuing his master's degree in mechanical engineering at UTRGV, was selected as the UTCRS Student of the Year Award Recipient. Ms. Tiffany Trevino, a graduate student pursuing her master's degree in mechanical engineering at the University of Nebraska-Lincoln (UNL), was selected as the MATC Student of the Year Award Recipient. Mr. Santos Ramos graduated with his bachelor's degree in civil engineering from UTRGV in Fall 2017 and is currently pursuing his master's degree in civil engineering at UNL. Both, Ms. Tiffany Trevino and Mr. Santos Ramos, participated in the Research Experience for Undergraduates (REU) Program organized by the UTCRS in summer of 2015 and 2016. Prior to participation in the UTCRS REU Program, both Tiffany and Santos had no intention of pursuing their master's degrees, but the research experience they received gave them the confidence they needed to pursue their graduate degrees. The success of these students in their academic careers speaks volumes to the research and education opportunities they received at UTRGV through the UTCRS. To date, the UTCRS REU Program has been responsible for placing eleven UTRGV students with majors in mechanical, civil, and computer science in graduate programs at UNL. Moreover, almost 75% of the UTCRS REU participants have joined graduate programs at UTRGV, UNL, and TAMU, which is an impressive statistic and a great achievement when compared to the success rate of other REU Programs nationally.

UTCRS NEWS CENTRAL



UTCRS SUMMER CAMP CLOSING CEREMONY

The University of Texas Rio Grande Valley throughout the month of June held its popular University Transportation Center for Railway Safety summer camps on the Edinburg Campus. The four week-long camps make up the largest railway safety-related camp in the nation, with more than 1,000 third- through 12th-graders in attendance this year. Winners from the four cohorts competed July 6, and were recognized that evening at a special awards ceremony at the UTRGV Performing Arts Complex... [Read More](#)



CHANNEL 4 NEWS VISITS OUR UTCRS STEM CAMP

Students in elementary school, some who just finished the second grade, are getting a jump on their academics by participating in the Railway Camp hosted by UTRGV. The largest STEM camp in the nation is in its fourth year and is held in Edinburg with professors and current UTRGV students teaching youth from 26 Rio Grande Valley school districts. Many of the students have never had the opportunity, before now, to engage in engineering projects... [Read More](#)



1,000 FUTURE ENGINEERS

Alexis Rodriguez, 10, an aspiring engineer and fourth-grader at Rivas Elementary in Donna, has been working on a magnetic levitation kit this summer, along with campmates participating in the largest STEM camp offered at The University of Texas Rio Grande Valley. "I love that I get to learn new stuff and spend time with my friends," Alexis said, as she learned about the forces of magnetism and applied it to her magnetic levitation train kit... [Read More](#)



STUDENT EXCELLENCE PROFILE: CASSANDRA SIAS

Cassandra Sias was a member of the University Transportation Center for Railway Safety (UTCRS) while pursuing her BS degree in Civil Engineering at The University of Texas Rio Grande. In Summer of 2017, she was an intern for the Railroad Division (RRD) at Texas Department of Transportation (TxDOT) - Austin District. Currently, she is working in HDR Engineering, Inc. in Austin Texas as a Utility Design Engineer... [Read More](#)

Student Excellence Profile: Cassandra Lozano Sias



Cassandra Sias was a member of the University Transportation Center for Railway Safety (UTCRS) while pursuing her BS degree in Civil Engineering at The University of Texas Rio Grande. As a freshman student, she was chosen as part of the inaugural cohort of students that participated in the 2014 research experience for undergraduate (REU) program administered by the UTCRS. Her outstanding performance led to her being chosen for the 2015 UTCRS REU cohort which consisted of 12 students.

