



# TRAN-SET

## QUARTERLY NEWSLETTER

SPRING 2020 • ISSUE 10

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### ABOUT TRAN-SET

Tran-SET is Region 6's University Transportation Center. It is a collaborative partnership between 11 institutions (see below) across five states (Arkansas, Louisiana, New Mexico, Oklahoma, and Texas). Tran-SET is led by LSU and was established in late November 2016 "to address the accelerated deterioration of transportation infrastructure through the development, evaluation, and implementation of cutting-edge technologies, novel materials, and innovative construction management processes."

### LETTER FROM THE DIRECTOR

Wishing you all a wonderful spring!

Spring is a wonderful season filled with new growth, new promise, and new beginnings. In the South, spring is an especially beautiful time of year before the long, hot days of summer.

I am excited to report Tran-SET's continued progress. One of our upcoming events is the 2020 Tran-SET conference in Albuquerque, New Mexico, on August 2020. The conference will include two keynote speakers, two additional guest speakers, 55 lectern presentations, 15 student posters, and more. It is a great opportunity to learn how Tran-SET is helping solve regional transportation challenges. Registration is ending soon, so be sure to register now!

Tran-SET will also be participating in one of the South by Southwest (SXSW) events, *Curb of the Future*, which will take place in Austin, Texas. The event was originally scheduled for March 16-18, 2020, but is postponed to the summer. The exact date will be announced on our [website](#) shortly. At SXSW, Tran-SET will showcase a hybrid UAV-based remote sensing system that provides real-time traffic monitoring with high temporal and spatial resolution. The presentation will show how the system interacts with the changeable message boards, motorist cellphones, traffic management center, and law enforcement personnel to connect to motorists. I invite you to come by our booth and learn more about our presentation.

I highly encourage everyone to follow us on [LinkedIn](#) and [Twitter](#). You may also subscribe to our mailing list [here](#). I invite you to read through our Spring 2020 newsletter and learn more about our research, technology transfer, educational, and workforce development activities.

Enjoy!

Marwa Hassan, PhD, PE, F.ASCE  
CETF Distinguished Professor  
LSU College of Engineering



# RESEARCH PROGRAM UPDATES

## THIRD-CYCLE PROJECTS RESEARCH REPORTS

Tran-SET's third-cycle projects are in progress, and their first progress reports and trackers were submitted in mid-December 2019. The second progress reports for these projects are due in April 2020.

## PROPOSALS FOR THE FOURTH CYCLE ARE IN THE REVIEW PROCESS

Tran-SET received 43 proposals for its fourth cycle of funding. Proposals are currently being reviewed by independent experts in each field. Tran-SET is currently updating its fourth-cycle funding program based on the received proposals, and all fourth-cycle projects are anticipated to start in July 2020.

## STAFF UPDATE: DR. MOUSA'S ARRIVAL



*Dr. Momen Mousa*

Dr. Momen Mousa joined Tran-SET this year in January. He will serve as the program manager of Tran-SET and will be in charge of further developing its main management processes and procedures; establishing a webinar series; developing Tran-SET's Technology Transfer (T2) Plan (and corresponding T2 processes); and overseeing the organization's main research, T2, educational, and workforce development activities.

Welcome to the team, Dr. Mousal!

# RESEARCH IN PROGRESS: HIGHLIGHTS

*Please see below for a showcase of select, Tran-SET research projects. **Is our research applicable to your technical area? Beneficial or a potential solution to your local transportation system? Can benefit from your efforts? Interesting?** Please contact us for ways to coordinate, be involved, and engaged! To learn more about the following projects (and the rest of our 35 active research projects), please visit [our website](#).*

## EVALUATION OF BAGASSE ASH AS CEMENT AND SAND REPLACEMENT FOR THE PRODUCTION OF ENGINEERED CEMENTITIOUS COMPOSITES (ECC)

