A Parent’s Guide to STEM

Science
Technology
Engineering
Math

(What you need to know to help your child succeed)
Table of Contents

2  A Message to Parents
4  What Is STEM All About?
6  5 STEM Myths (and Why They Don’t Hold Up)
7  How to Plot the Right High School Path
9  Insights: will.i.am, Musician
10  Cultivating a Love of Numbers
11  Your Daughter, The Scientist: How to Inspire Girls to Stick With STEM
12  Insights: Reshma Saujani, Girls Who Code
13  Learning by Doing: Why Working on Projects Beats Lectures
16  Insights: Robert Curbeam, Raytheon
17  New York City’s Best High Schools for STEM
21  Early College High Schools Offer a Diploma and a Degree, Too
22  Insights: Aprille Ericsson, NASA
23  A To-Do List for Your Collegebound High Schooler
25  An Introduction to the New SAT (Plus: How to Tackle the Math Section)
27  10 Hot College Majors in STEM
29  Insights: Linda Cureton, Muse Technologies
30  Starting a College Search? Here Are Some Great Schools to Check Out
31  What You Need to Know to Get Financial Aid
32  A Sampling of Scholarships for Students in STEM
33  The STEM Riches of CUNY
34  More NYC Resources
35  New York Urban League
The New York Urban League (NYUL) is pleased to bring you “A Parent’s Guide to Science, Technology, Engineering and Math” (STEM) in conjunction with our partners – the New York Daily News, U.S. News & World Report, The City University of New York, the New York City Department of Education and the New York City Department of Youth and Community Development – and with support from Time Warner Cable. NYUL’s goals, through education and work experience, are to ensure that families have access to quality educational services that lead to academic achievement, and to instill in students career and entrepreneurial aspirations aligned with 21st century professions in growing industries. Creating and distributing this guide is part of our ongoing commitment to developing New Yorkers who are prepared for college, work and life.

The goal of this guide is three-fold: to dispel myths within the minority community about STEM and its place in our world; to connect STEM more completely to our daily lives; and, most important, to inform and get students and parents excited about career possibilities in the many fields of STEM. We are also offering engagement workshops (visit nyul.org for more details) that will explore STEM and what coursework and activities support such careers. We hope you will find the guide to be a valuable tool to encourage our youth to become creators and innovators in the nation’s rapidly expanding information economy.

A high school diploma used to guarantee economic opportunity, but the good jobs of today and tomorrow increasingly require an associate or bachelor’s degree. The U.S. Bureau of Labor Statistics says that jobs in STEM are growing the fastest in number and salary.

In this guide, you’ll see how The City University of New York (CUNY) can help you prepare your children for the future. Middle-school parents might consider CUNY’s 17 early college high schools, where students can earn an associate degree; nine offer STEM programs. For high school students, we offer full-year and summer STEM programs. And College Now teaches college-credit courses to 20,000 students from 400 public high schools.

Most CUNY students begin at our community colleges; more than half of our bachelor’s degree graduates started there. To speed their graduation, we’re expanding our nationally recognized Accelerated Study in Associate Programs from 4,300 students this year to 13,000 in 2016. We’re also expanding STEM majors like computer science, biotechnology, media technology, forensic science and engineering. When our community college graduates seek a bachelor’s degree, CUNY helps with clear pathways that pick up where associate programs end. You can explore our seven community colleges, 11 senior colleges and six honors and professional schools at cuny.edu or come to CUNY’s Welcome Center at 217 East 42nd St. in Manhattan.
Throughout my 49 years as a New York City public school educator, I’ve always been committed to the principle that high-quality classroom learning gives our students the tools to grow and realize their dreams. Students, parents, educators and school leaders across our city share this same belief.

As the New York City Department of Education is working to deliver a holistic education that prepares all of the city’s children for the jobs of today and tomorrow, STEM is more important than ever. STEM doesn’t just give our students powerful and valuable technical skills. It prepares them to be the critical thinkers, problem solvers and collaborators that our city needs.

A great STEM education also helps students find joy and lifelong passions in the classroom. Just as we remember the teachers, classes and activities that inspired us when we were in school, today’s students may find their inspiration in a science or coding lab. We are working to ensure that the option of an excellent STEM education is available to all of our students, including girls and students of color who have too often been excluded from these opportunities.

This guide will help you understand the hands-on and “minds-on” STEM options being offered in our city’s public schools. You’ll learn about the STEM education we are bringing to students, from traditional math and science classes to innovative partnerships with universities and businesses that expose our students to a college environment. As a mother and grandmother, I know that parents must be partners in their children’s educations. This guide can help you make the best choices for your children. I am excited to be working hand-in-hand with you to make NYC’s schools a place where all our dreams can come true.

The New York City Department of Youth and Community Development (DYCD) is pleased to collaborate with the New York Urban League on this free handbook and reference tool, which we hope will make it easier and more efficient for New York City parents to find STEM programs for their children in their neighborhoods and throughout the five boroughs.

DYCD is proud to lead one of the largest publicly-funded after-school systems in the nation, helping nearly 89,000 young people strengthen their academic and leadership skills, including STEM education, to help prepare our future workforce. This booklet will assist parents in guiding their children as they acquire the STEM skills needed for higher education and career opportunities later in life.

As a lifelong New Yorker who has dedicated most of my professional life to building the capacity of community-based organizations that serve young people, the elderly and vulnerable populations, I have seen firsthand the powerful role professionals and providers play in supporting our youth. NYUL has exemplified its dedication to improving opportunities for young people, parents and communities in our city by developing this handy and helpful guide.
In New York City public schools, students are experimenting with solar energy in urban greenhouses and scuba diving in New York Harbor to experience environmental science up close. In one Bronx classroom, high schoolers are burning candy to discover how sugar reacts to oxygen-rich environments. Inside a Harlem junior high school, students have transformed an arts classroom into a top-notch science laboratory to extract DNA from a cell. Elsewhere, girls are taking computer programming and meeting with female software engineers and tech entrepreneurs to see what hands-on experience in these fields, contributing to the achievement gap in STEM. As a result, educators, employers, government officials and other advocates are making a strong push to get students from such underrepresented groups involved in science and math.

Jobs of the future
There’s good news for your child. In the years ahead, jobs in the STEM fields are projected to grow about twice as fast as those in other industries. What’s more, many of these careers are among the highest-paying: College STEM graduates typically make about $500,000 more over their lifetimes than their peers who studied other subjects. College graduates with petroleum engineering degrees, for example, could nab a starting salary of $100,000.

But getting a good job isn’t the only reason you should help your child develop a solid grounding in STEM. In an age of smartphones, the Internet, remote health care and computers everywhere, your child needs to master basic STEM skills to thrive in today’s world.

STEM in the city
In recent years, New York City has become a hotbed of STEM activity. In Brooklyn, teenagers are earning computer science associate degrees along with their high school diplomas in an innovative early college high school developed by the NYC
Department of Education, The City University of New York and IBM. Major tech companies like Facebook and Google have also opened offices here.

Numerous after-school and summer programs are cropping up that give students of all ages and backgrounds extra access to tutoring, mentoring and hands-on science activities – from building robots to designing mobile apps and websites to performing basic experiments in biology and genetics. In addition to expanding the number of early college high schools across the city, CUNY offers hands-on lab and field experiences in robotics, marine ecology, geology and other topics each summer for high school students at many of its campuses.

The key is to get kids excited about science at an early age – even as young as preschool – and find ways to help them stick with it. Dozens of schools across the city are transforming their curricula to better tackle STEM and help ensure that students are college- and career-ready. Many of the results are promising, but there is a lot more work to be done, particularly as an achievement gap persists in math scores for black and Latino students compared to many of their white peers.

**A helping hand**

Fortunately, you can be one of your child’s best advocates for STEM, no matter what your own educational background is. That’s why the New York Urban League and its partners have created “A Parent’s Guide to STEM.” Inside you’ll find tips and advice on picking the right high school and classes for your child, words of encouragement from STEM mentors and role models, profiles of some of the city’s cutting-edge STEM programs and plenty of study strategies. You’ll also find some leads to help you launch a college search, an idea of what students can expect when they begin prepping for the new PSAT and SAT tests, a sampling of STEM scholarships, a list of hot STEM college majors and advice on how to land a great internship. Plus, you’ll also learn about local museums and after-school programs that can help your child engage his or her inner scientist.

Perhaps the best strategy of all: Find a way to make STEM fun and help your child understand how it works in the real world. He or she could soon be on the way to becoming a biochemist, video game designer, physicist, electrical engineer, cybersecurity analyst – you name it. The opportunities are just about endless.●
Popular wisdom is often wrong when it comes to STEM. Here are just a few of the common myths that don’t hold up:

**Myth 1**

**STEM is not a field that welcomes minorities and girls or women.**

To the contrary, employers hungry for high-tech talent are determined to attract minority students and women into STEM fields. They’ve launched all sorts of efforts, including internships for high school and college students and partnerships with community colleges that offer the chance to earn an associate degree along with on-the-job training. And while studying STEM can seem like a complex and lonely proposition, there are plenty of resources and support systems, such as student clubs and college learning communities, where, say, female computer science students or aspiring engineering majors live and take classes together and build relationships to help them thrive.