Cassandra used the knowledge she gained from participating in the REU Program to land an internship in Summer of 2017 working for the Railroad Division (RRD) at Texas Department of Transportation (TxDOT) - Austin District. Her project focused on the state-owned South Orient Railroad (SORR) track rehabilitation project in Upton, Crane, and Crockett counties. Throughout the summer, she learned about the mechanics/components of the railroad tracks and how to inspect and detect defects for restoration – ties, stock rail, pins, etc. In addition, she developed a plan set using MicroStation that consisted of five grade crossing sketches depicting the placement of the Storm Water Pollution Prevention Plan (SW3P) developed by the environmentalist. Quantity tables for each county were also drafted to state the number of ties, ballast loads, and other track parts that are due for replacement. Cassandra stated that working at TxDOT was an incredible experience. She was able to challenge herself by applying her theoretical knowledge of railways into practical field applications.

In Fall of 2017, Cassandra graduated with her BS in Civil Engineering with three job offers in the field of transportation engineering. Currently, she is working in HDR Engineering, Inc. in Austin Texas as a Utility Design Engineer. Her job functions in support of project

engineer/design engineer include working on utility relocation/coordination projects within Texas for several agencies - TxDOT, Counties, Cities, and major railroad companies; identifying and resolving utility conflicts in the most feasible and time sensitive manner; inputting utility information into MicroStation creating utility layouts and plan sheets for design of utility relocation.

Cassandra provided the following quote: “Special thanks to Dr. Tarawneh for his unconditional support and mentorship throughout my undergraduate career.”



SORR Track Rehabilitation Project, Crockett County. Team inspections and plan layout set revision at one of the grade crossings. (Pictured left to right) Jody Wall, Operational Track Specialist, Cassandra Sias, Summer Technician Support, and Steven Brock, P.E. Track Specialist