Dr. Marwa Hassan and Dr. Gabriel Arce – LSU

Engineered Cementitious Composite (ECC) is an exclusive type of cement mixture with unique composition of low-volume fibers and different composites so as to impart high-ductility, high-tensile strength, besides ability to repair. Its exceptional properties make it an excellent material for repair and new construction of transportation infrastructure. One of the main drawbacks of ECC is the high cost of implementation. To this end, alternative ECC mixtures are being researched in order to decrease their high cost. Alternatives that could serve as a replacement to sand and cement, like sugarcane bagasse ash (SCBA), could be the key solution for this shortcoming. The implementation of sugarcane bagasse ash (SCBA) as a component in ECC mixtures may help ECC become more affordable, increasing its potential use in large-scale projects.

The objective of this project is to develop ECC, implementing SCBA in order to produce cost-effective and efficient ECC materials. Also, this project aims to promote sustainability and resiliency of the transportation infrastructure renewal and upgrade, as well as enhance the capacity to recover of the infrastructure projects under extreme weather conditions. As a result, ECC has the potential to become a viable solution to many of the transportation infrastructure's backlog of projects throughout the United States.



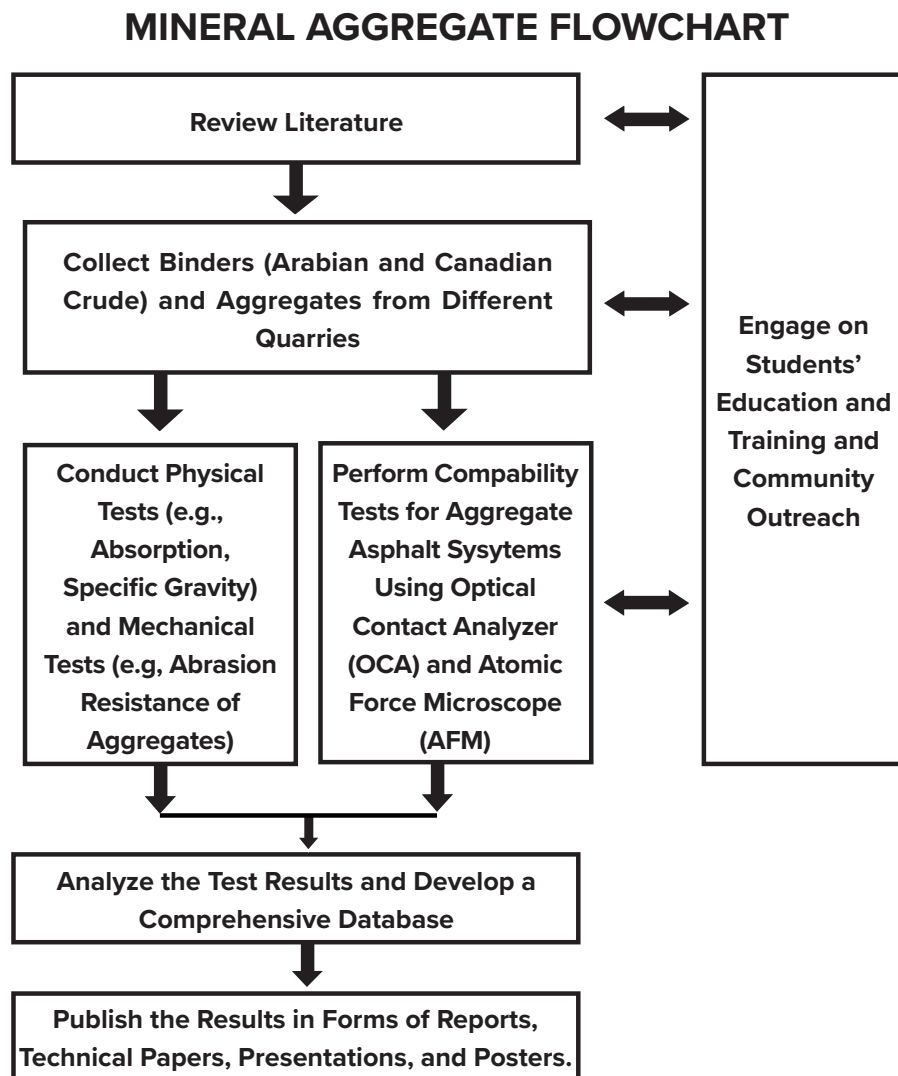
*Bagasse ash*

# ASSESSMENT OF COMPATIBILITY OF MINERAL AGGREGATES AND BINDERS USED IN HIGHWAY CONSTRUCTION AND MAINTENANCE PROJECTS

Dr. Zahid Hossain – Arkansas State University

Some aggregates in asphalt concrete and maintenance projects have been reported to present serious performance and durability issues during their life cycle. Aggregates from certain quarries are thought to have compatibility issues with some asphalt products (e.g., hot mix asphalt and chip seals). By selecting appropriate asphalt binders (acidic or basic) based on their crude sources, these issues can be resolved or at least lessened. Compatibility of the aggregates is determined by measuring surface free energy (SFE) and adhesion forces by using an optical contact angle (OCA) analyzer and an atomic force microscope (AFM).

The aim of this study is to assess the durability of selected aggregates throughout Arkansas, as well as their asphalt-binder compatibility. This involves evaluating/testing the aggregates' physical and mechanical properties, determining surface free energies and adhesion properties of binders and aggregates, recommending adequate test methods to identify incompatible aggregates, and developing a database of compatible aggregate-binder systems for future project reference. The developed compatibility database can be followed by asphalt contractors to choose the best compatible systems for building longer lasting roadways, thus potentially solving a very common issue in transportation infrastructure.