**Myth 2**

**Girls don’t like math and science.**

Not true. In fact, girls tend to get better grades in math and science than boys do and generally take the same number of credits in these disciplines. Often, they lose interest or get discouraged when parent or teacher attitudes – or their friends – steer them in other directions. But research has shown that, if girls receive encouragement and support, they often have both the deep interest and ability to do really well.

**Myth 3**

**Math and science are for brainiacs only.**

That’s the old “weed out” mentality – a long-held assumption by science and math teachers and professors that most students in lower level classes will not make the grade and will take another path. But that attitude is changing fast, as studies have shown that a passion for STEM subjects is much more key to success than sheer brainpower. Old teaching methods like boring lectures and memorization – which rarely inspired any enthusiasm – are rapidly being replaced by more exciting and success-oriented approaches in the classroom. Project-based learning, for instance, requires hands-on tackling of real-world challenges; students might develop new renewable energy sources, say, or use algebra and geometry to design furniture. That sort of engagement, along with the right grounding in key skills like math, provides the pathway to success.

**Myth 4**

**Science and math are boring and not relevant to real life.**

In fact, everyone has to draw on his or her science and math skills in myriad ways each day. Parents and teachers can emphasize this reality as they apply measuring and chemistry in cooking, compare unit prices at the grocery store, explain how a car engine works and so on.

**Myth 5**

**STEM jobs are isolated and lonely.**

There are hundreds of STEM professions, and many require people to team up to solve problems – as environmental scientists working to clean up the water and air, say, or engineers cooperating to design new space vehicles, or public health professionals working with communities to wipe out disease. These workers can make a difference in the lives of millions.
Why is it that fewer than 40 percent of students who enter college planning to get a STEM degree actually do?

One big reason: a lack of preparation. According to the latest government statistics from 2013, only 26 percent of 12th graders were performing at or above the “proficient” level in math, for example. A 2011 report on science found that only 32 percent of 8th graders were on target or ahead.

Parents can play a big role in helping their children enjoy (and excel) in math and science, and not just by making sure they study and do their homework. Here’s how:

First, create interest. Recent research debunks the conventional wisdom that succeeding in math and science over the long haul requires special talent. “We’re seeing now that interest is a stronger driver,” says Meghan Groome, executive director of education and public programs at the New York Academy of Sciences. “The interest drives the preparation. Anyone can do well in math.”

“Talk with them about how math and science are related to everyday life,” including your own, suggests Judith Harackiewicz, a University of Wisconsin–Madison psychology professor whose research has dealt with motivating kids to take an interest in STEM. When parents do so, her work has shown, teens take more math and science courses in high school.

Discuss, for example, how:

- Physics explains why cell phone calls are dropped in an elevator (radio waves don’t travel through metal easily).
- Math leads comparison shoppers to the best cell phone rate plan.
- Chemistry helps explain how hybrid cars charge their fuel cells.

Consult a counselor as early as possible. Parents of middle school students should start looking ahead to fit in all the math and science courses colleges look for, allowing for all prerequisites. You’ll find out, for example, that “math is hugely important,” says Shannon Miller, senior associate director of admissions at Johns Hopkins University in Baltimore. If you aren’t prepared for college math, she notes, you won’t be able to do science or engineering.

Plan on the most demanding possible classes. You’ll also want to make room for any advanced-placement (AP) courses offered at your school that make sense given your child’s strengths and interests. These challenging courses are designed by the College Board (the creator of the SAT test) in different subjects to expose high schoolers to college-level material (and expectations), and this type of class is important for anyone who is planning on a STEM major.

If taking AP calculus by senior year in high school is the goal, a reasonable one for anybody who wants a STEM degree, taking algebra I in ninth grade means there will be four courses to complete in three years. Commonly, they would be geometry, algebra II, precalculus and AP calculus. Taking algebra in eighth grade opens up an additional year to fit in the advanced math. “Parents should be ensuring their kids are taking as much math as possible,” says Groome, getting them after-school help or a tutor if necessary.

College admissions deans want to be able to tell from an application that a student is going to arrive on campus able to handle college-level work.

“What most college admissions readers look for is a very strong precollege program, including advanced classes in math and science,” says Kristin Tichenor, senior vice president at Worcester Polytechnic Institute in Massachusetts. Besides that math foundation, students who
How Your Teen Can Land an Internship

College admissions staffers like to see that applicants have pursued a passion. An excellent way of doing so is by seeking out and doing a great job in an in-field internship. “It takes a little bit of networking and a lot of hard work” to land one, says Eleanor Coufos, vice president of Bronx High School of Science’s endowment fund. But the payoff can be huge, in hands-on technical experience, job-related people skills – and a leg up in the college application process.

Like many schools, Bronx Science supports its students formally and informally in finding internships. First, 10 percent of its 3,000 students compete each year for the Intel Science Talent Search competition, which involves interning with a university faculty member on a project. More common, however, are those who reach out to teachers, family friends and alumni to find summer or after-school opportunities to work at companies and at museums or other nonprofits.

Opportunities like these have enabled Bronx Science students to help develop a migraine drug, for example, and to aid research on cancer stem cells.

Network, network. Encourage your student to start searching for ideas at the guidance office and to ask teachers for leads, too. This is a great time to learn the value of networking. It’s a good idea to reach out to professors at local colleges as well, and to companies or nonprofits working on projects or issues of interest. Many organizations have a strong desire to develop a pool of future workers.
Will.i.am, the Grammy Award-winning musician and Black Eyed Peas frontman, is an enthusiastic STEM advocate, inspiring students through his i.am.angel Foundation and other initiatives.

What sparked your interest in STEM?
One [thing] was a [2010] movie by the name of “Waiting for ‘Superman’” that talks about the education system in America and how poorly it performs. In particular, my neighborhood [in Los Angeles] that I come from was featured in that movie. Superman, a fictitious character, is supposed to solve real problems. STEM, to me, is the solution for schools and neighborhoods like mine.

How have you worked to improve STEM education?
To help solve the problems and the riddles that plague my community and the communities like it … we created this cross-disciplinary, transformative, project-based-learning curriculum that kids do after school. Our kids had a 0.74 GPA – just failing beyond failing – and now they have 3.4s, 4.0s. If you’re living in the hood and you’re surviving, what incentive do you give kids? We say, “Let’s get on track to go to college, learn the skill set, so not only are you looking for a job when you get out of college, you can create jobs.”

Do you have any other thoughts about changing the culture around STEM?
When I was going to elementary school, we had science in our school. I went to Brentwood Science Magnet. We had science class, oceanography lab, physics and computer labs. And then, somewhere in the ’90s, they started cutting budgets. They took music out of schools; they took science out of schools. What built America was STEM. It was companies like Ford – that’s engineering. It was H-1B visas – we were able to bring people from other countries. Thank God that it’s a subject making its way to popular culture because for some reason popular culture forgot the importance of science, technology, engineering and mathematics.

How can parents help?
At the [2014 White House] Maker Faire, there was this beautiful robot. Who built this? Two little girls. [I asked,] “How old are you?” “I’m 14.” “I’m 12. I’m her little sister.” I’m like, “So who designed it?” Here walks the dad: “I helped them design it. … Every weekend, me and my girls go in the garage, and we start building robots.” Wow. If it was a dad and a son, that sounds pretty obvious. But two girls and a pop? So that is an amazing story to see parents and kids – especially girls – building robots. They’re going to take that skill set with them to high school, and then, when they graduate high school, they’re probably going to go to MIT or Stanford. Then they’re going to get a job at Lockheed Martin or Boeing or the Department of Defense. Amazing things.
Cultivating a Love of Numbers

Barbara Oakley flunked her way through high school math and science courses and didn’t start studying the subjects seriously until her mid-20s. Now, she is a professor of engineering at Oakland University in Michigan. Drawing on neuroscience and cognitive psychology, as well as techniques from top teachers in the STEM fields, Oakley examines how people learn—and why many struggle with—these disciplines in her new book, “A Mind for Numbers: How to Excel at Math and Science (Even If You Flunked Algebra).” Oakley shares some of her insights—and tips—for learners of all ages.

What was your own experience with math and science?
I was so horrible at math and science growing up. I thought there wasn’t much good about them. I got into the military and learned Russian. I ended up eventually working as a translator on Soviet trawlers up in the Bering Sea. The engineers I worked with were really good problem solvers. They could do things and think about ideas that I couldn’t even handle. And then I realized that my fascination and interest with language was actually just a love of getting new perspectives and looking at different cultures and ways of looking at things. Why didn’t I try something like learning the new language of math? It became this sort of challenge.

How do we make STEM fields appeal to more people?
Show the natural connection between the way you learn in the humanities and the social sciences and the way you learn in math and science. People think, “Oh, if I’m learning a language, that’s really, really different than learning math.” But it actually isn’t. Part of the reason I now so love math is I can have an appreciation for the deep metaphors and analogies that mathematical equations provide. In fact, many of the ways that I used to study language to very good effect were exactly the same mechanisms I used to learn math and science.

What lessons could parents or teachers take away from your book?
Many things, like the idea that learning math and science is so much like learning a musical instrument, and it just needs a little bit of mental practice every day. For parents who want to help their kids, understand these ideas of stepping back during times of frustration.