OUR STEM TEACHERS



Andres Benitez



Beatriz Valenzuela



Erica Hinojosa



Imelda Dumalaog



Lizbeth Morales



Renee Garcia



San Juanita
Maldonado



Stacey Proctor

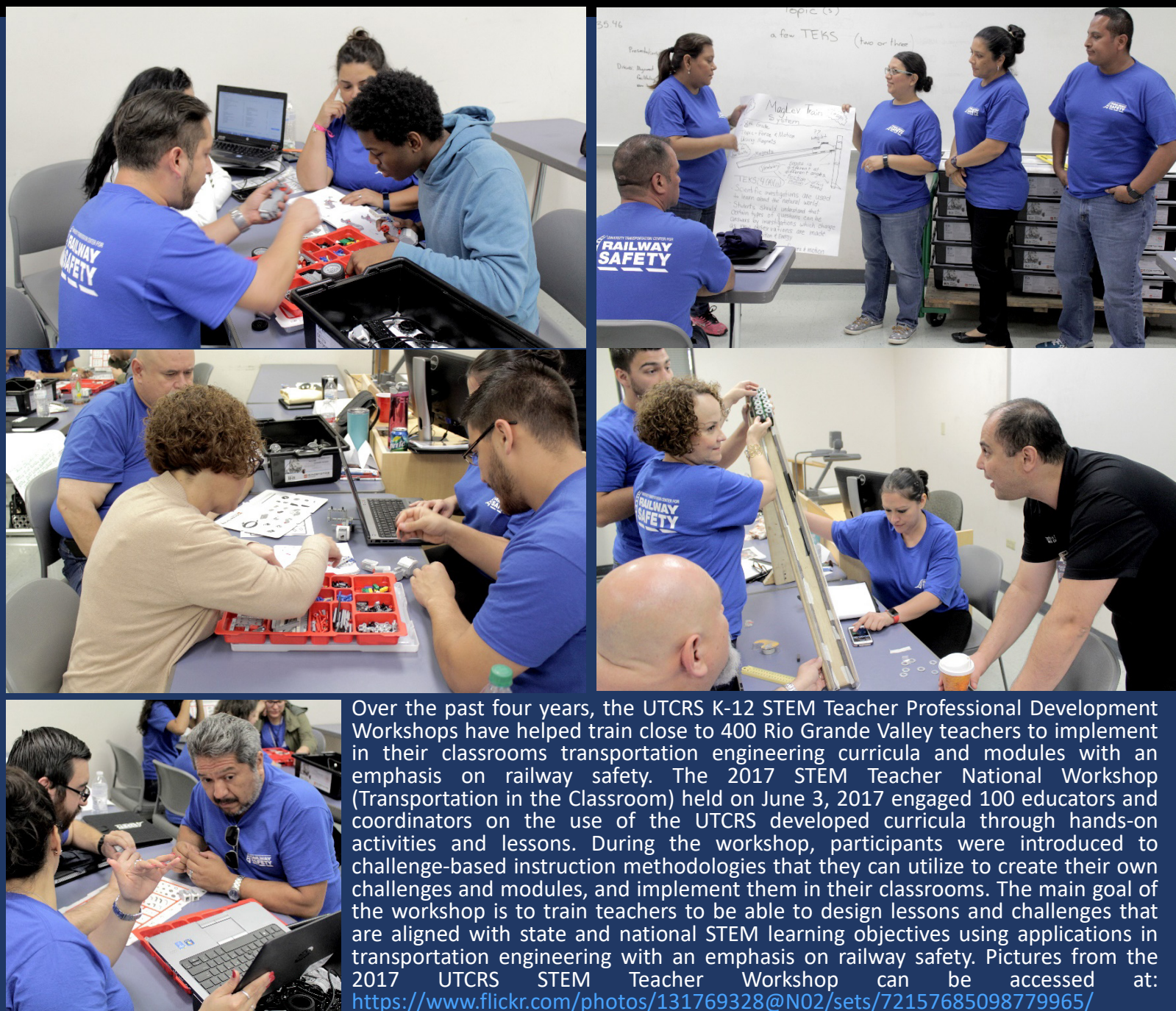


Stephanie Soto



Maria Isabel Reyna

STEM Teacher Workshop



Over the past four years, the UTCRS K-12 STEM Teacher Professional Development Workshops have helped train close to 400 Rio Grande Valley teachers to implement in their classrooms transportation engineering curricula and modules with an emphasis on railway safety. The 2017 STEM Teacher National Workshop (Transportation in the Classroom) held on June 3, 2017 engaged 100 educators and coordinators on the use of the UTCRS developed curricula through hands-on activities and lessons. During the workshop, participants were introduced to challenge-based instruction methodologies that they can utilize to create their own challenges and modules, and implement them in their classrooms. The main goal of the workshop is to train teachers to be able to design lessons and challenges that are aligned with state and national STEM learning objectives using applications in transportation engineering with an emphasis on railway safety. Pictures from the 2017 UTCRS STEM Teacher Workshop can be accessed at: <https://www.flickr.com/photos/131769328@N02/sets/72157685098779965/>

Elementary Camps

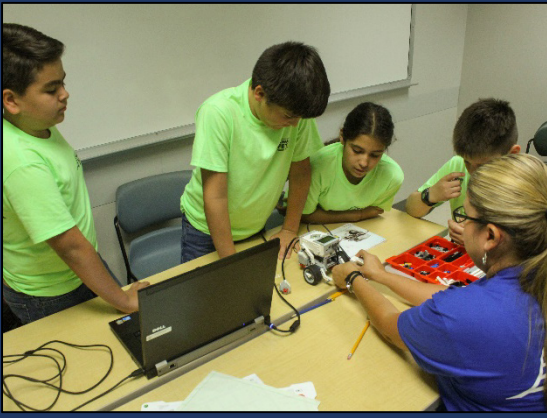


Following three successful years of implementation of the UTCRS Summer Camps in 2014 (700 participants - 300 elementary, 300 middle school, and 100 high school), in 2015 (1000 participants - 450 elementary, 425 middle school, and 125 high school), in 2016 (1300 participants - 585 elementary, 515 middle school, and 200 high school), the 2017 UTCRS Summer Camps that were held at UTRGV from June 5 to June 30 hosted 1014 K-12 students (473 elementary, 422 middle school, and 119 high school) from 26 different local school districts in the Rio Grande Valley (RGV). The UTCRS Summer Camps, acknowledged as the largest transportation related summer camps in the nation, have become the main program to attend for K-12 RGV students who are interested in engaging in hands-on interactive STEM educational activities.

