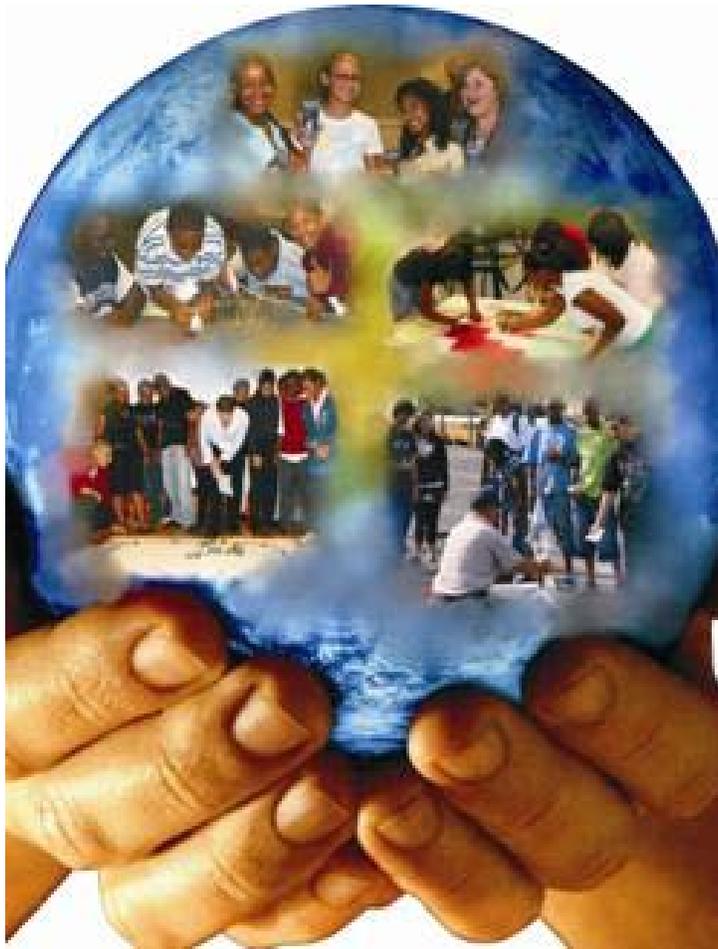


Final Report 2010



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-Dr. Richard A. Aló
Houston PREP Director

-Sangeeta Gad
Houston PREP Coordinator

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PURPOSE AND GOALS

The Houston Prefreshman Engineering Program (Houston PREP) is an academically, intense, mathematics-based summer program, which stresses the development of abstract reasoning and problem solving skills.

The purpose of the program is to identify achieving middle and high school students with an interest in science, technology, engineering and other mathematics-related areas and to increase their potential for careers in these fields.

The goals of the program are to increase the number of competently prepared students from Texas who will ultimately pursue engineering, science, technology, and mathematics studies in college and to increase the retention rate of these students as they progress through college by:

- acquainting these students with professional opportunities in engineering;
- reinforcing the academic preparation of these students at the secondary school level; and
- creating an environment in which talented students are encouraged to learn, explore, achieve, and discover.

This year we continued with Houston PREP Academy. Our new program for fourth year prep students fully accomplishes the goal of preparing our students for college by enrolling them in two actual college courses from the University of Houston-Downtown. These dual credit courses expose them to the college environment and give them valuable experience. Students gain high school credit as well as 6 college credit hours from the University of Houston-Downtown jump starting their studies and bringing them closer to their future success.

During the summer of 2010, Houston PREP freshmen Enrichment Program celebrated twenty-two years of operation. Two hundred and ninety-four students completed Houston PREP, among whom, over 90.3% were female or from an underrepresented minority group.

To date, PREP has enrolled more than thirty-three hundred students. In our most recent follow-up survey of college-age PREP participants, of those who responded, their high school graduation rate is 99.9%. In this surveyed group, 94% are college students or college graduates; over 49% of them are enrolled in STEM fields.

