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WHAT DOES IT MEAN TO BE AN ENGINEER?

What do engineers do? *Webster's* dictionary defines engineering as "putting scientific knowledge to practical uses." In essence, engineers are problem solvers, thinking outside of the box to find creative solutions to challenges that confound the rest of us. Some solutions can be seen in everyday life, such as a bridge spanning a river. Others are literally out of this world, such as a spacecraft that will take us to Mars someday. Engineers must be good at visualization as well as science, because sometimes the key to solving a problem is seeing it in a new way. They have to be excited by details to the point where they're fascinating, not tedious. Engineers, more than most of us, truly understand the old saying, "The devil is in the details."

Barry Cordero, chairman of the board of the Society for Hispanic Professionals in Engineering (SHPE) and also a biomedical engineer, agrees: "A lot of times it's hard for kids to understand what we do, but our purpose is to find innovative solutions to common or unique problems, using science, technology and math."

It used to be that parents dreamed that their children would pursue careers in medicine or the law, so as to guarantee their financial security. It's time to add engineering to that list. According to the website Payscale.com, a petroleum engineer with three years or less experience can earn in the range of \$80,000-\$90,000 per year. This is considerably more than the average for other college graduates with three years in the workforce, which is just below \$40,000. And those salaries are just after three years. Beyond that, the sky is the limit.

"What we know is that engineers or those who study STEM (science technology, engineering and math), have an easier time finding jobs, and their starting salaries are higher," says Rafaela Schwan, vice president of programs and development for the National Society of Hispanic MBAs (NSHMBA).

But there is an acute need for more Latino and Latina engineers. *Engineering by the Numbers*, a study published by the American Society for Engineering Education (AIEE), reveals that 44,853 white men received engineering degrees in 2012, compared to 5,734 Latinos. Among women, 9,091 white women received engineering degrees compared to 1,614 Latinas.

"More Latinas are pursuing higher education than Hispanic males, but when it comes to STEM fields, Latinas make up only 1.5 percent of Hispanics working in STEM related industries, compared to



Latinos who make up 3.5-4 percent," says José Marquez, president of Latinos in Information Science and Technology Association (LISTA).

But that's where the growth is. The U.S. Department of Commerce reports that in the last ten years, growth in STEM-related jobs has been three times greater than in other fields. And in the next ten years, they are expected to grow by 17 percent, nearly double the growth in other fields.

Discussion Questions

1. Does your student show an interest in math and science?
2. Does your student look at things in creative ways?
3. Does your student like problem solving?
4. Does your student like to build things?
5. Do you know an engineer who could mentor your student?

WHAT ARE CAREERS IN ENGINEERING?

From airplanes to smartphones, from televisions to refrigerators, the work of engineers surrounds us. When we drive on the freeway, we're exposed to the work of civil engineers, who designed the roads, and mechanical engineers, who created the cars. We could also add petroleum engineers since you can't operate most cars without gasoline.

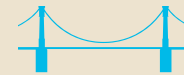
There are numerous engineering disciplines, but some of the most popular are:



Aerospace: take airplanes to the next level. Make spacecraft for a new era.



Agricultural: help feed the world with improved crop yields and more efficient machinery.



Civil: build better structures with innovative designs and materials.



Electrical and electronics: expand communication networks. Design and improve devices for the future.



Computer Software: create a program that revolutionizes modern life.



Chemical: harness chemical reactions for technology, biomedical, energy and environmental applications.



Nuclear: bring reliable power to more places.



Petroleum: fuel the future.



Mechanical: planes, trains and automobiles—design the machines that make modern life possible.

Engineering careers may also involve a commitment to education that may extend beyond a bachelor's degree. "Master's degrees reached another all-time high of 49,372 in 2012, up five percent over the previous year. This trend is expected to continue, with enrollment climbing this year for the eighth year in a row," according to *Engineering by the Numbers*. "Doctoral degrees increased by five percent in 2012 over 2011 to reach a new all-time high of 10,035—a 10 percent increase since 2008 and a 71 percent increase since 2003."