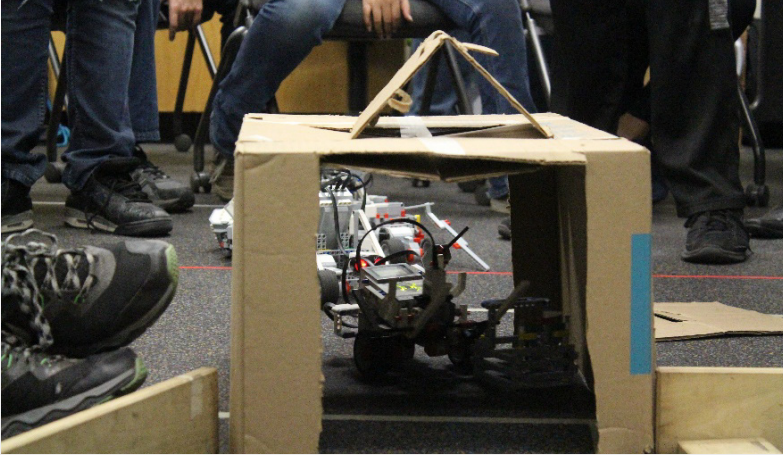
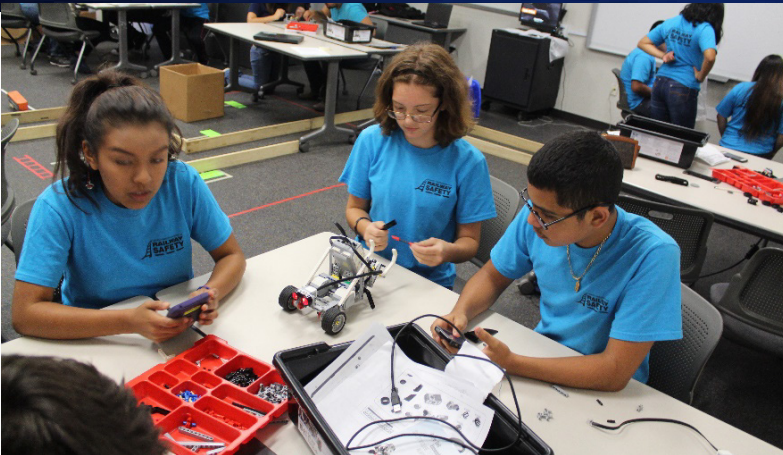
Middle School Camps



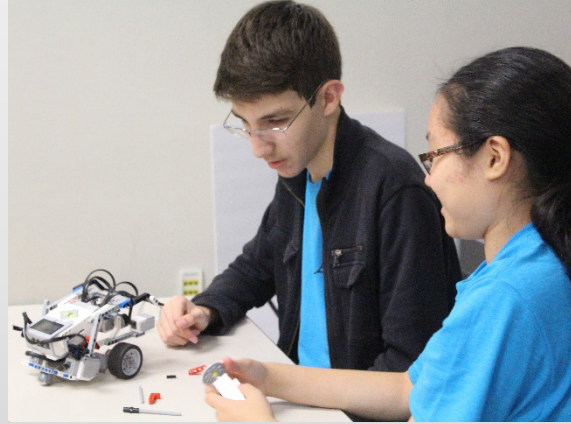
The 2017 UTCRS Summer Camps hosted 1014 students from 26 different school districts throughout the Rio Grande Valley. The middle school camps served 422 students during the month of June 2017. The camps are one-week long and feature the use of Lego EV3 Robotics kits to deliver STEM curriculum that is aligned with the Texas Essential Knowledge and Skills (TEKS) and focuses on introducing students to math and physics concepts utilizing hands-on applications related to transportation engineering with emphasis on railway safety.