LETTER FROM THE DIRECTOR

Through the Houston PREP Program, the Center for Computational Science and Advanced Distributed Simulation (CCSDS) is doing its part to respond to the dwindling number of students entering careers in Engineering, Mathematics, and Science, which are occurring on a national scale. Notably, the increasing number of economically and socially disadvantaged groups in our population are not looking to these fields as viable options. Houston PREP is designed to encourage students from these groups to follow these career opportunities. Moving forward into the next decade without such efforts, our nation is risking its leadership role in the high technology society that we have developed.

Programs such as Houston PREP are making a difference. The people and organizations that support it are the backbone of this development. We extend our sincerest thanks to all of you.

Richard A. Aló,
Program Director, Houston PREP
Executive Director, CCSDS

Sangeeta Gad
Coordinator, Houston PREP
Director for Recruitment and Retention,
CCSDS

2010 Houston PREP Personnel

PROGRAM DIRECTOR

Dr. Richard A. Aló, Executive Director, *CCSDS*

PROGRAM COORDINATOR

Ms. Sangeeta Gad, Director for Recruitment and Retention, *CCSDS*

CENTER STAFF

Marvelia Rocha, Coordinator, *CCSDS*

Orlando Huerta, Assistant, *CCSDS*

Lilian Antunes, Assistant, *CCSDS*

Duber Gomez-Fosenca, Assistant, *CCSDS*

PROGRAM INSTRUCTORS

Sarah Alvanipou – Applied Sciences Instructor – Houston Community College

James Bourgeois – Engineering Instructor – Professional Engineer

Derek Clack – Algebraic Structures Instructor – Aldine ISD

Ingrid Conway – Statistics & SAT PREP Instructor – Spring ISD

Carol Cooper – Problem Solving & SAT PREP Instructor – Alief ISD

Hooman Hemmati – Computer Science Instructor – Graduate Student

Anagha Machado - Problem Solving & Technical Writing Instructor – Houston ISD

Silvester Morris – Logic Instructor – Galena Park ISD

Shirley Oliver – Logic & Problem Solving Instructor – Sheldon ISD

Ralph Polley – Logic & Computational Science Instructor – Houston ISD

Ashfaqr Rehman – Physics Instructor – Houston ISD

Heather Schexnader – Problem Solving Instructor – Crosby ISD

Emmanuel Usen – Engineering Instructor – University of Houston-Downtown

Gwen Vastine – Infinity Project Instructor – Private School

Monica Woods – Logic & Problem Solving Instructor – Alief ISD

PROGRAM ASSISTANTS

Jerome Stephens 1A

Byron Jackson 1B

Clifford Sherrad 1C

Scotty McKinley 1D

Samantha Fuentesvilla 1E

Iris Mendez 2A

Reinaldo Mohammed 2B

Sherman Kuan 2C

Fatu Conteh 2D

Peeya Islam 3A

Katrina Bullock 3B

Kaleigh Ceaser 4th Years

Rafael Ortiz 4th Years

Halit Dilbert HCC

Marlon Bonilla HCC



PREP ACADEMIC CURRICULUM

First Year

Logic and Its Application to Mathematics
Introduction to Engineering
Computational Science/ Problem Solving
Infinity Project

Second Year

Engineering
Linear Algebra/ Algebraic Structure
Physics
Computer Science

Third Year

Technical Writing
Statistics
Engineering
SAT
Robotics

Fourth Year

Houston Prep Academy Duel Credit:
Introduction to Psychology (UHD PSY 1301)
Introduction to Computer Technology (UHD CS 1305)



Fourth year students at the Houston PREP 2010 Awards Ceremony

SCHOOL DISTRICTS

The participating school districts PREP students attend in Houston and surrounding areas are as follows:

- Aldine ISD
- Alief ISD
- Crosby ISD
- Cypress Fairbanks ISD
- Fort Bend ISD
- Galena Park ISD
- Goose Creek Consolidated ISD
- Houston ISD
- Humble ISD
- Klein ISD
- North Forest ISD
- Pasadena ISD
- Sheldon ISD
- Spring ISD
- Spring Branch ISD
- Private School

PROGRAM EVENTS

- MAIN EVENTS:

June 3 PREP Orientation

June 4 PREP Orientation for Houston Community College Location

June 7 PREP Opening Day

June 18 Field Trips: Museum of Natural Science, Holocaust Museum

July 9 Engineering Day

July 10 Field Trips: University of Houston; Texas Southern University

July 14 Final Examinations

July 15 Houston PREP Talent Show

July 16 Awards Ceremony



Mrs. Gad welcoming parents and students during orientation.



