Engineering Recruitment Program

Engineering Summer Programs

Project Summaries

FY 2009

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Project Selection Process

The Engineering Recruitment Program (ERP), Engineering Summer Program (ESP), was established by the 80th Texas Legislature through passage of House Bill 2978, codified as Texas Education Code 61.791. The purpose of the program is to provide grants to general (public) academic teaching institution that offer an engineering degree program to implement a one-week summer program for middle and high school students, so that these students are exposed to math, science, and engineering concepts they can expect to encounter in an engineering degree program.

Selection Step 1: The legislature appropriated $1 million for each year of the 2008-09 biennium. After consultation with the bill author's office, the Coordinating Board (CB) allocated $200,000 of the annual state appropriation for the summer program portion of the Engineering Recruitment Program.

Selection Step 2: The CB issued a Request for Applications on January 29, 2009, posted it on its ERP website, and sent email notifications to all eligible institutions.

Selection Step 3: The CB received 18 applications from 26 eligible institutions and set the award amount for each program at $11,111.11.

Selection Step 4: All applicant institutions finalized a budget for the set award amount.

Selection Step 5: By end of May, 2009, the Coordinating Board executed contracts with the 18 applicant institutions.

Participating Institutions

Lamar University, College of Education and Human Development

Prairie View A&M University, Department of Electrical Engineering

Tarleton State University, Department of Math, Physics, and Engineering

Texas A&M University, Department of Electrical, and Computer Engineering

Texas A&M University-Commerce, Department of Industrial Engineering

Texas A&M University at Galveston, Department of Academic Enhancement

Texas A&M University-Kingsville, Department of Environmental Engineering

Texas A&M University-Texarkana, Department of Electrical Engineering and Computer Science

Texas Tech University, Texas Tech T-STEM Center

The University of Texas at Austin, Equal Opportunity in Engineering Program

The University of Texas at Brownsville and Texas Southmost College, College of Applied Technology

The University of Texas at Dallas, Erik Jonsson School of Engineering and Computer Science

The University of Texas at El Paso, Undergraduate Studies and Engineering Education Research

The University of Texas at Tyler, College of Engineering and Computer Science

The University of Texas-Pan American, Department of Mechanical Engineering

The University of Texas of the Permian Basin, Department of Engineering & Technology Programs

The University of North Texas, Department of Computer Science and Engineering

West Texas A&M University, Department of Engineering and Computer Science

Engineering Recruitment Program ERP 2009 Engineering Summer Programs **Participation Statistics**	
Number of institutions	18 institutions
Number of one-week programs	18 programs
Number of participants	663 students
Average per one-week program	37 students
Median per one-week program	27 students
Smallest one-week program	8 students
Largest one-week program	153 students
Female participation	39%
White participation	38%
African-American participation	15%
Hispanic participation	40%
Other participation (Asian, Native American, unknown)	7%
Number of one-week programs with up to 30 participants	10 programs
Number of one-week programs with 30 to 45 participants	5 programs
Number of one-week programs with more than 45 participants	3 programs
Number of programs with girl-only participation	3 programs
Number of programs that included middle school students	7 programs
Number of residential programs	11 programs
Number of day programs	7 programs

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Lamar University

gO Women for Engineering, Science, and Technology Academy (gO W.E.S.T. Academy)

Project Leader: Dr. Otilia Urbina and Dr. Ryan Underdown, College of Education and Human Development

Type of Program: Day Program

Synopsis:

The Lamar University gO W.E.S.T. Academy recruited 20 high-achieving, underserved high school females who were entering the 9th-12th grades to attend a no cost, intensive, and exciting 5-day academy at Lamar University in Beaumont, TX.

The Academy introduced engineering careers to students with strong academic records in math and science and who were interested in cultivating interest in engineering as a career. Participants had an opportunity to experience college life by visiting engineering classes to learn underlying engineering principles, eating lunch with female engineer role models, participating in real-world, hands-on laboratory activities, designing projects spanning 2-3 days, industrial tours, and exploring career opportunities.

Program Content:

- Student team competitions: The program content area was designed to provide student team competitions in several areas. The Bicycle of Yesterday and Today lab explored dissembling and reassembling a bicycle. Students worked in teams of two per bicycle. The competition was to see which team could reassemble their bike the quickest. In addition, 6-Minute Engineering labs such as Foil Boat, Egg Drop, The Paper Tower, Popsicle Stick Bridge, and the Edible Tower were designed to provide small groups with limited time and materials to race for the "best" solution design.
- Project presentations: During the gO W.E.S.T Academy, students were given the opportunity to work in research teams and present PowerPoint presentation on selected career awareness topics. Teams gave a presentation of their research to the other teams and program staff on the closing day of the academy.
- Field trips: The students attended a field trip to NASA in Houston, Texas.
- Industry site visits: Students were given an opportunity to visit a construction site and speak to personnel within the infrastructure to discuss their career choices.
- Panel or luncheon discussions with professional engineers and scientists: Female guest speakers from local industries such as ExxonMobil, Schlumberger, and Jacobs Engineering described their daily activities, their reasons why they chose engineering as a career, and their challenges as females in a male-dominated field. A speaker represented each engineering discipline at Lamar: civil, chemical, electrical, industrial, and mechanical. Participants had an opportunity to join female engineers for lunch each day.
- Parent/guardian information that covers the Texas university application process, financial aid system, and scholarship opportunities: During Orientation and the Graduation Ceremony, parents/guardians were given information on the Texas University application process, financial aid system, and scholarship opportunities. In addition, they were given information on whom to contact at the University for further assistance.