High School Camps

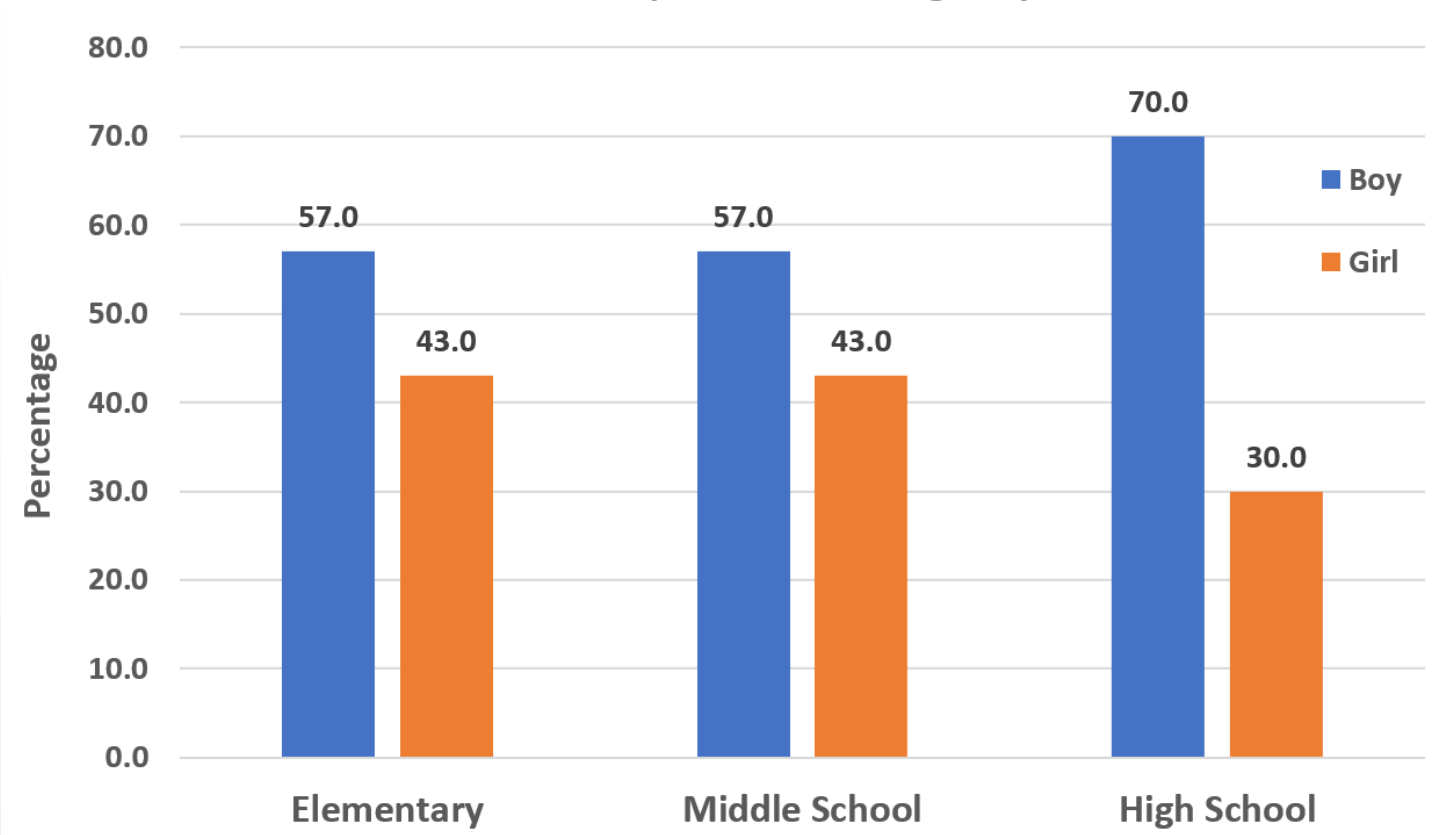


The impact of these camps becomes apparent when considering that more than 60% of parents in the Rio Grande Valley did not attend college, and that these camps are the first exposure to a university setting for their kids. Moreover, the UTCRS offers the necessary teaching tools, experiences, trainings, and professional development opportunities to K-12 