Dr. Alo speaking to parents and students at the Houston PREP Awards Ceremony.

Houston PREP Highlights

- **Opening of our HCC location**

This year we are proud to introduce a new, and hopefully continuing, partnership between Houston PREP and Houston Community College-Northwest. HCC was kind enough to offer us space to open up another location on their campus. This location was selected in order to accommodate those students in the outer school districts and expose them to Houston PREP. Through continuing support from our sponsors we hope to open up multiple locations all around Houston with UHD being the central hub of Houston PREP.



PREP instructor, Monika Woods, welcoming students and parents at HCC 's Orientation.

- **Students learn new programming language**

Second year students were introduced to a new programming language, Scratch, in their computer science class. The Scratch programming environment, developed by MIT, was used to teach basic computer programming concepts to PREP students. Scratch is free and easy to install. The well rounded set of programming instructions available are helpful in teaching programming principals, such as logic and variable manipulation, while connecting these concepts to visually responsive components. Students did programming of the behavior of objects called sprites. The sandbox like nature of the environment allowed students to experiment and integrate knowledge from other courses as well. A great example was a group of students that applied formulas from their physics course in order to program the behavior of a jumping character in their game.

▪ FIRST YEAR:

Students new to Houston PREP embarked on a journey of new and exciting fields of study that included engineering, problem solving, logic, and computer science as a curriculum. Having never been introduced to the engineering basics, students were intrigued as they analyzed problems and came up with creative solutions. This year, the student activities incorporated the construction of engine model rockets. Students learned about the basic components needed to construct a rocket and the science behind rocket propulsion. When the



students had the opportunity to launch the model rockets, they also had to measure the altitude of the rocket using trigonometry. In another project, the students had to design an apparatus that will allow an egg to drop off a three story high building without cracking or breaking. First year students also had an opportunity to learn about how math and science can be applied to real life applications in the Infinity Project. During this program the students were able to construct a working sound speaker out of a magnet, copper wire, and paper.

▪ SECOND YEAR:

The second year students got the opportunity to construct a bridge using balsa wood. These model bridges were tested on the basis of their strength, durability, and resistance to an exerted force. Students also completed a second engineering project that consisted of devising a mousetrap racecar. These were then graded based on distance traveled and aerodynamic design. This experience helped students understand and apply the dynamics behind precise measurements and accuracy in engineering design. In order to understand these concepts better, students also took a course in physics. This course introduced the elements of velocity, friction, gravity, projectiles and vectors. Physics is a necessity for anyone pursuing a science, technology, mathematics, or engineering career and will help prepare students for future advanced courses.



• THIRD YEAR:



The engineering component of the third year curriculum consists of a tradition hands-on application Houston PREP students await for each year. Students construct three different model houses using balsa wood and tiny pins. In groups, students measured, cut, and assembled their houses to match the specific design requirements they were assigned. This project lasted the duration of the program, and when completed, each house was graded for neatness, precision, and durability. This year we introduced Robotics as a new course in our curriculum for the third year students of Houston PREP. As a project, students had to design and program a robot using Lego's NXT Robotic Kit. The assignment was to program the robot to follow a black line along a model golf course, stop at two separate locations, and be able to knock two balls at their respective locations into a hole. Students got to learn how to use various sensors to carry out the task and the programming basics by learning about loops and "if statements." The students were graded on design, effectiveness of the program, and received extra credit if the robot made it in the hole.