The U.S. Bureau of Labor Statistics *2014-2015 Occupational Outlook Handbook* cites biomedical, civil, environmental, and petroleum as the hot engineering specialties for the next ten years. Demand for medical devices, sustainability, public health issue solutions, compliance with environmental regulations, and new oil and gas resources are driving the demand for engineers in these areas.

Engineering jobs are also among the most satisfying. The search engine Glassdoor recently ranked careers based on factors like pay, work/life balance, opportunity for growth, and number of job openings. STEM fields accounted for 72% of the jobs.

Discussion Questions

1. Which engineering disciplines seem most interesting?
2. Which professions require an engineering background?
3. What current event or news story involves engineering?
4. Try to match five objects in your home with an engineering job.
5. Can you name any famous engineers?

WHY DOES AMERICA NEED ENGINEERS?

We live in a technological age and to remain a global leader, America must remain innovative. But in 2012, the U.S. Department of Labor reported that only five percent of U.S. workers are employed in fields related to science and engineering. However, they are responsible for more than 50 percent of our sustained economic expansion.

According to a White House study, the U.S. needs to graduate an additional 100,000 engineers a year to meet current demand and keep pace with other countries like China and India. The study cited developments in the areas of high-speed broadband, wireless networks, and new health care information technology. The Institute of Engineering and Technology has identified future trends in engineering as focusing on smart power grids, satellite enabled consumer services, a secure infrastructure for mobile data, 3D printing, food security, and robotics.

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"We need engineers to ensure that as a country, we are developing individuals who can contribute to and sustain America's place within a global economy as a leader in technology," says Raul Muñoz, executive director of MAES, Latinos in Science and Engineering.

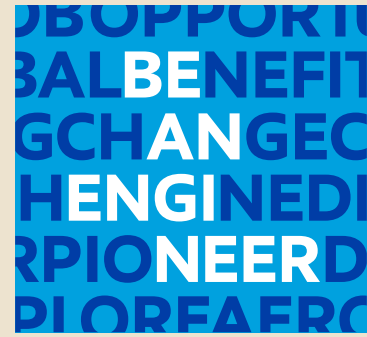
But engineering skills are also essential to a broad range of careers that involve national security. This includes service in the U.S. Armed Forces but also jobs in the fields of aerospace, computer science, communications and energy, to name just a few. The wars of the future may not be waged just on the battlefield but in cyberspace, and the latest in technology will ensure the safety of the young men and women protecting our country. Therefore, engineers not only keep our country prosperous, but also secure.

According to the U.S. Census, Latinos are the fastest growing and youngest group in the country. It is estimated that Hispanics will comprise 30 percent of the U.S. population by 2040 and will be the majority group in several states. Today, Latinos comprise nearly 25% of all students in public school systems. If as the president noted, we need 100,000 more engineers each year, then we need 25,000 Latino and Latina engineers to meet this goal.

According to the Hispanic Association of Colleges and Universities (HACU), "Increasing the percentage of Hispanics and other traditionally underrepresented minorities in STEM occupations is not only ethically and morally correct, as these groups deserve equal access to STEM fields, but allows minority groups to serve as role models and mentors for younger members of their own ethnic/racial group."

As more Hispanics enter the engineering fields, more will advance up the ranks of corporate America, ensuring more economic opportunities for our community.

ExxonMobil



Aprender

HOW TO PREPARE FOR COLLEGE?

According to Excelencia in Education, a national nonprofit with the mission of accelerating Latino student success in higher education, "For the U.S. to regain the top ranking in the world for college degree attainment, Latinos will need to earn 5.5 million more degrees by 2020."

In 2013, the Pew Research Center announced falling Hispanic dropout rates, from 32 percent in 2000 to 15 percent in 2012. The news about college enrollment was equally inspiring: "For the first time, a greater share of Hispanic recent high school graduates are enrolled in college than whites. According to the Census Bureau, 49 percent of young Hispanic high school graduates were enrolled in college. By comparison, 47 percent of white non-Hispanic high school graduates were enrolled in college."