What’s your big message for “mathphobes”?
Don’t just follow your passions; work to broaden your passions, and your life will be so greatly enriched. [Math] was so difficult for me, but it didn’t have to be. If I’d just known then what I know now about learning how to learn, I could have made it so much easier on myself. And so I really want to open doors to help make it easier for others.
When it comes to exciting kids about STEM, girls sometimes require special attention. That’s because they learn differently than boys do, and they can be far more discouraged by failure. A 2012 survey by the Girl Scout Council found that while 74 percent of girls start off interested in STEM subjects, somewhere in middle school, interest fades. Today, only 12 percent of engineers in the U.S. are women.

Your encouragement is crucial to improving these numbers. “Parents don’t have to be the experts,” says Linda Kekelis, CEO of Techbridge, an Oakland, California, organization that offers programs and activities to inspire girls in STEM. “They just have to be supportive.” Sometimes it’s as simple as giving your daughter time away from chores and schoolwork and providing transportation to an after-school program, watching a TV science program like PBS’s SciGirls or Design Squad Nation with her, or setting aside a special area where she can experiment.

Today, we face complex challenges in medicine, energy, the environment, transportation and agriculture. Your daughter can provide the solutions – with a helping hand from you:

**Start early.** It’s never too early to fight STEM stereotypes, so seek out games, toys and books that show that girls can be environmental scientists, biomedical engineers and mobile app developers too, says Dara Richardson-Heron, CEO of YWCA USA. For example, young readers can be inspired by books such as “Girls Think of Everything: Stories of Ingenious Inventions by Women.”

**Learn after school.** Not all education takes place in the classroom. Check out your local library, science or natural history museum or nearby college or university for after-school enrichment programs, as well as community organizations and clubs. The Girl Scouts, for example, have proficiency badges in innovation, science and technology and digital arts; and local YWCAs provide activities focused on engineering, robotics, computer science and biotechnology.

**Find role models.** Many girls want to make the world a better place. Show them that women make a difference. They solve problems; they make scientific discoveries; they protect the environment; they explore space. Some of the famous women in STEM include Marie Curie, who discovered radium and helped create X-rays; Shirley Ann Jackson, president of Rensselaer Polytechnic Institute and the first African-American woman to earn a doctorate from the Massachusetts Institute of Technology; and Ellen Ochoa, an electrical engineer and the first Hispanic female astronaut.

Closer to home, ask your child’s teacher or guidance counselor, church members, librarians or museum curators for names of local role models. If there is a college near you, students themselves can become mentors. “It’s sometimes easier for young girls to relate to someone who is just a step beyond them,” says Kekelis.

**Bring it home.** How does a grocery scanner work? Why doesn’t a bridge fall down? Where do bees go in the winter? Point out how science, math and engineering are part of daily life. Talk about science and technology at the kitchen table. Do projects with your daughter. Your local librarian can recommend books such as “Citizen Scientists: Be a Part of Scientific Discovery from Your Own Backyard” and “Kitchen Science Experiments” to give you some ideas.

**Build confidence.** Girls do just as well in math and science as boys, but their confidence is lower. Help your daughter get beyond the fear of failure by telling her that mistakes and risk are all about learning. “Praise the effort, the process,” suggests Kekelis. Let her know she does not have to have all...
the answers. Encourage your daughter to do hands-on projects; get messy; work on something, test the design and then rework it.

Try the team approach. Working in teams can be particularly valuable, says David Etzwiler, CEO of the Siemens Foundation, which sponsors an annual science competition that high school students can enter either as individuals or as groups. “We see a lot of girls coming forward in teams,” Etzwiler says. “It’s important to encourage girls to be risk-takers and to be willing to be wrong. They really like to team up to take those risks, to exchange ideas and work together.”

Embolden and encourage. Finally, be mindful of the messages you’re passing along to your daughter. If your child is floundering in one STEM topic, try gently pointing out alternatives where she might excel. When children struggle “with one type of math or one science class, they decide they’re unable to do any of it,” says Erika Ebbel Angle, CEO of Science from Scientists, a Boston group that brings scientists into schools. “Tell them that just because they don’t understand one subject they shouldn’t give up on it.” An open mind is key. “One of the biggest things is just to make sure that the girls try everything: robotics, electronics, 3D imagery, game design, mobile apps,” says Kimberly Bryant, founder and executive director of San Francisco-based Black Girls Code.

What is your background in science and math?
I think I represent the millions of girls that became terrified of math and science growing up. I struggled with my math and science classes. This fear stuck with me my whole life and really bothered me. Girls Who Code responds to the millions of girls who feel exactly how I felt.

What inspired you to found Girls Who Code?
I was running for office in 2010 and visited a lot of schools. We were starting to really feel the tech boom; people were obsessed with their Facebook and Twitter. I looked at these companies and saw that they are all founded by men. I saw the same thing happening in classrooms. I would see 100 boys in a robotics lab and one girl using a computer 10 years old. Seventy-one percent of STEM jobs are [projected to be] in computer science; less than 18 percent of computer science graduates are women.

What’s your answer?
Well, we have to acknowledge the role media, society and we as adults have played. In the 1980s, 37 percent of computer science graduates were women. Then, when personal computers started coming out, we targeted them toward boys. Every time you saw a computer person it was a geeky guy typing in a basement somewhere. Young girls said, “I don’t want to do that.”

In our classrooms, you see a girl from three generations of public housing – no Wi-Fi at home, no computer – and sit her next to a girl from the Upper East Side. At the end of seven weeks, they’re both equally competitive. You see the opportunity for technology to be a great equalizer. There are a lot of great programs, like Camp Interactive, CoderDojo and Black Girls Code, doing work to get more young people involved in computer science. But broadband access is really important. If you don’t have Wi-Fi, how can you learn?
Real-World Learning by Doing

Students working in urban greenhouses, learning to fly planes with simulators, or saving waterways – these are just some of the ways that project-based learning is coming to class. This popular and effective instructional approach helps students learn as they work on projects and is increasingly being used in middle and high schools across the country; it is particularly prevalent in STEM schools. When done well, project-based learning can enhance a student’s education and turn teenagers into more engaged learners.

Unlike in traditional classrooms, teachers engaged in project-based learning put a minimal emphasis on lecturing. Instead, they serve as guides for students as the young people work through their projects. Advocates say the approach gives kids a satisfying way to demonstrate that they’ve mastered class lessons, while honing their communication, collaboration and problem-solving skills – the kinds of abilities employers want to see used in the workplace.

Typically, students are put in groups and given an assignment with some real-world application. They might be asked, for example, to use their math skills to put together a food budget for a wedding or to draw on their chemistry knowledge to advise a vineyard owner on what kind of soil balance he needs to grow a certain kind of grape. Students are often asked to present their final product to adults who have a vested interest in the results of the project – the couple, say, or the vineyard owner – who then assess the students and play a role in determining their grade.

Project-based learning is often interdisciplinary in nature, meaning that students may complete a project, for example, that draws from both their history and science classes. Schools that practice the approach often emphasize technology, which helps students research and design creative, professional-looking final projects. Here are some of the innovative project-based learning initiatives already underway in New York City:

The Greenhouse Project
Teaching kids that science is not just something that takes place in test tubes and under microscopes is key to unlocking their deeper interest in STEM, says Sidsel Robards, director of development and events for NY Sun Works, a nonprofit that helps local schools introduce more innovative environmental curriculums in K-12 classes. Primarily, this is achieved through its Greenhouse Project, which installs greenhouse farms and environmental labs on the roofs or in converted classrooms of New York City public schools.

Rather than reading about climate change, conservation and sustainable development from textbooks, students get a chance to see how environmental systems work firsthand by carrying out tasks like collecting rainwater to grow crops hydroponically, composting food scraps to learn about waste management, or using solar panels to convert sunlight into electricity and collecting data to gain a better understanding of energy efficiency.

NY Sun Works also has created a curriculum that ties the lessons students learn in the labs to their classroom studies. And it collaborates with the Department of Education to train teachers in ways to incorporate more project-based teaching methods.

Elementary school students focus mainly on systems thinking, looking at each individual system in their greenhouse and then examining how all the systems interrelate. “They’re really looking at how everything works and how, if something
A Parent’s Guide to STEM

Some 43 states and the District of Columbia, including New York, have adopted the Common Core State Standards, with the goal of better preparing young people for college and careers. The academic standards establish consistent benchmarks for what skills K-12 students should have mastered in math and reading by the end of each grade. In New York, these standards have been modified somewhat to further tailor them to the needs of students across the state. To learn more about Common Core, visit schools.nyc.gov.

About a dozen states have similarly approved the Next Generation Science Standards, which aim to update and standardize science curricula. The New York State Department of Education and Board of Regents are currently assessing whether to adopt the benchmarks. For more information, visit nysed.gov.

Some 43 states and the

Middle and high school students involved in the Greenhouse Project are asked to complete a five-topic program in which they learn about food systems, health, oceanic preservation, sustainable development and urban farming. For urban farming, “they have to come up with their own hydroponic system, design it for a client and install it,” says Robards. “The system has to be fully functioning and come with a manual, which the kids write themselves. Then they have to teach the clients how to actually use it.” Robards says the goal is to get 100 school labs up and running by 2020.

New York Harbor School
Students at the New York Harbor School are bringing the city’s waterways back to life, one oyster at a time. The innovative high school on Governors Island aims to introduce 1 billion of the once-plentiful bivalves into local waters over the next two decades, a project that could filter out toxins and jumpstart the ecosystem. Along the way, students will get a traditional college prep education as well as technical training in the marine sciences or a trade.