# RESEARCH IN PROGRESS: HIGHLIGHTS

## RAILS TO RESILIENCE: EVALUATING NEW ORLEANS AND BATON ROUGE TERMINALS AND TRANSIT LINKS

Tara Tolford, Jim Amdal – University of New Orleans

For years, a passenger rail connection between Baton Rouge and New Orleans has been proposed by many interested parties in Louisiana. A broad coalition of stakeholders, including local and regional governmental entities, economic development organizations, and advocates, support the development of this connection, and several feasibility studies and station area plans have been developed in anticipation of possible future funding for implementation. This study aims to evaluate proposed terminal sites for the potential future passenger rail connection and identify recommendations for maximizing ridership and functionality of the proposed rail service.

The main objective of the evaluation is to maximize benefits of the proposed rail system like employment opportunities for Louisiana residents; promoting economic growth within rail corridor communities; mitigating traffic congestion and corresponding environmental pollution; and providing efficient access to goods, services, and destinations. This project will add value to multimodal planning processes conducted by transit, state and local agencies, commissions, and stakeholders, advancing the implementation of transportation projects with maximized return on investment. It is intended to address the gap in our understanding of how the proposed rail terminals relate to their immediate and regional context by evaluating multimodal connectivity and accessibility at the proposed terminals.



Example of lightrail

## ANALYSIS, MODELING, AND SIMULATION (AMS) CASE STUDIES OF CONNECTED AND AUTOMATED VEHICLE (CAV) IMPLEMENTATIONS SPECIFIC TO THE SOUTH-CENTRAL REGION

Christopher Melson – LSU

Automated and connected vehicle technologies are currently among the most heavily researched technologies worldwide. The vehicle technologies currently available are only a fraction of what is being developed for the future. Connected and automated vehicles (CAVs) are considered to be a potential congestion mitigation strategy for ever-increasing congestion across the United States. Emerging technologies, like CAVs, can be integrated into such strategies to provide exceptional mobility benefits. Unfortunately, due to the uncertainty in the technological capabilities and infrastructure requirements for CAVs, it is very difficult to estimate such benefits. As a possible solution, analysis, modeling, and simulation (AMS) tools can provide an efficient means to evaluate potential CAV implementations.