▪ FOURTH YEAR:

Due to the success from last year, we were able to offer once again our dual credit program to all new 4th year students. Based on testing scores, students were eligible to enroll in either Intro to Psychology, or Intro to Computer Science, or both. Houston PREP is delighted to report to you the results of our second PREP Academy. The results are:

- 35 students completed Intro to Computer Science, CS 1305; 9A's, 19B's, 7C's
- 32 students completed Intro to Psychology, PSY 1303; 11A's, 11B's, 8C's, 2D's

These students were for the most part rising high school juniors and sophomores who, instead of taking our regular Houston PREP summer curriculum, were enrolled in UHD summer classes along with our UHD students.

These new PREP alumni will have an opportunity to continue with their classes at UHD as they build up academic credits towards their BS. As a reward for their hard work, CCSDS will prepare them for scholarship opportunities here at UHD if the student decides to continue their education here.

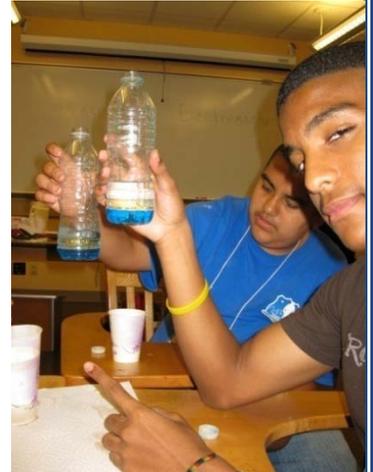
HOUSTON PREP STUDENTS PARTICIPATE IN EDUCATIONAL FIELDTRIPS

- First Years explored the wonders of the Museum of Health Science and toured the University of Houston labs.



The 1st Year classes attended a fieldtrip at the Museum of Natural Science and got the opportunity to learn about the past, present, and future through the different exhibits the museum had to offer. Students began the trip by learning about the Jurassic and Cretaceous periods and then moved on to explore marine and desert in the eyes of those animals that live in their respective regions. As the day went by, students shifted gears from learning about animals to learning about how diamonds are created from highly pressurized coal. In addition to learning about diamonds, students learned about the different techniques that are used to locate, drill, and refine oil both on land and at sea. The field trip was concluded with the screening of the Hubble Telescope in stunning IMAX 3-D presentation. Students got a close look at all the time, work, and money NASA invests to keep the famous satellite orbiting Earth. Students learned about the various repair missions and the different maintenance that is performed on the Hubble Telescope.

The first year students also attended the field trip to the University of Houston. Here students were divided into several groups and were able to visit various labs, research facilities, and as well as participate in several activities. Such activities included the construction of air cannon, learning how to analyze data and draw conclusions from evidence in a crime scene investigation activity, and learning about fluid mechanics in a density experiment done by stacking multiple liquids together.



- Second and Third Year Students learned about flight simulation at Texas Southern University and experienced life during the Holocaust



Houston PREP students visited Texas Southern University's Department of Aviation Science and Technology. Students learned how mathematics, science, and computer science are all incorporated in one of the fastest growing fields in the world. The students learned about airplanes, air traffic control, aerodynamics, and flight security. Towards the end of the field trip students were surprised to find out they would have the opportunity to experience firsthand how it is to fly a plane by using a state of the art flight simulation computer program in one of the labs at TSU.



Second and Third year students also had to opportunity to take a trip back in time to explore the World War II era by visiting the Holocaust Museum. Students learned about life before, during, and after the Holocaust. Inside, they got to learn about the horrors of genocide and what a country full of hate, prejudice and racism are capable of doing. At the museum, they also got to see a replica of the "Hanne Frank" which was a fisherman's boat from Denmark that would rescue the Jews from concentration camps in Germany. Students also viewed a life size replica of a rail cart that was used by Nazi's to transport Jews to their deaths in concentration camps.



ENGINEERING DAY

JULY 14, 2010



SHEP: Spaghetti Bridge project



KBR: Bridge building with tinker toy



Exxon Mobil: Dr. Jose Alvarez

Houston PREP had its 22nd annual Engineering Day on July 14th 2010. Once again, PREP was proud to have booked a whole day with presenters and representatives from companies in the industry. Engineering day is a way for students to take a look into the daily lives of scientists and engineers, and at the same time have fun with some of the challenging activities the presenters brought along.