The curriculum included mechanical design (evaluation, diagnosis, repair) applied to bicycle and related to Mars rover, bridge, terrain, and rocket. The curriculum included a discussion of different learning styles.

Prairie View A&M University

Increasing Engineering Students Using Summer Program Approach 2009

Project Leader: Dr. Warsame Ali and Dr. John O. Attia, Department of Electrical and Computer Engineering

Type of Program: Residential Program

Synopsis:

The Electrical and Computer Engineering Department organized and executed the following activities on campus under the Engineering Recruitment Program during summer 2009: (i) conducted a one week residential ESP for twenty-four middle school students, fourteen were males and ten were females; (ii) recruited middle school students were typically underrepresented in engineering education; (iii) provided selected students with instruction in math, science and engineering; (iv) student design team competition, and (v) project presentations. The program started on June 21and ended on June 26, 2009**.** The students developed critical thinking, reasoning and analytical skills. Based on the survey conducted, the students responded that they enjoyed the summer program and were mostly inclined to pursue engineering.

Program Content:

This program was run by a group of highly qualified faculty as well as student helpers. Taking this into account no stone was left unturned in ensuring that every program participant received every necessary attention to help them stay interested and excited. Our curriculum and activities helped maintain student interests with the aid of technology. Infinity Project activities are an example. Through Infinity, students learned how engineering plays a role in the subjects they use every day - music, the Internet, digital imaging, video and more. In addition, tools like LEGOS's mind storm robots and TI calculators helped students develop a sense of critical thinking, reasoning, and problem solving analysis. Students were involved in building basic Lego race cars and competed in an organized, onsite racing event for prizes. Overall, the instructional topics of the program were Infinity Project experiments, basic circuits, engineering ethics, engineering applications using TI calculators, strategies for succeeding in college, basic civil engineering, and solar cell vehicle design.

The curriculum put emphasis on mathematics applications for engineers. The expectation was to instill in middle school kids the self-reliance, skills, and incentive to succeed in the classrooms. The students experienced academic learning and received some elements of mathematics application required to succeed in high school and college. Students met with other students and learned how to balance academic and social commitments by living with a roommate and by being part of a collegiate environment. The environment prepared for the student's to transition from middle school to high school, and hopefully will make his/her college career successful.

Tarleton University

Girls in Engineering Summer Program

Project Leader: Dr. Denise Martinez, Department of Engineering and Physics, and Dr. Bethany Rinard, Department of Chemistry and Geoscience

Type of Program: Residential Program

Synopsis:

An engineering experience program targeting girls entering 9th and 10th grade from the rural area around Stephenville was offered from June 22-26, 2009. While participants had the option of commuter or residential program, all chose the residential option. The primary goal of the program was to expose the participants to engineering as an application of math and science, using active-collaborative learning activities and guest speakers. Participants also got a college-like experience including living in the dorm, eating in the dining hall, going to "class" all day, and take-home projects. The program concluded with a session for participants and parents by School Relations.

Program Content:

- Student competitions: students had a variety of design competitions ranging from structures, to safety, to robotics.
- Project presentations: student teams (two students each) conducted a PowerPoint presentation at the end of the week with their parents as the audience. The presentations showcased their projects program participants had done during the week.
- Field trips: the students were taken to the Tarleton observatory where they learned about the telescope and were able to gain hands-on experience using it to capture real deep-space images. The students also toured the Stephenville Wastewater Treatment Plant where they saw and discussed aspects of environmental engineering.
- Industry site visits: two industry representatives from Luminant/TXU Comanche Peak Nuclear Power Plant, one engineer and one engineering technologist, visited with students to discuss their jobs.
- Parent/guardian information session: Tarleton's School Relations group hosted a session at the end of summer program covering the importance of college, how to prepare for college, application procedures, financial aid information, and scholarship information.

The curriculum included structures (forces, strength of materials, stability, etc), Newton's laws, friction, engineering design and design tradeoffs (with examples of engineering disasters), algorithm development, hardware/software integration, the Mindstorms NXT environment, energy (potential, kinetic, and heat energy), electricity, functionality of a camera flash, binary and digital systems.