To get there, the first step involves committing to the prospect of sending your child to college and then steering him or her at an early age toward an education path that will make that possible. Early childhood education has been shown to improve a student's chances for success in college.

"Parents need to support and encourage boys and girls in math, and strive to take more and more difficult math," advises Barry Cordero, Society of Hispanic Professionals in Engineering (SHPE) board chairman. "They should also encourage them in extra curricular activities, like a science fair, to give them practical applications for science. The earlier you can connect math lessons with real life problems or projects, the easier it is to engage kids in education."

From pre-kindergarten to encouraging children to read at an early age, efforts by parents to not only focus on education, but participate in the process with their children will enhance a child's college prospects. Once on the college path, family support is critical to any student's success. But Latinos who represent the first generation to attend college in the family may need to educate their parents about the process as well. Studies have shown that while first-generation students face many barriers, they're also remarkably resilient. Counselors, teachers, even librarians can help students access the information they need to educate themselves and their parents about a college education. But ultimately, the Internet will be the greatest resource for finding this information.

Organizations like the Hispanic Association of Colleges and Universities (HACU) are devoted to ensuring that Latinos successfully complete the college journey. The College Board (collegeboard.org), which administers the SAT college admission exam, is also a wealth of information. There's a site administered by the federal government as well (studentaid.ed.gov).

Fraternal organizations like MAES (mymaes.org) Society for Advancement of Hispanics/Chicanos and Native Americans in Science (sacnas.org), or the Society for Hispanics in Engineering (SHPE.org) offer a wealth of information on their websites as well as scholarships. Another one is Great Minds in STEM (http://www.greatmindsinstem.org).

"What parents, high schools, and educators, need to do is seek out organizations for alliance partnerships, a group with programs for students to help them continue to be successful in college," adds Raul Muñoz of MAES.

Discussion Questions

1. Have you enrolled your student in an early childhood education program?
2. Do you read to you student or encourage him or her to read?
3. Has your student participated in a science fair at school?
4. Can you think about a science project you could do together?
5. Have you searched online for more information about preparing for college?

WHAT IS THE RIGHT COLLEGE?

According to *Engineering by the Numbers*, published by the American Society for Engineering Education (AIEE), Latino's became the third largest group in the country that graduated with a bachelor's degree in engineering in 2012, continuing a ten-year trend of yearly increases.

A lot of this success can be attributed to students who chose the right college, especially for those who represent the first in their family to attend one. As intimidating as college can be, certain campuses can be more nurturing than others.

"Gearing up for college is a comprehensive process but first, I would suggest, starting as early as possible, no later than middle school," offers Antonio Flores, president of the Hispanic Association of Colleges and Universities (HACU). "Next, students should spend time and effort learning about themselves, what are their interests, where do they excel?"

He also recommends that families take the time to visit college campuses, even if they're out of town. "I cannot emphasize enough how important it is to choose an institution that's the right fit, not only the program of study, but also the chance to know campus life," Flores asserts. "Is it something that you feel will be reflective of your values and expectations? Does it feel welcoming and comfortable?"



Certain schools will have a reputation for excellence in certain areas of study. These are the top ten schools that graduated Latino engineers in 2012:

1. University of Puerto Rico, Mayaguez
2. Florida International University
3. Polytechnic Univ. of Puerto Rico
4. The University of Texas, El Paso
5. Texas A&M University
6. University of Florida
7. California State Polytechnic, Pomona
8. The University of Texas, Austin
9. University of Central Florida
10. The University of Texas, Rio Grande Valley

While a school's reputation is an important consideration, it should not be the ultimate factor. Other aspects, like location and size, should be considered. Not all colleges are the same, and all have their own strengths and weaknesses. Moreover, the *best* college may not be the best college for *you*.