Students and staff take the ferry each day from lower Manhattan to the Harbor School’s island campus, now centered in two renovated Coast Guard buildings. At the foundation of the unique curriculum is a belief that students learn best when they feel like they’re making a valuable contribution to society. So each of the high school’s six programs of study – vessel operations, marine systems technology, ocean engineering, scientific diving (a scuba program), aquaculture and marine biology research – is aligned to the overall goal of improving the marine habitat of New York City.

Its 9,000-square-foot Marine Science and Technology Center has rooms crowded with wet suits and oxygen tanks, along with labs loaded with saltwater tanks bearing baby oysters. Students in the school’s scuba program can expect to make dozens of dives in New York Harbor and neighboring waters as they pursue their diver’s certifications and degrees. Kids in the vessel operations and marine systems technology programs have access to several boats that are usually docked just below the school’s aquaculture labs, which are housed at the water’s edge.

Competition can be fierce for spots at Harbor School. The school takes students of all backgrounds from all boroughs, offering each an education that will ensure plenty of time on the water, while generating enticing fodder for college admissions essays.

Frederick Douglass Academy
Armed with new equipment designed for the classroom, teachers are merging flight simulation and STEM subjects, a partnership that is proving very effective in engaging middle and high school students in topics they might otherwise find uninteresting or intimidating.

At the Frederick Douglass Academy in Harlem, Henry Rey, who teaches physics and earth science, developed a two-
year flight simulation program for juniors and seniors that teaches earth science, math, systematic problem-solving and even a little bit about medicine. (His students, for instance, learn about how colds and inflammation will affect their ability to fly a plane.) Rey targets two groups of students: Those struggling with math and science and those interested in pursuing aviation as a career. For the former, the computers and simulators help them understand “the concepts we are talking about” without having to use a lot of math initially, he says. For the students interested in flying, the classes prepare them for jobs right out of high school. Those young people who pass Rey’s program can earn a Federal Aviation Administration certificate and become private pilots or ground instructors. The flight simulators have proved equally beneficial to all students. Rey notes that some of his female students, who may not have been performing well in other areas, have shined in flight simulation. “They can sometimes fly with a shorter instruction time and more skill than the guys,” he says, adding that girls often seem to be naturally better at the multitasking involved in flying.

At the end of the day, the program is about getting the kids energized to learn. Sometimes teens need instant feedback and evidence their work is paying off, says Rey. “If I’m using a test, it might take me two or three days to tell them what they got wrong,” he explains. With the simulator, “you can do a playback as soon as you are finished; they can correct themselves.”

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**A Summer of Science**

Don’t forget about school breaks. Across the Big Apple, high school students got a healthy dose of science last summer as public schools teamed with local colleges and universities to offer classes in STEM and other futuristic topics. New York University, for example, runs summer camp programs and its Polytechnic School of Engineering gives classes in cybersecurity, video games, renewable energy, computer coding and other white-hot fields.

The City University of New York’s “College Now” summer offerings focus on lab and field work. At LaGuardia Community College, students interested in environmental engineering and earth science systems took a three-credit algebra and trigonometry course and used that knowledge to build a model rotary parking tower with an electrical station and a solar-powered electric car. They even measured the surface temperature of the earth with specialized software. At Brooklyn College, a precollege urban marine ecology program provided four weeks of field and lab research in salt marshes, an oyster farm, a wildlife refuge and the beach. The students developed scientific writing and formal presentation skills while working with faculty from the college’s Aquatic Research and Environmental Assessment Center.

Dozens of science-loving students from Dewitt Clinton High School in the Bronx took summer classes at nearby Lehman College. The Summer STEP collaboration includes courses in engineering, mammalian anatomy and computer science. Recent student projects included building bridges, dissecting animals, constructing robotic arms, and studying chemical reactions in tie-dyed clothes and ice cream.

Students from 14 high schools also experienced high-level exposure to STEM through apprenticeships at Columbia University’s Zuckerman Mind Brain Behavior Institute. Students accepted to the BRAINYAC program got special access to neuroscience laboratories at Columbia University Medical Center, plus training in basic lab skills and neuroscience fundamentals.
As an aspiring scientist in Baltimore in the 1970s, Robert Curbeam would stand at the end of his street and marvel at NASA's Skylab space station when he could see it floating in the sky. Decades later, as an astronaut, he would see space firsthand and put his STEM skills to use installing and repairing equipment on the International Space Station. Curbeam participated in three NASA spaceflights and was the first astronaut to complete four spacewalks during a single mission. He retired from the space agency in 2007 and now serves as vice president of mission assurance for aerospace and defense company Raytheon.

What inspired you to study engineering?
When I was growing up, my mom was a chemistry teacher and I really took to it. When I started looking at colleges, I found out that I really had a keener interest in engineering. Also, when I was in middle school, I had a very good friend. He and I used to spend a lot of time together trying to design a better car or a better plane, things like that.

What kept you interested?
It was creativity mixed with mathematics. When you do design work, it’s never straightforward. It almost approaches being art-like, an artistic kind of thing, where creativity and the way you think about the problem sometimes will yield a different design than someone would originally think.

How did you use that training?
There were two ways, actually. The first is the actual operation of a spacecraft. That’s not to say that without a technical degree you couldn’t do that. It just makes it easier to operate the spacecraft and understand the interaction between all of the systems. I also used my engineering degree after the [2003 space shuttle] Columbia accident because I was on the safety and mission assurance team that was evaluating all of the hazard analyses. At that point you really get to the nitty-gritty of how the systems work, where the hazards are, what kinds of interfaces the different systems have and their interactions, and how maybe a failure in one can cause a cascading failure in others.

What’s ahead for space travel?
The thing that excites me is we’re finally to that stage where you can have an interaction of both human systems and purely machine systems. We can take the best of the remotely piloted or driven vehicles, which is their persistence, their ability to operate in very harsh environments, along with your human-driven or piloted vehicles, and their inherent flexibility and responsiveness. At the end of the day, we’re going to need a lot of very, very smart and informed and knowledgeable people in the next generation to help us continue to push that forward.

What can parents do to help encourage children in STEM?
I just think it’s through exposure. I count my lucky stars that I had a chemistry teacher as a mom. I had a very keen understanding of science at a very young age. I think parents need to expose their children to more of this, even if it’s just going to the science museum once a year and going, “Hey, isn’t this cool?”

Any other advice for future STEM students?
STEM is important, and it is absolutely critical that we do it well. But as we would say in mathematics, it is a necessary but not sufficient skill to have. I try to stress all the time that we need to do it better, we need to be better at emphasizing the STEM disciplines throughout, but not at the expense of some of the other things that we teach. Although I don’t always use calculus every day, I do use English every day. You can have all the knowledge in the world, but if you can’t communicate that knowledge, it often goes unused. We still have to be able to make room for English, foreign language, and the other humanities and social sciences.
New York City is brimming with great high schools. The New York Daily News and U.S. News & World Report teamed up to crunch the numbers (such as those that represent the level of math and science participation and success) to compile a list of the Best High Schools for STEM in New York City.

1. Stuyvesant High School
   Manhattan
   Enrollment: 3,284
   Average student SAT score: 2096
   Stuyvesant has long been hailed as the best of the best – and with good reason. The school provides its students with the foremost opportunities in scientific fields through mentoring programs at professional research facilities and summer programs at MIT and Rockefeller University. In addition, students receive a balanced education in the humanities. The school offers 28 AP courses and seven languages, including Mandarin Chinese and German.

2. Staten Island Technical High School
   Staten Island
   Enrollment: 1,233
   Average student SAT score: 1953
   With state-of-the-art science, computer and engineering laboratories, Staten Island Tech is the preeminent institution in the fifth borough. The scholars choose from a wide-ranging course catalog that entices inquisitive minds to intensive programs, including Lego robotics, prelaw and Russian. Only well-qualified applicants are picked from a pool of thousands to take advantage of a curriculum that offers 13 AP courses and a plethora of extracurriculars.

3. Bronx High School of Science
   Bronx
   Enrollment: 3,030
   Average student SAT score: 1969
   With a curriculum based on teaching its students to think scientifically and engage with society, the Bronx High School of Science is a haven for youngsters who can’t get enough of the lab. The school offers a wealth of AP programs and allows some students to take post-AP courses in genetics and psychology along with electives like game programming and animal behavior at the Bronx Zoo. With an equally impressive offering of extracurricular activities – including Model U.N. and bridge-building – it’s no wonder that the school’s alumni have won seven Nobel Prizes, more than any other school in the country.

4. High School for Mathematics, Science and Engineering at City College
   Manhattan
   Enrollment: 449
   Average student SAT score: 1847
   The school’s goal is to prepare its students for successful college careers, and to train them to be future leaders in science and technology. Students select either engineering, biomedical research or mathematics as their concentration, and can choose from such electives as gastronomy and sports journalism. Most students study German, the language of engineers. With its location on CUNY’s City College campus, students get a preview of the college experience. They are encouraged to do internships at places like Mount Sinai Medical School and CCNY’s Grove School of Engineering.