The main objective of this study is to conduct two mobility-focused AMS case studies of CAV-deployment strategies specific to Region 6 (Arkansas, Louisiana, New Mexico, Oklahoma, and Texas). It is envisioned that case studies will focus on low automation levels, perhaps replicating the first CAV applications that will be deployed on a system level, such as cooperative adaptive cruise control (CACC), truck platooning, cooperative speed harmonization, cooperative on-ramp merging, lane speed monitoring schemes, platooning-based intersection management, and advanced traffic signal coordination.

## BRIDGE CONSTRUCTION MONITORING



Examples of mobility-based CAV applications: (a) truck platooning, (b) cooperative merging, (c) signalized intersection approach and departure, and (d) CACC.



# RESEARCH IN PROGRESS: HIGHLIGHTS

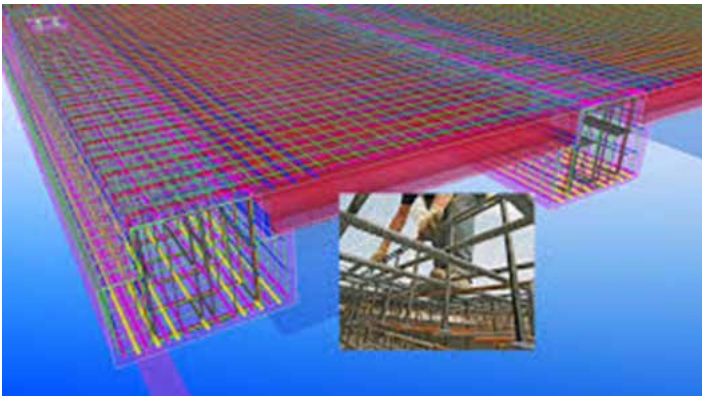
## USING LIDAR FOR QUANTIFIED, OBJECTIVE QUALITY CONTROL/ QUALITY ASSURANCE (QOQCAQ)

Dr. Fernando Moreu, Dr. Chris Lipitt – University of New Mexico

At the moment, there are no 3D requirements in the form of quality control/quality assurance (QCQA) standards for construction projects. The New Mexico Department of Transportation is exploring new technology available on this subject to implement it in QCQA of bridge construction, in particular, during concrete pour and finishing. LIDAR technology is the chosen method chosen for the purpose of this study. LIDAR is a surveying method that measures distance to a target by illuminating it with laser light and measuring the reflected light with a sensor. Differences in laser return times and wavelengths can then be used to make digital 3D representations of the target. Finally, the resulting 3D model can be used to see how it compares to the project's documents and requirements.

This project aims to develop and implement a methodology to measure construction progress and compare it to the projected 3D model, quantifying the difference in order to improve the accuracy/quality of the finished product. Particularly, this study is focused on improving the quality of finished surfaces on bridges (bridge decks). A comparison between the chosen technology (LIDAR) and alternative similar technologies will be made in order to introduce other available technology and comment on their performance. Also, a draft of new bridge specifications for LIDAR technology applications in QCQA will be developed using feedback from the New Mexico Department of Transportation.

## ECO-FRIENDLY STABILIZATION OF



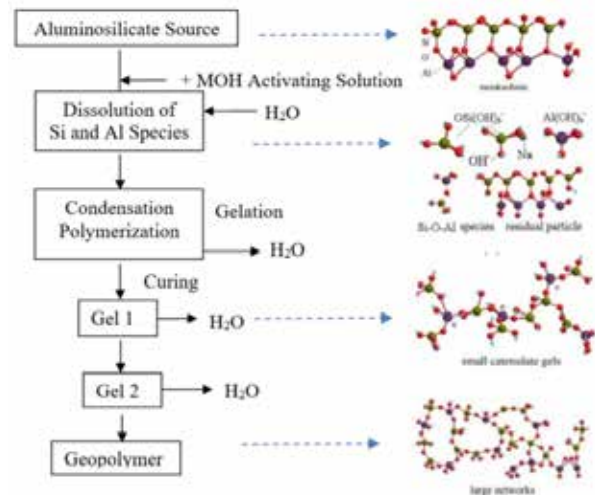
LIDAR to monitor construction activities