students and teachers at little or no cost to them, which, in some cases, is the only way that some of the poorer school districts can afford these experiences for their students and teachers. The high school camps have greatly helped attract and recruit underrepresented groups to STEM career fields.



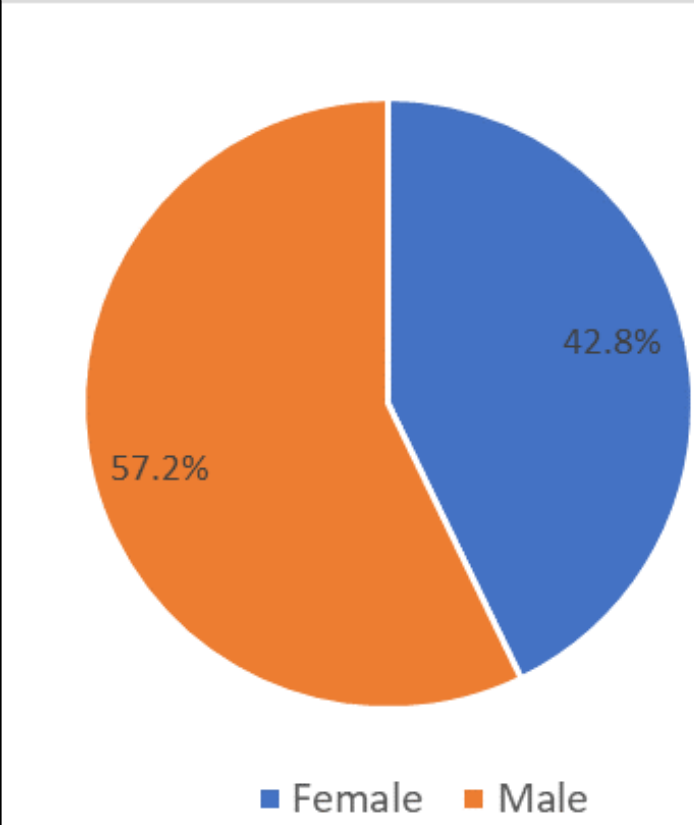
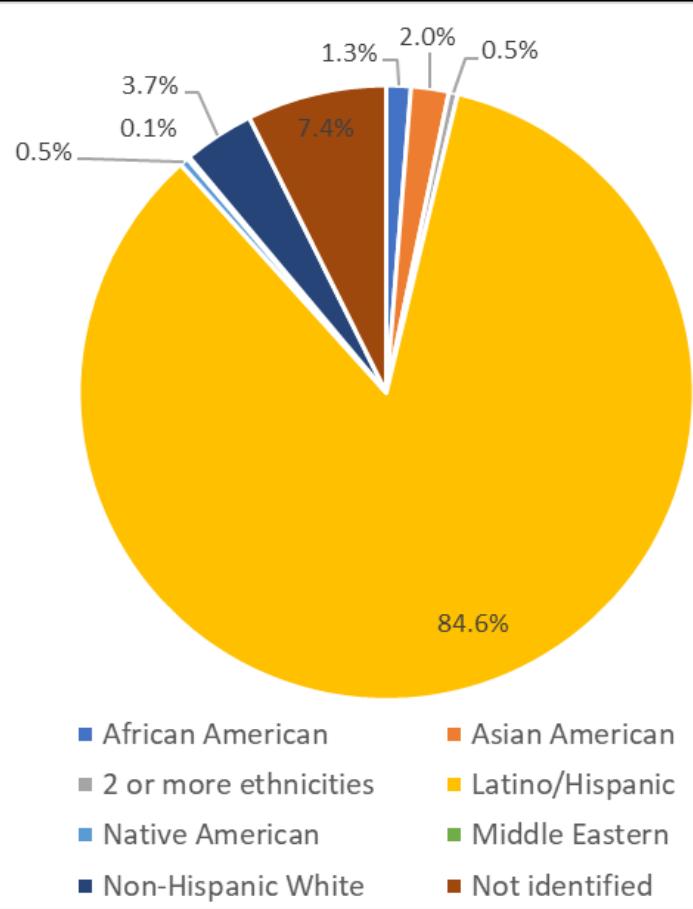
Attracting Females to STEM