5. Queens High School for the Sciences at York College
   Queens
   Enrollment: 417
   Average student SAT score: 1868
   With a curriculum structured around math and science, this collaboration with CUNY provides one of the most fascinating course loads in the city. Among the most popular electives for the science-minded student body is an impressive robotics course. Even so, the administration provides its students with 13 AP courses that include subjects like music theory and world history. The selective admissions process produces a student body of high achievers.

6. Eleanor Roosevelt High School
   Manhattan
   Enrollment: 528
   Average student SAT score: 1758
   One of the most selective schools in the city, the Eleanor Roosevelt High School offers a unique and individualized education. By interweaving the arts and technology through its curriculum, the school teaches ways to explore a student’s own professional and intellectual pursuits. Students can enjoy such diverse electives as animation and public speaking, but can also challenge themselves with any of the 13 AP courses offered. The school’s style encourages a progressive social awareness and a lifetime of continuous learning.

7. Brooklyn Technical High School
   Brooklyn
   Enrollment: 5,411
   Average student SAT score: 1833
   Brooklyn Tech is the biggest high school in New York City, and one of the most diverse. The school offers hands-on and interdisciplinary classes, specializing in STEM. Its immense size allows for a huge variety of classes, sure to fascinate
any young scholar. At the end of their sophomore year, students pick one of the 16 offered majors, and take at least two classes a day in that subject during their junior and senior years.

8. Townsend Harris High School
Queens
Enrollment: 1,143
Average student SAT score: 1910
Located on CUNY’s Queens College campus, this demanding school utilizes a traditional curriculum in the humanities to prepare youngsters for a new world. Students gain a working knowledge of the classics as they study two years of Greek and Latin, and the school doesn’t offer classes that are not honors, AP or college level. Students must take eight academic subjects each semester—one more than most New York City high schoolers. Not surprisingly, the admissions process for such an elite institution is rigorous.

9. High School for Dual Language and Asian Studies
Manhattan
Enrollment: 407
Average student SAT score: 1424
Founded in 2003, this school provides a dual-language education in English and Mandarin Chinese. An enriched math and science program with a plethora of APs is just the first step at this highly competitive school. Native English speakers take a double period of Chinese each day, and all students are required to pass the Chinese Regents exam, as well as the five other exams needed for a Regents Diploma. This school relies on an intensive schedule from 7 a.m. to 4 p.m. to impart a cultural fluency as it weaves Asian-related topics into the academic curriculum.

10. Beacon High School
Manhattan
Enrollment: 1,267
Average student SAT score: 1744
A collaborative work environment and a focus on technology are the foundations of the inquiry-based curriculum at this high school. Each year, students must complete a performance-based project before a panel of teachers as well as community service before graduating. Though only offering five AP courses, Beacon provides free college classes at NYU, John Jay College and Fordham University. Travel opportunities to Russia, England and Mozambique give an international flair to this one-of-a-kind program.

11. Midwood High School
Brooklyn
Enrollment: 3,804
Average student SAT score: 1473
Midwood is a large neighborhood high school with excellent academics. With 3,800 students, the school can offer a wide array of classes and give kids the chance to participate in many different extracurriculars. The school boasts more than 50 clubs and has 18 AP classes. The school accepts neighborhood kids to a zoned program, but also screens applicants for two top-flight academic programs: the Medical Science Institute, which offers a rigorous math and-science curriculum, as well as Humanities Institutes.

12. Baruch College Campus High School
Manhattan
Enrollment: 438
Average student SAT score: 1577
With partners like CUNY’s Baruch College and Harvard University, it’s no surprise that this school offers a true liberal arts education in its competitive program. Students will choose from a range of electives like cognitive science and film, while they complete their coursework in science, math, English and history. The school encourages a socially conscious education with extracurricular clubs like Amnesty International, and requires yearly community service.

13. Leon M. Goldstein High School for the Sciences
Brooklyn
Enrollment: 1,036
Average student SAT score: 1627
This school takes full advantage of its affiliation with CUNY and Kingsborough Community College. Students stay for after-school learning and help with any of 11 AP courses, the three years of required Spanish or Italian, or the full four years of required math and science. Upon completion of this demanding course load, successful students are rewarded with the prestigious Regents Diploma for passing examinations in a variety of subjects. Programs include oceanography and orchestra, and the school encourages giving back to the community by requiring its students to complete 40 hours of community service each year.

14. Manhattan Center for Science and Mathematics
Manhattan
Enrollment: 1,572
Average student SAT score: 1430
Though more than 1,500 students attend this school, teachers make an effort to provide one-on-one, personalized attention to each young scholar. In addition to 17 AP classes, electives include computer programming, robotics and psychology. The school offers three years each of French, Spanish and Chinese, which could quickly come in handy for those students who take advantage of partnerships with Columbia and Cornell universities to study abroad in Singapore, Vietnam and China.

15. Benjamin N. Cardozo High School
Queens
Enrollment: 3,566
Average student SAT score: 1514
This large Queens neighborhood...
school offers top-notch academics and a wide array of classes, including 18 AP courses. Besides admitting local kids, the school boasts four smaller competitive programs in science and math, journalism, humanities and dance, with 100 kids admitted each year to those specialties.

16. Fiorello H. LaGuardia High School of Music & Art and Performing Arts
Manhattan
Enrollment: 2,701
Average student SAT score: 1707
Young artists here take pride in the school’s two-pronged education in conservatory arts and top-notch academics. Eighth- and ninth-graders can apply to this diverse school in any of six arts disciplines, from studio art to technical theatre. The school day is long – typically from 8 a.m. to 4 p.m. – and consists of multiperiod studio time and a full college preparatory course load, including honors classes for all grades and a choice of 15 APs.

17. New Explorations Into Science, Technology and Math High School
Manhattan
Enrollment: 1,612
Average student SAT score: 1621
One of five citywide gifted programs, NEST+m provides a one-of-a-kind experience. Technology is interwoven into the curriculum to promote collaboration, research and a forward-thinking student body. Ninth-grade math and science classes are single-gender, and before high school, select students are placed into an accelerated science program that teaches an AP course each year. The school also utilizes the alternative in-depth Singapore method of teaching math, which emphasizes problem-solving.

18. High School of American Studies at Lehman College
Bronx
Enrollment: 385
Average student SAT score: 1920
This Bronx institution uses an emphasis on American history to develop its student body. While only offering seven AP courses, the school utilizes honors and CUNY’s Lehman College courses in all subjects, and the curriculum requires that students take offerings in American history and research methodology. The administration takes full advantage of the CUNY connection and support from the Gilder Lehrman Institute of American History to offer electives ranging from anatomy to multilingual journalism.

19. Queens Gateway to Health Sciences Secondary School
Queens
Enrollment: 804
Average student SAT score: 1538
With a focus on health sciences, this diverse 6-12 school encourages its students through practical experience and a rigorous academic program to consider careers in the medical field. The school’s Hospital Experience Program at next-door Queens Hospital Center provides invaluable experience in real-life settings. The Medical Distinguished Speaker Series brings in professionals to the school to share their expertise. In addition, there are op-
opportunities in other areas, such as AP courses in history and literature.

20. Medgar Evers College Preparatory School
Brooklyn
Enrollment: 1,294
Average student SAT score: 1436
Students entering Medgar Evers College Prep are immersed in a challenging curriculum that includes an impressive 19 AP courses and stresses preparedness for higher education. With just over 1,000 students and a graduation rate of 99 percent, the medium-sized school has a formula that works. It could be the AP courses in Mandarin Chinese and electricity and magnetism, or it could be the electives and extensive list of extracurriculars – which include everything from robotics to bowling. Partnerships with the Brooklyn Museum, Medgar Evers College and CUNY encourage young scholars to explore cultural interests outside of the classroom.

21. Benjamin Banneker Academy
Brooklyn
Enrollment: 897
Average student SAT score: 1391
The young scholars at Benjamin Banneker are immersed in the institution’s African theme that runs through the rigorous curriculum. Teachers focus on African-American artists, scientists and writers while including the traditional curriculum of AP courses and honors classes for college preparation. In addition, students go on class trips to the Martin Luther King, Jr. Memorial and to an African country. Of course, enrollment is open to students of all races. The school simply wishes to demonstrate an alternative look at history while also preparing its students for a more traditional post-secondary education.

22. Scholars’ Academy
Queens
Enrollment: 1,249
Average student SAT score: 1532
Hard work and innovation are keys to the highly accelerated curriculum at the Scholars’ Academy. Students begin Regents-level courses in the seventh grade, starting with biology. Freshmen have course loads that are similar to juniors at most high schools, taking Regents exams in English, geometry, physics, Spanish and U.S. history and government. In fact, all classes at the academy are AP or honors, and juniors and seniors have the opportunity to earn college credit. The rigor of the program extends to the strong arts curriculum, too, with all sophomores taking the Visual Arts Regents test. The academy boasts an impressive 100 percent graduation rate, and 94 percent of the students go on to college.

Do Your Admissions Homework

With more than 400 free public high schools to pick from, the families of city students have their work cut out for them when it comes to choosing a secondary education.

Technical high schools, early college schools, curriculums based on every subject from Latin to computer coding to scientific scuba diving – the list is seemingly endless. And the complex application system can be overwhelming. “We have a lot of choice,” says Robert Sanft, CEO of the New York City Education Department’s Office of Student Enrollment. “You’re not limited to one school that is down the block that might not be able to accommodate you.”