Texas A&M University

Exploring Electrical and Computer Engineering at Texas A&M

Project Leader: Dr. Karen Butler-Purry and Ms. Jackie Perez, Department of Electrical and Computer Engineering

Type of Program: Residential Program

Synopsis:

The Electrical and Computer Engineering (ECE) Unplugged summer program was designed to give academically talented students interested in ECE an opportunity to explore electrical or computer engineering as a major at Texas A&M University (TAMU). Participants toured TAMU labs and National Instruments in Austin. They completed design projects including building a windmill, Theremin, and building and programming a Lego Mindstorms Robot. Over 15 current ECE students, 14 faculty and one alumni assisted with the event by hosting lab tours, assisting with design projects, meeting participants during meals, and giving presentations. Three participants and three faculty were interviewed by a Waco News Channel for a future public service announcement on engineering.

Program Content:

- Student team competitions: Participants were encouraged to be creative when completing their Theremin project and programming their Lego Mindstorms Robots. Recognition and certificates were given to students that persisted and went above and beyond just completing the project.
- Project presentations: Participants demonstrated the projects for family and faculty on the final day of the program including showing their success and creativity in programming the robots.
- Tours: Participants toured ECE faculty research labs: an MRI Lab, Chip Fabrication Lab, and Thin Film Lab (all part of the ECE Department at TAMU). They had free time at the Student Recreation Center and took a campus tour.
- Industry Field Trips: Participants spent 5 hours at National Instruments in Austin participating in a tour and hearing presentations mostly given by TAMU ECE alumni.
- Panel or luncheon discussions with engineers and scientists: Participants interacted with engineers at National Instruments during lunch. On the Texas A&M Campus participants interacted with ECE faculty and current students.
- Parent/guardian information that covers the Texas university application process, financial aid system, and scholarship opportunities: Representatives from the TAMU Offices of Admissions and Financial Aid spoke with the parents on the first day during the welcome ceremony. In addition to the financial aid representative, faculty from the College of Engineering and the ECE Department spoke to participants and families about scholarship opportunities.
- Other: One of the alumni and TAMU ECE Department External Advisory Board members served as the guest speaker on the final day of the program and shared his experiences and accomplishments in the field of engineering and told how electrical and computer engineers impact people's lives.

The curriculum included windmills and electric wind turbines, basic concepts of circuit boards, oscilloscopes, digital multi-meters, solder gun, thin film deposition, MEMs, MRI, noise-based logic, networking, and the future of robotics.

Texas A&M University–Commerce

Engineering Summer Program 2009

Project Leader: Dr. Brent Donham and Dr. Matthew Elam, Department of Industrial Engineering and Technology

Type of Program: Day Program

Synopsis:

The ESP brought a week long engineering focus to the already effective 2-week X-TEEMS summer program. X-TEEMS is a program designed to promote interest and learning in STEM fields. Students and teachers from rural and financially disadvantaged school districts participated in collaborative learning activities with an engineering emphasis, culminating in the selection of a project that will be developed during the school year. The results of these projects will be showcased at public exhibits and also demonstrated at state and national conferences. It is believed participation in the summer program/project will encourage more students to be involved in STEM fields.

Program Content:

Students and teachers participated in the X-TEEMS ESP summer program.

- Student team competitions:
  - Structure Design
  - Egg Bungee
  - Kite Design
  - GPS Scavenger Hunt
  - Robotics
- Project presentations:.
  - Engineering Notebooks
  - Engineering Projects
- Tours:
- Industry Field Trips:
  - Campbell Soup manufacturing plant
  - A&M-Commerce Building Construction Site
- Panel or luncheon discussions with engineers and scientists:
  - Engineering Panel with representatives from TI, Raytheon, TriQuint Semiconductor, and Innovation First
- Other:
  - Faculty presentations about semiconductor manufacturing technology, aerodynamic principles, robotics, and GPS. For teachers there were presentations about project based learning, engineering education resources, and graduate school opportunities.

The curriculum included engineering design process and the scientific method, introduction to simulation and modeling software, aerodynamics, mechanical engineering, automation and robotics, the manufacturing environment, Lego Mindstorms robotics, programming, construction principles and construction safety, semiconductor manufacturing (silicon wafers, manufacturing of integrated circuits, cleanroom fabrication), nanotechnology, and GPS technology.

Texas A&M University at Galveston

GO (Galveston Ocean) Engineering Week

Project Leader: Dr. Elizabeth Turner and Ms. Daisy Duerson, University Outreach

Type of Program: Residential Program

Synopsis:

Texas A&M University at Galveston hosted 20 high school students in an inaugural engineering summer program called GO (Galveston Ocean) Engineering Week in June 2009. The students lived in campus housing and participated in a variety of engineering and college preparation activities including Galveston Harbor tours, table talks with Texas A&M University at Galveston former students and engineering faculty, a field trip to the Ocean Star Oil Rig museum, Math Olympics, building circuit boards, and a design project for a Remote Operated Vehicle. Besides experiencing campus life firsthand, students also completed a college math placement test and a college planning workshop.

Program Content:

The curriculum for Galveston Ocean Engineering Week ("GO Engineering Week") reflected engineering from Texas A&M University at Galveston's uniquely water-oriented perspective.