Location may be the most difficult for Latino parents since it forces them to confront the prospect of their child leaving home for the first time. Leaving home can also be traumatic for the student, ultimately affecting his or her success, so a parent's understanding of their child's temperament and confidence level is important.

A school's size will also play into this equation. Smaller, private schools may be more suitable for certain students. Larger, state colleges, and universities may leave a student lost in the crowd. At the same time, these schools will have more support programs, but it will be up to the student to seek them out.

For this reason, the HACU has identified schools with a student population comprised of at least 25 percent Latino students and identifies them as Hispanic Serving Institutions (HSIs). For a list of these colleges, go to HACU.org.

Discussion Questions

1. Have you had a discussion about college with your student?
2. Would you be willing to send your student to college out-of-state?
3. Do you live near a university with a strong engineering program?
4. Is it important to attend a school with a large Latino student population?
5. Do you know anyone who graduated from a college that your student might be interested in attending?

HOW TO PAY FOR COLLEGE?

Going to college takes time and money and because of the magnitude of this commitment, many families may think a college education is out of reach. The good news is that multiple options do exist to help parents pay for college. But financial planning for college should start as early as possible.

The average annual cost for the 2014-15 school year, including tuition and fees, for a public four-year college is \$9,139 for in-state students, according to the College Board. By comparison, the cost for a four-year private school is \$31,231. Out-of-state students can expect to pay an average annual rate of \$22,958. These figures, however, do not include housing.

For parents with young children, the time to open a college fund is now. For parents with children set to graduate, the focus should be federal, state, and private funding sources as well as scholarships. Happily, there is an estimated \$238 billion in available financial aid. During the 2012-2013 academic year, \$9.7 billion was awarded by state higher education organizations. For a state-by-state listing of available dollars, go to FAFSA.ed.gov.

To start the financial aid process requires filling out paperwork, namely, the Free Application for Federal Student Aid (FAFSA). The FAFSA form must be completed to be eligible for federal, state, or institutional funds. Distributed in November by the U.S. Department of Education and available online at FAFSA.com or from high school counselors or college financial aid offices, the form must be submitted as soon as possible, ideally at the beginning of the year, to avoid missing deadlines set by each state or institution.

Grants are usually designated by need (determined by information on the FAFSA form), whereas scholarships are designated by merit, but not always. The best thing about grants is that they don't have to be repaid. Federal grants begin with the Pell Grant. In the 2015-16 award year (July 1, 2015, to June 30, 2016), the maximum Pell Grant award will be \$5,775. But the amount you receive will depend on factors such as your financial need and your cost of attendance.

Other federal grant programs include Federal Supplemental Educational Opportunity Grants, Teacher Education Assistance for College and Higher Education, and Iraq and Afghanistan Service Grants. Students who do not qualify for grants may qualify for federal work-study. Schools participating in the program employ these students, paid for by the government, based on the designated award. This helps students earn the money they need (19 hours per week maximum) while staying on campus. Students may opt to work off campus as well.

Finally, if neither of the two options apply, then parents and students may consider applying for a federal student loan that offers lower interest rates and flexible repayment options. Private loans are available, but they're usually more expensive, less flexible with repayments, and more vulnerable to scams.

In addition, there are a number of organizations that offer scholarships to Latinos, and the Internet is your best tool to research these options. Start with the websites of organizations like the Hispanic Scholarship Fund (HSF) at HSF.net, the Hispanic Association of Colleges and Universities (HACU) at HACU.org, and the Congressional Hispanic Caucus Institute (CHCI) at CHCI.org. All of these feature searchable databases of scholarships.

There is financial aid available for college, but it's incumbent on parents and students to do the research to find as many funding sources as possible.

Discussion Questions

1. Have you begun your college financial planning?
2. Have you completed a FAFSA form?
3. Have you researched need-based federal funding sources for college?
4. Will your student be eligible for a merit-based scholarship?
5. Have you searched online for Latino scholarship programs?

Be An Engineer is an initiative by ExxonMobil. For more information, go to BeAnEngineer.com.