City families can apply to up to a dozen district-run high schools in order of preference, in each of two application rounds held each year. A computer algorithm matches the choices of students with how the schools rank those students. Roughly 1 in 10 kids doesn’t get a match and must go on to the second round. To increase your chances of landing a placement on your first try, apply to the maximum number of schools, Sanft says.

And do the research. Some high schools give geographical preference to certain areas and haven’t admitted students from outside their districts in years. The specialized high schools admit students solely on the basis of scores from a single test. (Some experts are pushing for a broader set of admissions criteria.) Charter schools have an entirely different method of admitting students. Families may apply to as many as they wish, and the schools execute a random lottery, giving preference to students in their home districts.

Your middle school guidance counselor can provide advice on how to apply and where. The Department of Education (schools.nyc.gov) publishes a giant high school directory and operates enrollment centers in all five boroughs and has its own hotline (718-935-2399) for extra help and questions. The insideschools.org website offers advice on the process, plus statistics and reviews of each school.

The department also runs a series of high school information fairs that must not be missed by anyone mulling city high schools. In fact, many schools use attendance at the fair as a factor in admissions decisions.
Pathways in Technology Early College High School – better known as P-TECH – has earned a lot of buzz for its innovative six-year program in which students start in ninth grade and stay until they’ve earned an associate degree in a partnership with the New York City Department of Education (NYC DOE), IBM and The City University of New York (CUNY).

No tuition, no entrance exam

P-TECH is less than four years old, but the school is already a darling of the STEM movement now sweeping the nation. A number of other early college high schools have been operating in the city as well, several of which highlight science and technology. But P-TECH is the first to have an industry partner.

Mentors from IBM help P-TECH students with advice on their coursework and help kids understand the connection between their classes, college and careers. Graduating students will earn one of two computer science associate degrees from CUNY. They’ll then get first dibs on jobs at IBM.

Student Gulshan Mangra says the college courses and link to jobs with IBM make the classes at P-TECH compelling. “You’re learning about the real world,” says Gulshan of East New York, Brooklyn. “You’re learning how to make a difference.”

The school uses a lottery to select its students and doesn’t consider their academic histories, yet more than half of P-TECH’s sophomores are taking college courses through the school’s partnership with CUNY. Although a third of P-TECH’s inaugural class entered the school behind in reading, nearly all students were promoted to 10th grade, and the school has above-average attendance.

More 9-14 schools now open

To further bridge the gap between public high school and college and careers, New York City has recently opened other high schools based on the P-TECH model, the so-called “9-14” institutions that allow students to earn both a diploma and an associate degree. These include:
- Energy Tech High School in Queens, which focuses on engineering with electrical or mechanical concentrations. It was founded in partnership with the NYC DOE, CUNY, LaGuardia Community College, National Grid and Con Edison.
- Health, Education and Research Occupations High School in the Bronx, which prepares students for health care and related fields and offers two program tracks: nursing and community health. It was founded through a partnership between Hostos Community College, CUNY, the NYC DOE and Montefiore Medical Center.
- Inwood Early College for Health and Information Technologies in Manhattan, which is an early college and career technical education institution developed in partnership with the NYC DOE, Microsoft, New York-Presbyterian Hospital and Guttman Community College.
- Business Technology Early College High School in Queens, which offers an associate degree in business systems or engineering technology and gives students the chance to gain work experience in the business technology field. It was founded in partnership with SAP, a global software company; the NYC DOE, Queensborough Community College and CUNY.
- Manhattan Early College School for Advertising, which enables students to earn their associate degree and gain industry-specific experience that will prepare them for entry-level positions in the advertising and media fields. It was collectively founded by the Borough of Manhattan Community College, the NYC DOE, CUNY and industry partners from the American Association of Advertising Agencies.

A Diploma and a Degree, Too

At P-TECH, graduating students will earn one of two computer science associate degrees from CUNY.
What sparked your interest in STEM?
My mom was a teacher, so I sort of walk behind her shoes. A number of women in the family were teachers too, and the men were engineers. My grandfathers included me in activities like getting up on a scaffold and helping to scrape down the house, or fixing a doorknob lock. All those little things of coming up with solutions and using your hands to build and make things, I think, were all good assets for me to become an engineer.

[Going to school in New York City,] I did lots of science classes. I won second place in the science fair in eighth grade. My experiment was a homemade glass milk barometer that I made with my grandfather. I've been at NASA’s Goddard Space Flight Center 20-plus years; half of my career here, I was an instrument manager. The fact that I started building my first instrument in junior high school and that's what I ended up doing was pretty cool. I had the right teachers and people pushing me.

I also believe very strongly in being well rounded. For me, sports were so important. Working on a team, being a leader, having versatility, and then learning to be a good teammate are all skills that I think help me in my current career. People forget that engineers aren’t just in the room by themselves working on a design. We work on huge missions with multiple people in multiple countries, which brings in another aspect of being well rounded: having another language or having learned about other cultures.

What is one of the biggest challenges you faced — and overcame — in STEM?
I went to the Massachusetts Institute of Technology without having calculus. I stumbled through math my first year, and then it caught up with me my second year when I had to take differential equations. I failed that class twice. So I went to The City College of New York for a semester and took classes. I did really, really well, and then I got a 98 on the final for differential equations. That was a big boost to my confidence. It also goes back to what we tell freshmen going into engineering about these gatekeeper classes: how important it is to master the tools and required coursework before moving on to the upper-level coursework.

How can parents help get their kids interested in STEM?
Kids can go to museums and do hands-on activities. I went to the Brooklyn Public Library, the botanic garden, the Brooklyn Museum. There are lots of professional organizations, like the National Society of Black Engineers or the American Institute of Aeronautics and Astronautics, that have children’s activities and junior chapters. There’s so much free stuff out there. You really just have to get out of the house. Or when your child has a science question, get on the Web when you’re not sure of the answer.

Let your children cook. That’s being a scientist. I learned how to measure and bake. I did sewing in junior high school, and I learned how to put things together, how to make a pattern, which is very much what an architect is doing when laying out a building or designing a bridge. All of these skills that you wouldn’t normally think of as STEM-related have direct linkages to STEM. I did Girl Scouts. I loved learning how to build a fire, learning about nature. All of those experiences as a child helped to build up my skills, so that I could pull off these bigger projects that I do at NASA.
With some careful planning, a little research, and a lot of hard work, students can make sure their high school years position them to get into the college of their choice.

FRESHMAN YEAR
Get set for a great high school career. It’s important to remember that what lies ahead is more than just a four-year audition for college. Still, it helps to start thinking now about what admissions staffers will look for just three (short) years down the road.

▪ Seek advice and teacher feedback. Ask someone you trust to help you map out your classes (see “Plot the Right High School Path,” page 7). Grades are important in ninth grade, but rigor is key, too, so don’t just go for easy A’s. If you get a bad grade, read (or listen) to your teacher’s comments and figure out how to do better.

▪ Read voraciously. Books, newspapers, magazines, blogs – choose what engages you and remember to look up unfamiliar words.

▪ Get involved. Not only will you develop talents and interests that will catch a college’s eye, but also you’ll find school is more fun when you have activities to look forward to.

SOPHOMORE YEAR
Now that you’re no longer a rookie, you’ll want to focus on evolving as a learner. Besides studying the material, take note of what your teachers value and consider how you can learn more efficiently – and better.

▪ Refine your route. Look ahead to which 11th and 12th grade courses you might be interest in taking and plan to work in any prerequisites.

▪ Challenge yourself (wisely). Create a balanced schedule.

▪ Make the most of your summer(s). Don’t just hang out at the beach or pool. Work, volunteer, play sports or take a class. Find an activity that builds on a favorite subject or extracurricular interest.

JUNIOR YEAR
Essays and testing and APs, oh my! Your grades, test scores and activities junior year constitute a big chunk of what colleges consider for admissions. Do your best in class and truly prepare for the tests you take. This can also be the time to step forward as a leader. Explore pursuits that interest you, not just because they’ll look good on an application, but also because they’ll help you grow as a person.

▪ Ask for help. As Einstein allegedly put it, insanity is “doing the same thing over and over again and expecting different results.” So, if you feel stuck in your studies and in need of a breakthrough, ask teachers, parents or friends for help in finding a new approach.

▪ Speak up in class. You will

Freshman year, ask someone you trust to help you map out your classes. Grades are important in ninth grade, but rigor is key, too.
need to ask two junior-year teachers to write college recommendations. They can’t know you without hearing your thoughts, so make sure you stand out by contributing in class.

- **Sleep.** The average 16-year-old brain needs over nine hours of sleep to function at 100 percent, and that’s exactly where you want to be.

- **Plan your testing calendar.** Test scores matter (along with grades), so talk with your parents and guidance counselor about which ones to take and when, and how to prepare for them. First up, the PSAT. If your 10th-grade scores put you in reach of a national merit scholarship, it might be wise to spend concentrated time preparing. Then take the SAT or the ACT in winter or early spring. Don’t worry if you don’t get your ideal score; you can try again. The SAT subject tests are also an option for May or June in areas where you shine or in subjects you covered junior year.

- **Get involved.** It’s great to show you’ve worked hard, are dedicated to an activity, play well with others – and can lead them. Start an arts discussion group that goes to museum openings, say, or be voted team captain.