As we have during our previous five summer engineering programs, we used the plans for a PVC ROV submersible described in the book *Build Your Own Underwater Robot and Other Wet Projects* by Harry Bohm and Vickie Jensen. MIT has posted a sample of these plans, the Sea Perch ROV, online at http://nereides.mit.edu/seaperch/. Since the full ROV construction requires about 40 hands-on hours, we pre-constructed portions to allow the students some hands-on experience with this machine. Two of the four teams were fully successful at completing an operational neutrally buoyant machine.

On the first day, each team of students was provided with a digital camera and a USB drive to use during the week. We challenged them to capture their experiences and impressions with a PowerPoint show presented to their parents and faculty on the last day. As part of teaching students how to prepare for the physical demands of college life, we provided an introduction to the campus gymnasium through demonstrations of sports gadgets (heart monitors, treadmills, pedometers, and ellipticals), followed by an opportunity to work out in the gym.

Faculty and staff working with "GO Engineering Week" strived to inspire and motivate, keeping things fun, but real. Mathematics was presented with games and a team competition culminating late on Thursday, in time to determine the awards presented at the Friday grand finale. The mathematics component emphasized algebra skills and the value of understanding mathematics.

On the final day, students delivered presentations before an audience of professional engineers, scientists, and parents. The students also had time to interview the engineers and scientists. This event was very well received by the students and provided an opportunity for students to comprehend the global reach of ocean engineering and science, as many of our faculty and former students work on projects far from the Galveston area. Students and parents participated in a college planning session using the THECB 4-Year Plan.

Texas A&M University–Kingsville

Engineering Summer Program 2009

Project Leader: Dr. Jianhong Ren and Dr. Muhittin Yilmaz, Department of Environmental Engineering

Type of Program: Day Program

Synopsis:

A total of 32 high school students enrolled in the program. Students were divided into eight teams and worked on a different project each day. Topics included four engineering projects (river pollution, computer technology, bridge building, and wax sculpting) and four technical activities (air pollutant measurements, miniature hybrid car, robotics, and hydrostatic measurements). Competitions were held every morning, a field trip was arranged Friday morning, information on university application process, financial aid system, and scholarship opportunities was provided to parents/guardian Friday afternoon. Departmental presentations and luncheon discussions with professional engineers were conducted each day. Daily and comprehensive program evaluations were conducted.

Program Content:

- Student team competitions: The teams of the program competed on four competition projects extracted from the engineering projects.
- Project presentations: notebooks and poster presentations were prepared by each team to document all program activities, especially the four engineering projects. The notebooks and posters were evaluated by all program students on Friday and were made available for all guests who attended the Friday afternoon session.
- Industry site visits: a field trip to DCP Natural Gas Plant, Falfurrias, TX. During this trip, YESTexas students were introduced to the engineering design, operation, and management of a gas plant in South Texas, important safety procedures in engineering applications, and an opportunity to interact with professional engineers.
- Panel or luncheon discussions with professional engineers: professional engineers from Celanese Bishop, Texas Department of Transportation (TxDOT), DCP Midstream, and Nueces Electric Cooperative, Inc. met the program participants during lunch time, presented their perspectives on choosing an engineering career, and discussed the nature of and requirements for engineering jobs.
- Parent/guardian information that covers the Texas university application process, financial aid system, and scholarship opportunities: an information session was given Friday afternoon by the TAMUK admission and financial aid offices. Students and their parents received information regarding college application, financial aid, and scholarships.
- Other: luncheons were sponsored by TAMUK Career Services, TAMUK Special Programs, TAMUK President's Office, TAMUK Frank H. Dotterweich College of Engineering, and TAMUK CREST-RESSACA Center Monday through Friday. Students were introduced to a variety of services available at TAMUK for undergraduates that will assist each student to be successful during their undergraduate education. Department program information was provided Tuesday and Wednesday morning.

The curriculum included laboratory flume, computer architecture (hardware components), mechanical engineering design, computer aided design, manufacturing, air pollution measurements, hydrostatic measurements, hybrid car functionality, and robotics.

Texas A&M University–Texarkana

Robotics Program for Middle and High School Underrepresented Students with Emphasis in Role Models

Project Leader: Dr. Raul Cruz-Cano and Dr. Victor Govindaswamy, Department of Electrical Engineering and Computer Science

Type of Program: Day Program

Synopsis:

The program consisted of a week-long robotics program for twenty-four middle and high school students, mostly underrepresented minority/female students. Special attention was paid to have appropriate role models available. The program was held from August 10 to August 14. Only the twenty-four applicants with the best scores in their letters of recommendation were accepted into the program and received a stipend of $100, after the successful completion of the program. The program consisted of sessions in which the participants learned to assemble and program LEGO NTX Robots along with the necessary mathematical skills.

Program Content:

The short term objectives was to teach the participants to assemble and program the LEGO NTX Robots and cover the mathematics related to the design of robots. The long term objective was to improve their confidence and interest on engineering by providing them the opportunity to successfully complete and compete using the robots.