One activity the students participated in, involved the design, planning, and construction of a bridge made out of spaghetti noodles. The bridge had constraints such as length, height, and weight. The objective was to build the most cost effective, but strongest bridge. At the end of the activity students got to see how strong their bridges were when the presenter started to apply force to the bridge by using weights.

Throughout the summer PREP students are required to build racecars, bridges and houses, out of balsawood in their engineering courses. At Engineering Day students had the opportunity to have their work showcased and were able to compete their mousetrap race cars with the other students from other classes. With an auditorium full of the PREP students and other Engineering Day attendees, the racecars competed until only one winner was left.



NASA presentation



Sim Vivo: Dr. Yash Gad



NASA: Planetary Sciences

PRESENTERS AT ENGINEERING DAY

Presenter	Title	Company	Activity
Todd Sullivan	Operational Excellence & Quality Manager	DHL Global Forwarding	Astronomy & Space Science presentation
George Salazar	Systems Engineer	NASA/JSC	Engineering Presentation
Dr. Jose Alvarez	Senior Analyst	Exxon Mobil	Presentation on Fluid Pressure Fields & Acceleration
Juniper Jairala	EVA Project/Test Engineer	NASA Johnson Space Center	Engineering Career Presentation
Ms. Laurie Y. Carrillo, PE	ES3/Thermal Design Branch Engineering Directorate	Johnson Space Center	Satellite and Rocket Presentation
Mr. Graham O'Neil	NASA Engineer	NASA/JSC	NASA Presentation
Dr. Yash Gad	CEO	SimVivo	Neuroscience Engineering Presentation
Jeremy Kemp, Stephanie Thames, Brian Holtkemp	Senior Students	University of Houston-Downtown	3-D Simulation
Dr. Byron Christmas	Professor, Natural Science Dept.	University of Houston-Downtown	Chemistry Lab Demonstration
Dr. Phillip Lyons	Associate Professor, Natural Science Dept.	University of Houston-Downtown	Biology Lab
Vanessa, Claudia, Maria, Nestor,	Undergraduate Students	Society of Hispanic Professional Engineers-University of Houston Chapter	Light bulb drop using Legos.
Fred Goodall, Jonathan Marda, Zerayacob Sermollo, Carolina Bre, David Qu, Alan Ping, Michael Grimm, Elaine Jimenez, Tracy Smith, Ken Wilson	Engineers	KBR	Created bridges out of tinker toys and tested strength and durability by adding weight to each bridge
Marco Stocco, Rocio Garcia, Julio Cabrera, Refugio Molina, Rafael Munoz	President, SHPE Flight Activity/ Attitude and Pointing, JSC	Society of Hispanic Professional Engineers / Johnson Space Center	Created bridges out of spaghetti and tested strength and durability by adding weight to each bridge

2010 HOUSTON PREP AWARDS CEREMONY



This year during the 2010 Houston PREP Closing Ceremony we had the honor of having Houston’s City Council Member Melissa Noriega as a guest speaker. She gave a speech on the important role of summer programs like Houston PREP and how these courses are the gate keepers to more academically challenging classes. After concluding her speech, she presented those students who graduated with certificates on behalf of the City of Houston.