## SULFATE-RICH EXPANSIVE SOILS USING GEOPOLYMERS FOR TRANSPORTATION INFRASTRUCTURE

Dr. Xinbao Yu, Dr. Anand Puppala – University of Texas at Arlington; Dr. Miladin Radovic – Texas A&M University

Sulfate-rich soils are predominant in the South and Western United States and are widely used in the construction of pavements. When sulfate-rich expansive soils are treated with traditional calcium-based stabilizers, such as lime or cement, the stabilized soil is affected by sulfate-induced heave (it expands when in contact with water). Therefore, other stabilizing techniques are being researched; among these is the use of geopolymers as an alternative to lime or cement (OPC). Anticipated impacts of using geopolymers include life cycle assessments and low carbon footprints.

This project aims to investigate the feasibility of stabilizing sulfate-rich expansive soils using geopolymers and studying efficient dosage rates, optimum workability, recommended curing conditions, overall performance, and structural and mechanical properties of geopolymer-stabilized subgrade soils. Both material characterization studies related to micro and macro behavioral changes of native soils and geopolymer-treated soils will be carried out. Also, it will highlight some of the most relevant environmental benefits of using geopolymers as an alternative to ordinary Portland cement (OPC). For instance, the fact that geopolymers are ecofriendly and sustainable materials because they can be processed from waste materials or natural sources at room temperature inexpensively, and their use as a replacement to OPC can significantly reduce CO<sub>2</sub> emissions that normally come from the production of OPC.



Geopolymerization flowchart

# TECHNOLOGY TRANSFER ACTIVITIES

Tran-SET has two objectives that guide its technology transfer (T2) activities: to ensure that scientific and technological developments are (1) accessible, disseminated, and transferred to a wide range of users including state agencies, universities, and industries; and (2) have long-term research value and significant impact to the transportation industry.

Please see below for a showcase of select, T2 activities sponsored by or involving Tran-SET. Stay up-to-date with our activities by following us on [LinkedIn](#) and [Twitter](#), visiting our [website](#), and [subscribing to our mailing list](#) !

## STILL TIME TO REGISTER FOR THE 2020 TRAN-SET CONFERENCE



Tran-SET will be hosting the 2020 Tran-SET Conference on August 2020 in Albuquerque, New Mexico. The conference is co-sponsored by the ASCE Construction Institute and hosted by the University of New Mexico and New Mexico State University. It will include two keynote speakers, two additional guest speakers, 55 lectern presentations, 15 student posters, and more. This is a great opportunity to learn how we are solving transportation challenges in the South/Central United States.

Registration is open but will be closing soon! Please visit the [conference website](#) to view the detailed program, learn more about the conference and location, register, or become a sponsor.

## RECORDING OF WEBINAR ON FREIGHT MOVEMENT NOW AVAILABLE

The most recent joint Tran-SET webinar was held on March 4, 2020, and was titled, *Innovative Techniques to Optimize, Enhance, and Facilitate Freight Movement*. It was jointly hosted by the [Cooperative Mobility for Competitive Megaregions](#) (a Tier 1 University Transportation Center), and a recording of the webinar is available on [Tran-SET's YouTube page](#).

Tran-SET would like to sincerely thank the webinar presenters (please see below):

**JOINT TRAN-SET WEBINAR SERIES** WITH **CM<sup>2</sup>**

**Innovative Techniques to Optimize, Enhance & Facilitate Freight Movement**

Wednesday March 4<sup>th</sup>, 2020 | 2:00 – 3:45 PM (CST)

Free registration at: [shorturl.at/aulTV](http://shorturl.at/aulTV)

<sup>1</sup>Understanding the Impact of Hurricane Harvey on Port Truck Movements in Texas  
<sup>2</sup>A Perspective on Intraregional Freight Planning Capabilities, and the Implications for Megaregional Planning  
<sup>3</sup>Methods and tools for freight flow disaggregation

**<sup>1</sup>Dr. Kate Hyun**  
University of Texas at Arlington

**<sup>2</sup>Prof. C. Michael Walton**  
The University of Texas at Austin

**<sup>3</sup>Prof. Mihalis Gollis**  
University of Memphis

Logos for Tran-SET and CM<sup>2</sup> Cooperative Mobility for Competitive Megaregions are at the bottom.