- Monday
  - Team formation and basic math (3 contact hours)
  - Introduction to the NXT Robot and its parts (3 contact hours)
  - Introduction to basic system programming (3 contact hours)
- Tuesday
  - Word problems, e.g. “Speed versus Torque” and “Gear Ratios” (3 contact hours)
  - Advanced Programming (Repetitive and conditional structures, functions, etc.) (3 contact hours)
  - Drag racing and tug of war (3 contact hours)
- Wednesday: programming using sensors
  - Line following using the light sensor (3 contact hours)
  - Stop before crashing using the ultrasonic sensor (3 contact hours)
  - Move after a clap using the sound sensor (3 contact hours)
- Thursday: programming using sensors
  - Reverse direction after touching the wall using the touch sensor (3 contact hours)
  - Preparation for the final competitions (6 contact hours)
- Friday
  - Final competitions (4 contact hours)

During lunch each day, participants were given the opportunity for counselors to share their experiences studying engineering.

Texas Tech University

Run on the Wind

Project Leader: Dr. A. Dean Fontenot and Ms. Martha Hise, Texas Tech T-STEM Center

Type of Program: Residential Program

Synopsis:

Students explored the power of the wind and the means by which we harness it. They measured the wind, learned the basics of turbine design, and tested their wind turbine. They learned what academic skills are necessary to succeed in this important emerging field.

Program Content:

The curriculum was based around wind energy and engineering. Session topics and activities included:

- Principles and physics of wind to electricity
- Environmental considerations in wind power
- Atmospherics and meteorological aspects of forecasting wind power
- Wind turbine design considerations
- Building a wind turbine
- Wind sailing at Reese Technology Center
- Wind tunnel demonstration
- Model Turbine Project competition

The program goals were to provide students with information regarding:

- Interdisciplinary nature of wind science
- What careers are possible with a degree in wind science
- What academic skills are necessary to succeed

The University of Texas at Austin

"Introduction to Engineering" Summer Programs – The University of Texas at Austin

Project Leader: Ms. Andrea Ogilvie, P.E., Equal Opportunity in Engineering Program, and Ms. Tricia Berry, MBA, Women in Engineering Program, Cockrell School of Engineering

Type of Program: Residential Combined (more than half of the students resided on campus)

Synopsis:

The "Introduction to Engineering" summer programs provided 170 high school students with the opportunity to explore engineering through hands-on, technology, and engineering-based team projects. One week of the program (June 9-13) was a day program and two weeks (June 7-12 and June 14-19) were residential programs. Participants attended interactive workshops that introduced various engineering disciplines and the college admissions process. Participants were exposed to engineering role models and established an ongoing support network and a connection to university resources. The ERP-ESP grant was used to support 50 students during week one of the "Introduction to Engineering" programs residential program.

Program Content:

- Engineering Sessions**:** Faculty members from each of the 7 engineering departments (Aerospace, Biomedical, Chemical, Electrical/Computer, Civil/Architectural/Environmental, Mechanical, and Petroleum) led engineering sessions that gave participants an overview of the engineering major and included information about career options. Students witnessed demonstrations, participated in hands-on activities, and toured engineering labs.
- Student team competitions: Student teams participated in design competitions where they were required to design, build, and test varying engineering products to meet given specifications under budget constraints. Student teams prepared business proposals and developed problem-solving skills to come up with cost-effective designs.
- Project presentations: All team participants were required to create and present a PowerPoint presentation as well as a skit of their product in front of an audience of industry judges.
- Luncheon discussions: Our "Lunch with an Engineer" event brought approximately 20 industry volunteers from various companies to have lunch with students and encourage them to pursue engineering as a career. After lunch, volunteers served on an industry panel where they informed participants about various career paths available to engineering majors and shared information about the benefits of an engineering degree.
- Student Panel: Engineering students from a variety of majors and academic levels provided insight into their personal and academic experiences at UT Austin through a student panel. This session allowed participants to ask questions regarding course work loads, funding college, living on campus, and being a college student. Participants learned about the type of commitment involved in pursuing a degree in a highly technical field such as engineering.
- Parent/Guardian Session: Parents were invited to an information session/orientation at the beginning of the program. Led by the EOE Director, EOE Academic Coordinator, and a UT Austin Freshman Admissions Counselor, parents were informed of the steps their child should take when applying for admissions, housing, and financial aid. Information about Cockrell School of Engineering resources and academic programs was also shared.

The University of Texas at Brownsville and Texas Southmost College

E.T. at UTB/TSC "Engineering Teens" Summer Program 2009

Project Leader: Dr. Peter B. Gawenda, College of Applied Technology and General Studies, and Dr. Apolinar Zapata, Department of Mathematics

Type of Program: Day Program

Synopsis:

The E.T. at UTB/TSC "Engineering Teens" Summer Program 2009 program was designed to serve a cohort of 20 female students attending high schools in the Brownsville area.