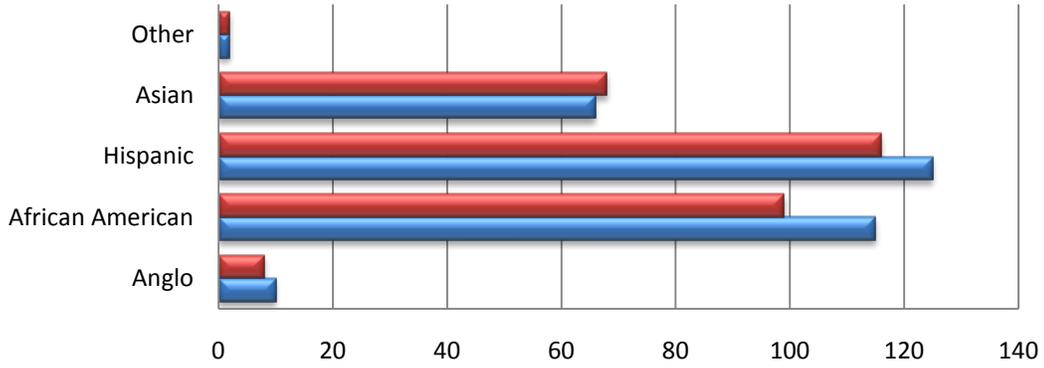
The 2010 Houston PREP Awards Ceremony held approximately 350 PREP parents, faculty members, and graduating participants. Each faculty member presented awards to the most exceptional student from his or her class. The Program Assistants also presented a citizenship award to those students from his or her class that showed great leadership skills and character by helping their fellow classmates. PREP Coordinator, Ms. Sangeeta Gad, then presented an award to the overall high-achieving student from each individual class.

CITIZENSHIP & OVERALL OUTSTANDING STUDENT AWARDS

Group	Citizenship Award Recipient	Overall Outstanding Student
1A	Jesus Aguirre	Sarah Young
1B	Isaiah Carter	Patrice Carmouche
1C	Ashlyn Everhart	Manaswi Marri
1D	Yi-Hsuan Ku	Praneeth Kambampati
1E	Jason Weilee	Jason Weilee
1-HCC	Hadiqa Memon	Adejetu Adenji
2A	Delia Gomez	Christina During
2B	Adrienne Simpson	Kimberly Perret
2C	Melissa Guerrero	Brittany Trinh
2D	Joseph Anthony	Puneet Singh
3A	Crisjo Jaimon	Rachel Adeneken
3B	Nathan Caldwell	Steven Luong

2010 PROGRAM STATISTICS

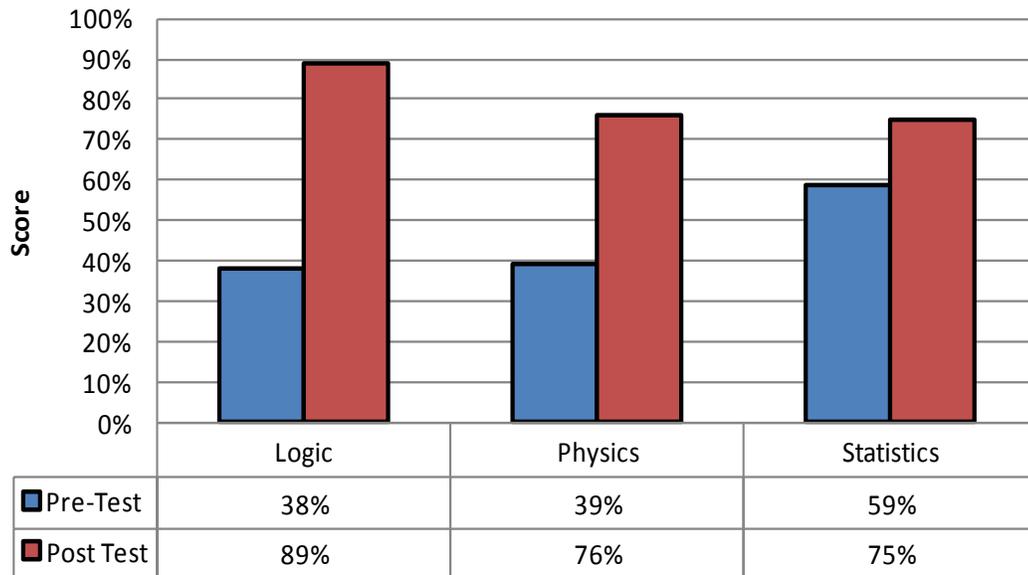
Started-Graduated Student Demographics



	Anglo	African American	Hispanic	Asian	Other
■ Graduated	8	99	116	68	2
■ Started	10	115	125	66	2