- **Begin building your college list.** Once you have gotten your test scores, talk to a counselor and start putting together a list of target schools. Make use of new technology and apps to aid your research. Explore college websites and resources like studentaid.ed.gov and usnews.com/bestcolleges. (While you’re online, be sure to clean up your Facebook act. It might get a look.)

- **Make some campus visits.** Spring break and summer vacation are ideal times to check out a few campuses. Attend college fairs and talk with the folks behind the tables. They can give you a feel for their school and some good future contacts.

- **Write.** Procrastination doesn’t make for a good college essay. Aim to have first drafts done by Labor Day. Share them with an English teacher or counselor.

### SENIOR YEAR

You made it. Let’s party! Well, not quite yet. This will also be a year of hard work and continued preparation for you. Colleges do take senior-year transcripts into consideration. They can and will rescind offers to students who slack off, so stay focused.

- **Finish testing and check the boxes.** You’re in the final stretch. If necessary, retake the SAT, ACT or subject tests. The early fall test dates will give you time to apply early. Also, make sure you’re completing all graduation requirements as well as course requirements for your target colleges.

- **Ask for recommendations.** Early in the school year, ask two teachers if they are willing to write a letter of recommendation for you. Choose teachers with whom you have a good relationship and who will effectively communicate your academic and personal qualities. You will want people who can offer different perspectives on your performance. Be sure to update and polish your résumé, too; it will come in handy when you’re filling out applications and preparing for admissions interviews.

- **Apply.** Fill out each application carefully and ask someone to look over your essays critically. Check that your colleges have received records and recommendations from your high school, and have your SAT or ACT scores officially sent in. A month from the date you submit your application, call the college and confirm that it is complete.

- **Follow the money.** Many colleges require that all of your financial aid application forms be turned in by February. But the earlier the better.

- **Make a choice.** Reach out to former classmates, friends or acquaintances currently at schools that accept you who can offer the inside scoop. Talk with alumni and check if an accepted-student reception is being held near you. Then confidently make your college choice official by sending in your deposit. Done!
Get Ready for the New SAT

If you’re reading this as the parent of a high school student who will graduate in 2015 or 2016, your child is preparing to sit – or has already sat – for the familiar 2400-point SAT, complete with its fancy vocabulary words and mandatory essay. But the class of 2017 will begin prepping this year for a completely overhauled test. The College Board has announced major revisions to the fall 2015 PSAT and the 2016 SAT, saying the current SAT has “become disconnected” from the work of schools.”

What’s different
The changes, which include going back to the old 1600-point composite score that’s based on 800-point math and “evidence-based reading and writing” sections, and making the essay optional, are intended to better reflect the material kids are learning (or should be learning) in high school, as well as to improve the SAT’s reliability as an indicator of how prepared they are to tackle college work. The current test is designed more to get at innate abilities; its defenders think the change could weaken what they see as an effective tool to identify smart, capable students at academically weaker schools.

One big shift is the way vocabulary will be handled. Rather than test knowledge of obscure words out of context (like “cruciverbalist,” “melilfluous” or “prestidigation”), the focus will be on so-called high-utility words that appear in many disciplines, and they’ll be used in a passage. For example, after reading a selection about population density that uses the word “intense,” the test might ask which word has the closest meaning: “emotional,” “concentrated,” “brilliant” or “determined.”

Some college officials think this move will let students from all backgrounds show what they really know, not just what they’ve memorized in prepping. But others remain a fan of the way the current test gets students to tap their critical-thinking skills and knowledge of Greek and Latin roots.

Focus on evidence
The new SAT will also require students to draw conclusions by taking account of evidence, to revise and edit text, to analyze data and interpret graphs, and to solve the types of math problems most commonly seen in college courses and the workplace. It’s no coincidence, observers say, that the new test will more closely resemble the ACT, which has been growing ever more popular. (The format of the ACT isn’t changing, but the company plans to make the optional essay a more analytical exercise and break out new scores measuring job skills and proficiency in STEM.)

The redesigned SAT will last three hours, with an extra 50 minutes allotted for an optional essay that will require analyzing a passage and how the author builds an argument.

Another change is the elimination of the guessing penalty, the practice of subtracting points for wrong answers.

Prep and practice
High school juniors and seniors, too, can capitalize on one development that takes effect right away: the college Board’s new partnership with the Khan Academy to provide free online test-prep materials. The idea is to start by taking a practice SAT, then master the material by watching in-depth explanatory videos and answering practice questions. Starting with the 2015 PSAT, a personalized dashboard will allow students to track their progress.

Admissions deans and college counselors see the partnership as a boon for the many kids who can’t take advantage of costly test prep. “We want to assist students from all backgrounds – suburban, rural, inner city – so that they all have equal access to quality test-prep materials, and now we can,” says Mike Drish, the director of admissions, recruitment and outreach at the University of Illinois–Urbana-Champaign.

Whichever test your child takes, devoting time to practice should increase his or her comfort level. But some experts advise against sitting for the real thing several times in an attempt to raise the score; some colleges may ask to see all re-
sults— and they certainly want to see kids engaged in more activities than exam prep. Try to keep the testing in perspective.

The rollout

Classes of 2015 and 2016 take the current SAT. Khan Academy prep materials are available for free at khanacademy.org/sat.

The Class of 2017 takes the redesigned PSAT in October 2015 and the redesigned SAT beginning in spring 2016. Free Khan Academy prep materials are available beginning in spring 2015.

Consider applying to a test-optional college or university

Many fine colleges have concluded that they don’t need test scores to make admissions decisions. Two that just joined the group in 2014: Temple University and Bryn Mawr in Pennsylvania. The National Center for Fair & Open Testing (fairtest.org) maintains a database of some 815 schools that are “test-optional” (applicants choose whether to submit scores) or that de-emphasize the tests.

Conquering the SAT and ACT Math Sections

The SAT and ACT math sections can be intimidating, even for those who excel in math. Here are four tips from Washington, D.C.-based Varsity Tutors for reaching the best possible score.

1. Understand the test content.

   This is an obvious point, but it must be emphasized: Devoting time to learning the material that the SAT or ACT will test is the most important step a student can take. In other words, understand the formulas so there’s no need to waste time continually referring to them. Know concepts like special triangles and be able to recognize them immediately. Memorize multiplication tables, factors, denominators and any other information that will spare unnecessary calculator usage. Speed is important, and this is the best way to conserve time without sacrificing performance.

2. Don’t just use scratch paper for simple calculations.

   If a geometric or pictorial problem is described in words, sketch it out. It is much easier and faster to process the question by looking at a drawing than trying to imagine it. Similarly, rewrite complicated word problems into mathematical language such as simple fractions. As a general rule, it is both more difficult and more time-consuming to solve complex problems just by picturing them.

3. Focus on both knowledge and speed.

   While practicing for an exam, if a problem or a particular type of problem is taking significant time to answer, it’s smart to step back and examine the method being used to solve it. Is there a more efficient way to achieve the same answer? Is there a shortcut? If so, students may be able to drastically aid their overall score by devoting more time to other problems on the test. Performing well on the ACT or SAT mathematics section is not solely about recognizing how to arrive at the correct answer, but also about understanding how to arrive at the correct answer in the most efficient manner possible.

4. Don’t use a calculator as a crutch.

   Even if your child possesses the best calculator money can buy, it’s not a good idea to rely on it more than absolutely necessary. In fact, learning how to do without it can often save time. If a problem can be solved with a calculator, but doing so will involve multiple calculations, there may well be ways to simplify the expression given so that the calculator will only have to perform short, simple tasks. And remember: Practice is key. You want your child’s test-taking strategies to become second nature.
Looking for a direction with terrific job growth potential? Here are a few hot STEM majors your child might want to consider when searching for a college.

**BIOMEDICAL ENGINEERING**
These folks stand at the intersection of the life sciences, engineering and medicine and work on such advances as artificial kidneys, “designer” blood clots that save wounded soldiers on the battlefield, and stem cells to build new blood vessels and repair damaged hearts.

The Bureau of Labor Statistics estimates the field will see a 27 percent growth in jobs between 2012 and 2022. Thayer School of Engineering at Dartmouth College, Georgia Institute of Technology and the University of Michigan boast top-ranked programs in the field. The accrediting organization ABET provides a list of all schools with accredited programs at abet.org.

**BIOMETRICS; FORENSIC SCIENCE**
As more experts are needed to operate the tools being invented to prevent and investigate crimes, colleges have begun stepping up to fill the need.

Biometrics teaches students how to build automated identification devices, such as facial recognition systems. Forensic science focuses on using technology to analyze evidence.

As biometric readers (finger-print scanners, for example) replace photo IDs and passwords, the industry is expected to grow from $50 million in 2011 to $363 million by 2018, according to Albany, New York-based Transparency Market Research.

Grads pursue careers as security consultants, intelligence analysts or biometric system designers with government agencies, defense contractors or nongovernmental entities like banks.

Students in forensics learn to use technology – including many of the systems and devices developed by biometrics – to analyze crime scenes. They might specialize in forensic biology (DNA and plant or insect analysis) or forensic chemistry or toxicology. About 15 U.S. bachelor’s programs are now accredited by the American Academy of Forensic Sciences, including Penn State University, Loyola University Chicago and Texas A&M University.