A total of eight hands-on activities, using PITSCO equipment and supplies, were performed to introduce the participants into basic theories and applications for engineering, math, and science.

The activities were supported with two industrial visits and two professional talks. An additional important key in this program was the contribution of two science high school instructors and three UTB undergraduate engineering students, for their participation in coaching and motivating the participants into engineering fields.

Program Content:

- Student team competitions: participants competed in designing the bridge supporting the maximum load, in designing the fastest dragster, and in moving objects with a hydraulic robot arm made with syringes.
- Project presentations: at the closing ceremony, the participants did a presentation of the projects to their parents and friends.
- Industry site visits: participants visited two companies. They visited Premier Trim LLC (http://www.premiertrim.com/index2.htm), which is a manufacture for wooden steering wheels. They also visited Keppel AmFELS Inc (http://www.floatec.com/), which is dedicated to the design, construction, and repair of mobile drilling rigs and platforms. Program participants were fascinated by both the production processes and the complexity and huge size of the platforms.
- Presentations by professional engineers: Two professional engineers presented interesting talks to the participants. Jose Armando Garza, Chief Water Operator for the Southmost Regional Water Authority, presented a talk in which he explained in detail, supported with pictures, the desalination process at the desalination plant for the Public Utilities Board at Brownsville. William Wells, a retired engineer and retired engineering professor, presented a talk which purpose was to encourage participants to make good choices in their life, also he pointed out several arguments about why engineering is a good career to take on.

The curriculum included building a model trebuchet (force, motion, rations, inertia, friction, data analysis and prediction, design), hydraulic robotic arm (Newton's laws, load and effort force, levers, hydraulics), wind generated electric energy (soldering, Ohm's law, semiconductors, circuits), solar car and CO2 car (aerodynamics, friction, gear rations, metric measurements, tolerances, inertia), and bridge design (strength, statics, design).

The University of Texas at Dallas

Electrical and Computer Science Academic Bridge Program (ECS-ABP) Summer Program

Project Leader: Dr. Simeon Ntafos and Dr. George Fair, School of Engineering and Computer Science

Type of Program: Residential Program

Synopsis:

The Electrical and Computer Science Academic Bridge Program (ECS-ABP) Summer Program enrolled 40 students who were to enter the 12th grade and expressed an interest in entering a university with a major in engineering or computer science. This was a five day residential program which focused on engineering and computer science activities, visits to UT-Dallas laboratories and programs, university applications and financial aid procedures, leadership activities and career explorations. The project included project-based learning, using the Lego Mindstorms Platform, a full day visit to the CISCO corporation regional headquarters, and mentoring with current Academic Bridge Program students.

Program Content:

- Student team competitions: These were conducted by means of a BeyBlade Tournament and Ultimate Challenge activities. (BeyBlade is a spinning top developed and manufactured by Takara.)
- Project presentations: by individual program participants.
- Industry site visits: All program participants traveled to the regional headquarters of the CISCO corporation for presentations and demonstrations of CISCO equipment, and products, and research.
- Panel or luncheon discussions with professional engineers and scientists: Each day UT-Dallas professors or researchers presented a variety of engineering fields and responded to questions from students.
- Parent/guardian information that covers the Texas university application process, financial aid system, and scholarship opportunities: Each participant and his/her guardian or parents attended a summer program orientation session at UT-Dallas and other information was provided to each student.
- Mentoring sessions with advanced students: Advanced Academic Bridge students and students majoring in engineering and computer science were available for multiple interactions with participants.

The curriculum included career networking, diversity and careers, engineering opportunities, college admission and financial opportunities, the admission essay, and nanotechnology research.

The University of Texas at El Paso

Engineering Summer Program 2009

Project Leader: Mr. Gabriel Gándara, Department of Undergraduate Studies and Engineering Education Research

Type of Program: Day Program

Synopsis:

The ExciTES Summer Institute delivered a one-week residential session to the general public. Various partners supported the identification and ultimate recruitment of students that attended and participated in activities and modules on the UTEP campus. Activities and modules were structured to be team-based and inquiry-based and were facilitated by undergraduate engineering and education majors. There was a total of 35 contact hours for this program.

Program Content:

- Student team competitions: activities/modules were designed to create a competitive nature between student teams. For the larger activity, the Cardboard Canoe, teams consisted of three to five students.
- Project presentations: team and individual presentations occurred formally and informally throughout the program.
- Field trips: students took field trips around campus, e.g. to the library and the museum.
- Panel or luncheon discussions with professional engineers and scientists: lunch was structured to have engineering student facilitators to sit and chat with student participants for every day of the program.

The curriculum included a GPS hunt, chemistry, cardboard canoe (buoyancy), hot air balloon, straw tower, egg drop, popsicle stick bridge, computer hardware assembly, alarm clock, and solar cooker.