Joint Tran-SET Webinar Series with Cooperative Mobility for Competitive Megaregions. *Innovative Techniques to Optimize, Enhance, and Facilitate Freight Movement*

# TECHNOLOGY TRANSFER ACTIVITIES

## IMPLEMENTATION OF WILDLIFE MONITORING STATIONS

Dr. Nick Ferenchak is collaborating with the New Mexico Department of Transportation, New Mexico Department of Game and Fish, and the Arizona Game and Fish Department in an ongoing Tran-SET project to develop a cost-effective solution to wildlife-vehicle collisions, which cost the United States about \$8.4 billion each year. The project team has recently installed wildlife monitoring stations. Stay tuned for interesting results.



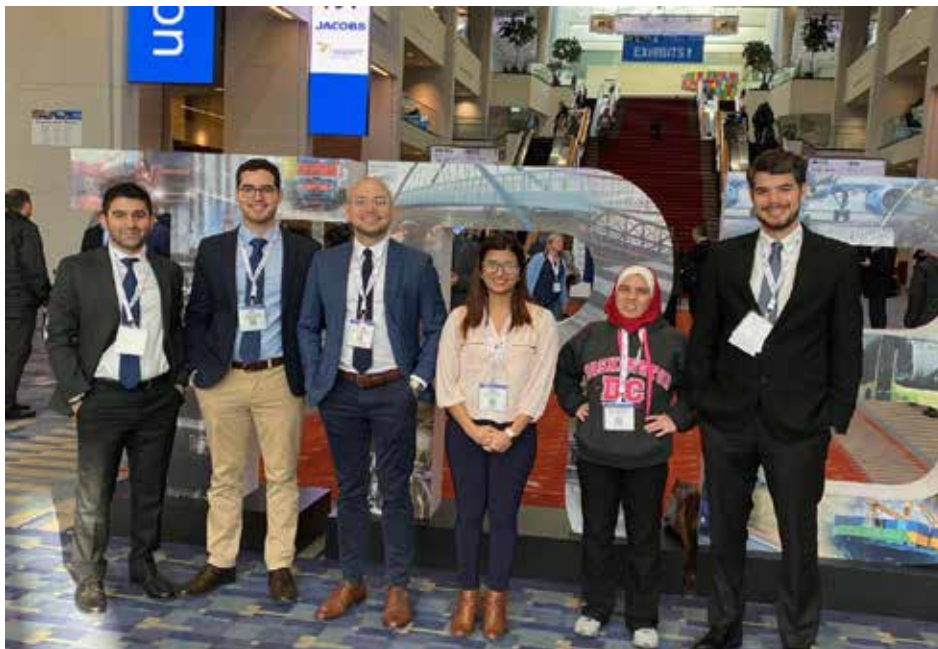
*Monitoring equipment*



*Wild animal on the side of the road*

## TRANSPORTATION RESEARCH BOARD ANNUAL MEETING

Tran-SET had a strong presence at the 2020 TRB Annual Meeting held in Washington, DC, on January 12-16, 2020. Eight Tran-SET-related lectern presentations and eight poster presentations were conducted, and more than 30 Tran-SET-related researchers and students attended. The TRB Annual Meeting is one of the largest transportation research conferences in the world, covering all transportation modes and addressing topics of interest to policy makers, administrators, practitioners, researchers, governments, industry, and academic institutions. More than 13,000 transportation professionals were in attendance. During the conference, Tran-SET also conducted its mid-year meeting with our associate and program directors. During the meeting, Tran-SET communicated important center-wide updates, discussed current reporting requirements, and identified “lessons learned” from recently completed second-cycle projects.