□

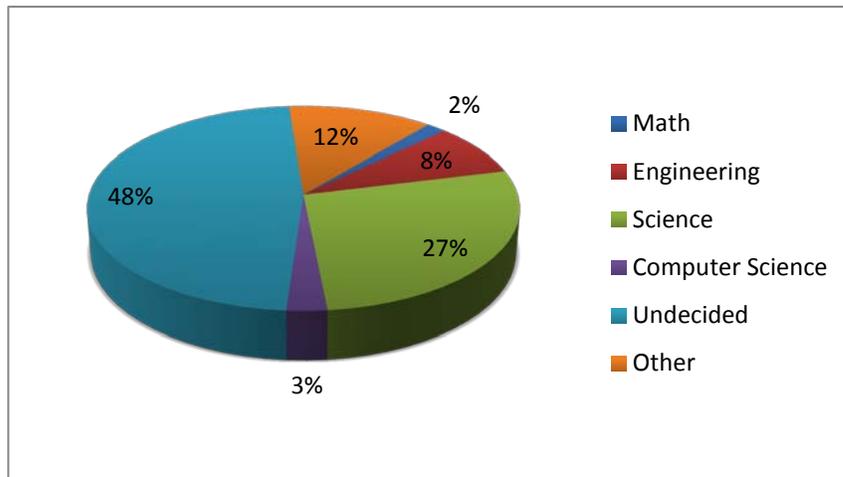
Student Improvement



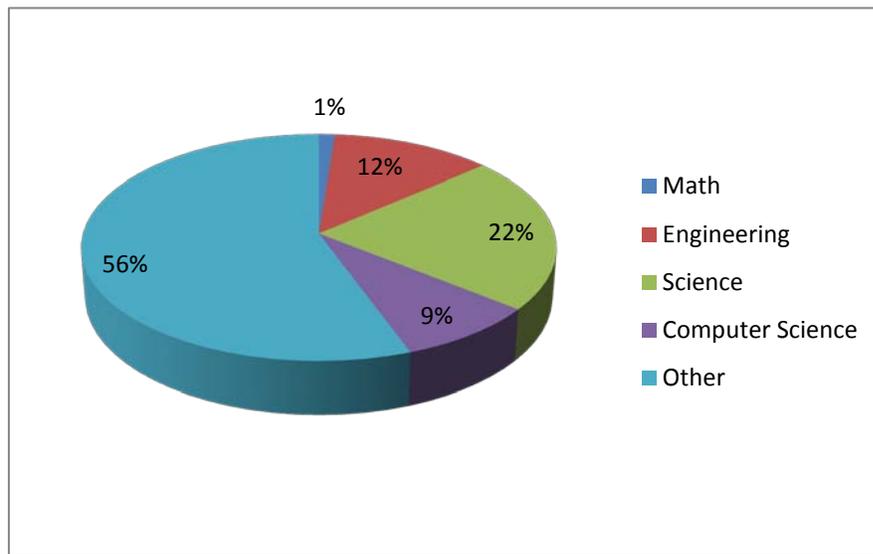
2008 FOLLOW UP SURVEY RESULTS

- 99.9% are high school graduates
- 99% are college students
- 49% of the senior college graduates are engineering, mathematics, science or computer science major