The University of Texas at Tyler

RISE 2009 - East Texas Research Involving Student Engineers Project

Project Leader: Dr. James K. Nelson Jr., and Jennifer H. Scott, College of Engineering and Computer Science

Type of Program: Residential Program

Synopsis:

Planned engineering activities with faculty, coordinated high altitude balloon experiment, and submersible robotic craft design activities with facilitators. Arranged field trip to NASA Columbia Scientific Balloon Facility and Trane Company Research Laboratory. Arranged evening activities including pool recreational time, basketball, games. Arranged presentation on college admissions, honors program, CECS Advising. Coordinated meals, snacks, dorm, classroom, and lab facilities. Advertised event. Reviewed applications, distributed scholarships. Prepared and reviewed submission of necessary forms and releases. Interviewed and hired student assistants. Successfully carried out week long residential program. Arranged reception last day for presentations to parents. Ordered materials as needed. Participant evaluations completed.

Program Content:

- Student team competitions: Students worked in competitive teams during morning activities, racing robots, designing bridges with specific constraints, designing balloons out of plastic bags and lifted by "hair dryer power." Students worked in week long assigned project teams on their high altitude experimental design and capsules, as well as their submersible robots.
- Project presentations: The student teams prepared a poster display of either their robot or capsule for the RISE and DIVE activities. These projects were displayed during a parent reception Friday afternoon concluding the week's activities.
- Field trips: The students participated in a field trip to the NASA Columbia Scientific Balloon facility where they saw "Mission Control," a film about world-wide coordination during balloon launches. They visited with engineers and scientists.
- Industry site visits: The students visited the Trane Company Residential Systems Research Laboratory where air conditioners are tested, e.g., in heat and cold, for noise emission, and for adequate protection during shipping.
- Panel or luncheon discussions with professional engineers and scientists: Students had the opportunity to interact with faculty and engineering students during the departmental sessions in each morning session.
- Parent/guardian information that covers the Texas university application process, financial aid system, and scholarship opportunities: Students attended information sessions for the college application process—including visiting schools and finding a good "fit", applying for scholarships and financial aid, appropriate preparation for engineering and computer science degree programs during high school, and information regarding our Honors Program.
- Other: Students had an opportunity to visit and have recreational time with other students who were exploring college and career opportunities with them.

The curriculum included buoyancy and heat transfer, programming of Lego Mindstorms robots, fiber optics, circuits and chip design, load bearing bridge models, failure of concrete and masonry, soldering, robotics, and balloon capsule design, construction, and testing.

The University of Texas-Pan American

PREP Plus+

Project Leader: Dr. Stephen W. Crown and Dr. Javier Kypuros, Department of Mechanical Engineering

Type of Program: Residential Program

Synopsis:

PREP Plus+ provided 43 students of the 2nd and 3rd year of Texas Prefreshman Engineering Program (TexPREP) with a one-week on-campus residential experience. During this week their regular TexPREP curriculum was enhanced with the course Introduction to Vehicle Dynamics. Students built battery-operated and scaled cars that were instrumented with sensors and microcontrollers measuring vehicle acceleration. While on the UTPA campus, students participated in campus life activities. Up to 20 eligible participants will be provided scholarships by the UTPA TexPREP program to take a 2-hour college credit Engineering Graphics course during the summer of 2010 while they return for their final year of the TexPREP program.

Program Content:

The Introduction to Vehicle Dynamics course was taught over five morning sessions, while program participants continued with their regular TexPREP instruction during the afternoon. The course introduced students to engineering principles associated with analyzing, designing, modeling, and measuring vehicle dynamic responses, while using basic algebra, geometry, and physics. Students built battery-operated and scaled cars that were instrumented with sensors and microcontrollers measuring vehicle acceleration. Materials used included a kit car with DC electric motor and instrumentation to measure and plot vehicle velocity and acceleration.

The curriculum included:

- Monday: basic dynamics
- Tuesday: modeling and simulation
- Wednesday: manufacturing
- Thursday: measurement and instrumentation
- Friday: experimentation and bracket racing

The University of Texas of the Permian Basin

UTPB Academy Engineering Summer Program 2009

Project Leader: Dr. Raj Desai and Mr. Reynaldo Lascano, Department of Continuing Education

Type of Program: Day Program

Synopsis:

Through the UTPB Academy Engineering Summer Program students were able to learn the value of team work through competitions and presentations. The students also obtained an insight into college life by being on campus and using the university's resources such as computers and the library. Projects allowed the students to find new and creative ways of making something work just like an engineer would in real life and professionals gave informative speeches about the engineering careers available.

Program Content:

Activities emphasized working cooperatively while developing problem solving and critical thinking skills. Hands-on activities taught students how to measure wind speed, calculate RPM, and determine optimum pitch angles. Along the way, they learned how to test, evaluate, and solder. Better study skills and time management were also stressed upon by following schedules and setting deadlines by which the students had to present their project. In addition, students gained valuable information about the University's admission process, financial aid applications and scholarship opportunities.