*Part of the LSU team at TRB*



# EDUCATIONAL & WORKFORCE DEVELOPMENT

Tran-SET has a firm initiative to advance the transportation workforce and develop its next generation of leaders by: (1) attracting and supporting diverse, promising individuals to the transportation field through internships/research assistantships; (2) providing experiences through education and cutting-edge research to more properly prepare these individuals as they enter the workforce; and (3) incorporating and disseminating knowledge generated from sponsored research into educational and training products/activities.

Please see below a showcase of select, educational and workforce development activities sponsored by or involving Tran-SET.

## A-STATE SAFETY WORKSHOP

Dr. Zahid Hossain at Arkansas State University coordinated a safety workshop for one of his local industry partners, NEAR Ready Mix Concrete, on February 5, 2020. About 50 plant operators and drivers participated in this workshop on the A-State campus. Two professional safety trainers hired by NEAR Concrete served as the instructors.



A-State Safety Workshop

## LOCAL HIGH SCHOOL CAREER FAIR

Dr. Hossain and his colleague at Arkansas State University participated in a career fair organized by a local high school to represent engineering as a recruitment avenue.



Students coming to see the Arkansas State University Desk

## KASU RADIO BROADCAST: A-STATE CONNECTIONS AND CREATE@STATE: MAKING CONNECTIONS THAT COUNT



Dr. Zahid Hossain at Arkansas State University took part in KASU's weekly segment, *A-State Connections and Create@State: Making Connections That Count*. In this radio broadcast, on the topic, "Making Concrete and Asphalt Stronger, Which Will Make Transportation Safer in the State," three research papers were presented that were submitted for the TRB conference in Washington in early 2020.

The broadcast of the interview is divided into two parts. Please follow the links to Episodes [62](#) and [63](#) to listen to the podcast.



# EDUCATIONAL & WORKFORCE DEVELOPMENT

## MMR ADVANCED MATERIAL LAB TOUR TO GERMAN FULLBRIGHT STUDENTS

Dr. Marwa Hassan and Dr. Momen R. Mousa led a lab tour at the MMR Advanced Materials Lab to 40 German Fullbright students. Presentations on innovative materials, including ECC and EGC, were given by Sujata Subedi, Ruwa Abu Farsakh, Ricardo Hungria, and Ipshit Idris under the supervision of Dr. Gabriel Arce. The German students were incredibly interested about these materials.



*MMR Advanced Material Lab Presentation to German Fullbright Students*

## STEAM NIGHT AT OAK GROVE

Oak Grove Primary held STEAM Night on March 10, 2020, to generate interest and enthusiasm for STEAM education among students and their families by giving them a chance to explore science in action with hands-on activities and a student science fair at their school in Prairieville, Louisiana. Tran-SET hosted a booth display at this event, highlighting its functions and showcasing interesting hands-on material to bring STEAM learning to the near 600 in attendance for this event.



*Students at STEAM Night at Oak Grove*

## INSTITUTE OF TRANSPORTATION ENGINEERS (ITE) INAUGURAL MEETING



The University of New Mexico student chapter of the Institute of Transportation Engineers (ITE) had its inaugural meeting with 14 student

members attending. ITE is an international organization with more than 15,000 members from across the transportation industry. The student chapter will provide its members with strong connections to professional firms and resources to attend nationally recognized transportation conferences. The group plans to organize and participate in events such as transportation facilities tours, NMDOT operations observation, job shadowing, design competitions, panels of city/regional professionals, and lunchtime speakers. Elections resulted in Risa Gutierrez (president), Travis Moe (vice president), Natalie Gayoso (secretary), and Lynette Torrez (treasurer) as officers. Its faculty advisor is Tran-SET PI Dr. Nick Ferenchak.