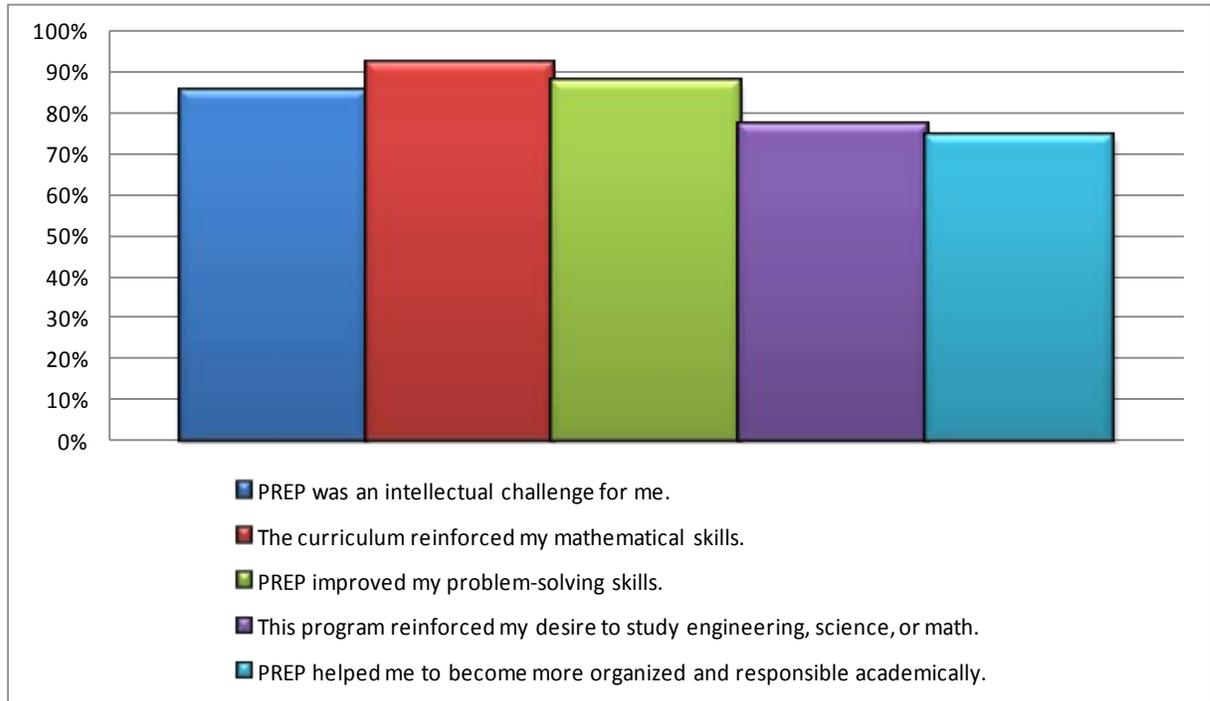
Former PREP Students - Currently In College



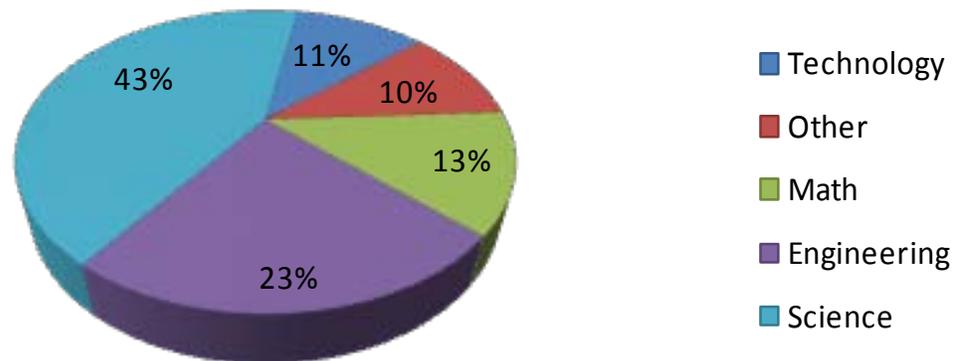
Former PREP Students – College Graduates



2010 STUDENT EVALUATIONS



PREP Student's Intended Field of Study





SPONSORS

Aldine Independent School District

Alief Independent School District

Center for Computational Sciences, UHD

Computer and Mathematical Sciences, UHD

Crosby Independent School District

Galena Park Independent School District

Houston Community College – NW

Houston Independent School District

Kellogg Brown and Root Foundation

Northrop Grumman Foundation

North Forest Independent School District

Project GRAD Houston

Sheldon Independent School District

Simmons Foundation

Spring Branch Independent School District

Spring Independent School District

State of Texas Legislature

TexPREP

University of Houston-Downtown