- Student team competitions allowed the students to test the durability of their finished product and the innovative designs of the other students.
- Project presentations were a part of everyday so that the students were able to share their findings and present their results to other teams.
- Panel or luncheon discussions with professional engineers and scientists were made available to students to enlighten them about engineering possibilities. Dr. Stephen Nelson discussed the basics of science and engineering, Robert Martinez spoke about the importance of math to engineers, and Garnet Cameron discussed the world energy outlook and nuclear power.
- Parent/guardian information that covers the Texas university application process, financial aid system, and scholarship opportunities: Tony Love spoke to the students about career opportunities and Robert Vasquez discussed the different kinds of financial aid available to students in order to take advantage of those career opportunities.

The curriculum included the philosophy and history of engineering, engineering ethics and professionalism, engineering principles and the engineering workplace. The curriculum also included project design, timeline, analysis, business plan, and presentation. It included circuits, LEDs, solar cells, wind energy, and other energy devices and generators. It included fluorescent light, energy efficient motors, variable frequency drives, and continuously variable transmissions. House design by means of a CAD design.

University of North Texas

Game Design and Development for Xbox 360 Summer Program

Project Leader: Dr. Robert Akl and Mr. David Keathly, Department of Computer Science and Engineering

Type of Program: Day Program

Synopsis:

The University of North Texas hosted a one-week game design and programming summer program for 20 high-school students. The dates of the program were July 6 to July 10. Enrollment and registration was done online through the program website at "http://capstone.cse.unt.edu/robocamp/." The program filled up very quickly after it started to accept applications in April, and project leaders decided to host two more programs from June 22 to June 26 and from July 20 to July 24. The two later programs were funded by the Texas Workforce Commission Summer Merit Program. All three programs were filled to capacity. We submitted data for 29 students that benefited from the ESP grant from all three programs.

Program Content:

The program met every day for 5 days from 9 a.m. to 5 p.m. The program was organized around team- and project-oriented activities that utilized a number of resources, including laptops, XNA Framework (which was provided by Microsoft for free), and Xbox 360 gaming consoles. The curriculum consisted of open-ended projects that produced observable behaviors and allowed students to explore beyond the limits of the defined exercises. By using gaming as the backdrop, students learned coding and programming principles and developed an understanding of the role of physics and mathematics in game design, including car-racing games, side-scrolling platform games, and role-playing games. Even though the students were provided with templates that they modified, they were able to change many aspects of the games, including graphics, sound, physics, scoring, and objectives. Being able to "play" the games provided tangible means to see the results of their programming. Students made presentations and were asked to justify their design decisions. Teams also competed against each other; not only in trying to see which team had the better game but also in playing the games that they developed.

Working in a team environment encouraged the program attendees to make individual contributions to the overall success of their efforts, regardless of whether their individual strengths lie in problem analysis, game design, development, or programming. By the end of the program, students had an understanding of what computer science, computer engineering, and software engineering mean and what careers in those fields might entail.

The last day of the program, the parents were invited to attend the presentations and demonstrations of each student's game design. The parents took pictures and videos and several students made copies of the game files to be able to show them to their friends at home.

The curriculum included programming in X# with XNA framework, game customization by modifying levels, tiles, and backgrounds and by adding and changing sound, player animation, modifying objectives and scoring, modifying characters, working with combat and AI, game graphics, items, and quests, modifying textures and tracks, level design, car physics.

West Texas A&M University

Engineering Summer Program 2009

Project Leader: Dr. Freddie Davis and Ms. Rhonda B. Dittfurth, Department of Engineering and Computer Science

Type of Program: Residential Program

Synopsis:

We accepted 153 students to the program and 149 completed the week. Program participants were exposed to a variety of engineering aspects and ideas as well as many hands-on opportunities for them to work with projects. They had 13 types of engineering sessions, six engineer speakers, one field trip, and one race car session.

Program Content:

- Student team competitions: these were conducted in the L.E.A.N. manufacturing sessions and in the combustion and rocketry sessions.
- Field trips: all program participants traveled to Palo Duro Canyon to study soils, erosion, and environmental engineering.
- Panel or luncheon discussions with professional engineers and scientists: each morning began with a professional engineer from a variety of engineering fields speaking to the all program participants and answering student questions. Speakers covered mechanical, civil, environmental, electrical, and aerospace engineering. One speaker spoke about the necessity of good communication in engineering.
- Parent/guardian information that covers the Texas university application process, financial aid system, and scholarship opportunities: each program participant attended a session that covered college preparedness, and that included academic and enrollment opportunities. Information to take home was provided to each student.

The program exposed students to a variety of different types of engineering and a variety of academic skills required for engineering. The following sessions were offered to participants:

- Bridge building
- Combustion
- Algorithms
- L.E.A.N. manufacturing
- C.A.D.
- MatLab
- Structural engineering
- Library research
- Solar energy
- Wind energy
- College prep
- Soil engineering
- Museum tour of the energy exhibit

A mechanical engineering session showcased four different types of race cars and one Smart Car. Students saw and listened to the engines. Engine and car designers spoke about car motors, fuel systems, and car bodies.