2017 UTCRS Summer Camps Gender and Age Representation



Previous years (2013-2016) have consistently shown that elementary (grades 3-5) boys and girls are equally likely to participate in the summer camps. However, female participation decreases during middle school and high school. For example, during 2016, elementary participation was approximately equal for boys and girls (50%/50%). By middle school, the distribution changed to 60%/40%, and by high school 79%/21%. During the 2017 UTCRS summer camps, 57% of the elementary participants were male and 43% were female. In the middle school robotics camps, 57% of the participants were male and 43% of the participants were female. In the high school camps (combined MagLev and robotics), 70% of the participants were male and 30% were female. This demonstrates a 43% increase in high school female participation, a finding that is statistically significant. One possible explanation for this increase is our strong collaborations with our local school districts that have led to important discussions about STEM recruitment efforts.

UTCRS Summer Programs Stats



The critical ethnic disparity in the education of students in science, technology, engineering, and mathematics (STEM) fields is evident by the acute underrepresentation of Hispanics in STEM careers. Hispanics represent 17% of the U.S. population and 2 of every 3 Hispanics in the U.S. are of Mexican descent. About 10 million Hispanics live in Texas alone. Yet in 2010, the percentage of Hispanics working in a STEM field is 6.5% with the number of Hispanic women in these fields even lower. To reverse these trends, the UTCRS runs a number of education and professional development programs every summer that include K-12 Summer Camps, Research Experience for Teachers (RET) Program, Research Experience for Undergraduates (REU) Program, STEM Teacher Workshops, and the Transportation Engineering Summer Enrichment Program (TESEP). The racial and ethnicity representation as well as the gender representation of the participants in all of the summer programs offered during 2017 provides clear evidence that the UTCRS is effective in attracting and recruiting underrepresented groups to STEM fields.

Closing Ceremony



On Thursday July 6, 2017, the UTCRS celebrated the accomplishments of the K-12 students and teachers that participated in the 2017 UTCRS Summer Camps during the closing ceremony that was held at the UTRGV campus. The closing ceremony was attended by more than 1000 community members and the keynote speaker was U.S. Representative Vicente Gonzalez (TX-15) who stressed the importance of STEM education to ensure that students are exposed to these opportunities at an early age. Santiago Navarro, manager of the Technology Transfer Program, in the U.S. Department of Transportation OST-R, also addressed the community and re-iterated the importance of these programs to K-12 students. The winning teams from the elementary, middle school, and high school final competition challenge were introduced during this ceremony. Details can be found in the article: <http://www.utrgv.edu/en-us/about-utrgv/news/press-releases/2017/july-07-aspiring-engineers-recognized-at-utrgv-railway-safety-camp-awards-ceremony/index.htm>
Also See: <https://www.flickr.com/photos/131769328@N02/albums/72157686183548205/with/35474431180/>