**COMPUTER GAME DESIGN**
Over 60 percent of all time spent on mobile devices is devoted to playing games. So it’s hardly surprising that over 200 colleges now offer majors in game design, development and programming.

Designers must learn skills such as animation, audio design, programming and production management. Increasingly, their expertise is also being employed to create simulated training environments in which firefighters learn to deal with chemical fires and explosions, for example, and emergency personnel respond to earthquakes or other natural disasters.

Schools offering computer gaming majors include the University of Southern California, University of Utah, George Mason University in Virginia, Rochester Institute of Technology in New York, and Drexel University in Philadelphia.

**CYBERSECURITY**
Large companies and governments are moving aggressively to protect their computer systems. Between 2014 and 2016, the Pentagon plans to add more than 4,000 experts to the current 900 at its Cyber Command, which is responsible for defending the nation’s critically important computer networks, from the military’s own to civilian power grids and financial systems. Specialists in cybersecurity can also find openings in health care, keeping medical records private; energy, where systems controlling water and power supplies are susceptible to attack; and at security services firms.

To help ensure workers have the right stuff, the National Security Agency is identifying centers of excellence in cyber operations. The first four: Dakota State University in South Dakota, the Naval Postgraduate School in California, Northeastern University in Boston, and the University of Texas at Arlington.
and the University of Tulsa in Oklahoma. Others with programs include the University of Maryland–Baltimore County and the Polytechnic Institute of New York University.

**DATA SCIENCE; BUSINESS ANALYTICS**

The International Data Corporation, a technology market research firm, says the global volume of computerized data is doubling every two years. Data science focuses on finding meaningful patterns in all that information, while business analytics looks for patterns that impact business, says Christopher Starr, chairman of the computer science department at the College of Charleston in South Carolina. By studying statistics, math and programming, graduates become “data explorers,” he says, and help government agencies, consulting firms, scientific organizations and companies develop strategy, understand customer behavior or predict market trends.

Business analytics entails figuring out how companies can grow and improve their performance. Courses include computer software, math, statistics and communication skills.

**PETROLEUM ENGINEERING**

New technologies such as horizontal drilling and fracking have opened up shale formations thought unproductive 10 years ago, and a new crop of petroleum engineers will be needed to tap these reserves; half of the current supply are expected to retire in the next decade. These engineers earn the highest starting salary of any recent college grads, more than $100,000. Grads will find employment in three areas, says Robert Chase, chair of the department of petroleum engineering and geology at Marietta College in Ohio: as drilling engineers to engineering studies, you basically have robotics,” says David Barrett, professor of mechanical engineering and design at Franklin W. Olin College of Engineering in Massachusetts.

Robotics majors generally study mechanical, electrical and software engineering as well as modeling and entrepreneurship. Other schools with strong robotics programs include Worcester Polytechnic Institute in Massachusetts, Lawrence Technological University in Michigan, the University of California–Santa Cruz, and Carnegie Mellon.

**SUSTAINABILITY**

New and retooled environmental degree programs are placing fresh emphasis on practical problem-solving. “We saw that students were tired of the gloom and doom often discussed in environmental science and wanted to talk about the solution,” says Michael McKinney, professor of geology and environmental studies at the University of Tennessee–Knoxville. The solution-oriented curriculum spans law, business, science, resource management and ethics. A course in green engineering, for example, teaches how to design industrial systems that use fewer resources. Sustainability managers in all sorts of companies and organizations look for ways to make the institution more efficient and produce less waste and pollution. Recently, at least 17 schools added sustainability majors, including the University of South Dakota, Cornell University in New York, and Oregon State University–Cascades.

New graduates in petroleum engineering earn a starting salary of over $100,000.
What sparked your interest in STEM?

I liked math and science when I was in school. I ended up majoring in math. I got a master’s and a post-master’s degree, and I’ve been working in the field ever since.

There weren’t a lot of people majoring in math, but the teachers encouraged me a lot to stay with it. I went to Washington, D.C., public schools, and they had a college internship that I applied for. I got into Howard University a year early because of it. I wanted to take calculus in 12th grade. I went to a performing arts school, and they didn’t have calculus.

One challenge I faced was not really knowing what I could do with a math degree. A lot of girls and young men don’t know. The only thing you can do, they think, is teach math. But I ended up in computer programming. NASA happened to be looking for mathematicians who knew IBM assembly language and Fortran, so they recruited me heavily. I only stayed there a year and a half, but I came back to NASA 25 years later to be the chief information officer of Goddard Space Flight Center and later the entire agency.

What is the biggest challenge you faced – and overcame – in STEM?

I didn’t have many cohorts coming up through school. There were a couple of women there, but we didn’t really work together. We sort of kept our heads down and studied on our own. We didn’t have much of a support system. But in spite of that, I think that a woman, when you’re in a field like this, you sort of learn your way. In a sense it was good training for the real world, for the workplace, and not having a lot of women role models.

How can we get more kids interested in STEM?

In trying to help encourage more girls and African-American kids to enter the STEM fields, one angle that I think is overlooked is music and art. I guess I would call it the STEAM angle. I’m on the board of directors of the D.C. Youth Orchestra Program, trying to grow a strong performing arts program, using music to tap that left brain, right brain thing and get it working together.

At 8 years old, I started playing the piano. In school, a lot of the kids who were really good students were also taking some musical instrument. I think that there is an affinity – how good a kid is in school and playing a musical instrument, maybe because of learning the discipline of practice and studying. I think they start developing that focus while they’re young, and they’re able to keep it when they go on to higher levels of education.

What advice do you have for underrepresented students?

Sometimes, especially in junior high school, you sort of want to do what your friends are doing. You don’t want to be that different. If you’re going to be successful in life, you’re going to have to learn how to break away from the pack. I always say that there’s a lot of success in the path least taken. Whether it means that you’re going to study math or science or be a professional musician, you’re going to follow a path that not many people follow. Getting comfortable with that in junior high school or in high school prepares you for success in life.
Finding the Right College

U.S. News & World Report, which publishes its “Best Colleges” lists each year, spotlights schools producing the most STEM grads, the best engineering programs and the top HBCUs.

The Biggest STEM Producers
These schools award the highest percentage of STEM degrees:
- California Institute of Technology
- Colorado School of Mines
- Missouri University of Science & Technology
- Worcester Polytechnic Institute (MA)
- Massachusetts Institute of Technology
- Rensselaer Polytechnic Institute (NY)
- Stevens Institute of Technology (NJ)
- Michigan Technological University
- Clarkson University (NY)
- Georgia Institute of Technology
- SUNY College of Environmental Science and Forestry (NY)
- Illinois Institute of Technology
- Carnegie Mellon University (PA)
- Stanford University (CA)
- Case Western Reserve University (OH)

Best Engineering Programs
If you want a bachelor’s degree in engineering, start with these lists

**UNDERGRAD-FOCUSED SCHOOLS**
- Harvey Mudd College (CA)
- Rose-Hulman Inst. of Tech. (IN)
- Franklin W. Olin Col. of Engineering (MA)
- United States Military Academy (NY)
- United States Air Force Academy (CO)
- United States Naval Academy (MD)
- Bucknell University (PA)
- Cooper Union (NY)
- Embry-Riddle Aeronautical U. (FL)
- Villanova University (PA)
- Baylor University (TX)
- U. S. Coast Guard Acad. (CT)
- Embry-Riddle Aeronautical Univ.–Prescott (AZ)
- Kettering University (MI)
- Lafayette College (PA)
- Milwaukee School of Engineering
- Santa Clara University (CA)
- Swarthmore College (PA)
- Union College (NY)
- Univ. of Colo.–Colorado Springs
- University of San Diego

**RESEARCH UNIVERSITIES**
- Massachusetts Inst. of Technology
- Stanford University (CA)
- University of California–Berkeley
- Georgia Institute of Technology
- U. of Illinois–Urbana-Champaign
- Carnegie Mellon University (PA)
- University of Michigan–Ann Arbor
- Purdue Univ.–West Lafayette (IN)
- Cornell University (NY)
- Princeton University (NJ)
- University of Texas–Austin
- Northwestern University (IL)
- Univ. of Wisconsin–Madison
- Johns Hopkins University (MD)
- Texas A&M Univ.–College Station
- Virginia Tech
- Duke University (NC)
- Pennsylvania State U.–Univ. Park
- Rice University (TX)
- Univ. of California–Los Angeles

Best Historically Black Colleges and Universities
- Spelman College (GA)
- Howard University (DC)
- Morehouse College (GA)
- Hampton University (VA)
- Tuskegee University (AL)
- Xavier Univ. of Louisiana
- Fisk University (TN)
- Florida A&M University
- Claflin University (SC)
- N. Carolina A&T State University

For more information and rankings, visit: usnews.com/bestcolleges.
How to Get Financial Aid

Each year the federal government hands out billions in grants and loans to young people headed to college – some $138 billion in fiscal year 2013 alone. States and colleges and other organizations make big handouts, too. Here are six things families need to know to be sure of getting their share.

1. You don’t have to automatically rule out high-priced colleges. New York students enjoy a relative bargain in The State University of New York and The City University of New York systems; room and board aside, tuition at the four-year colleges now runs just over $6,000 a year for state residents. Still, many colleges with large endowments want to enroll smart, capable students regardless of their ability to pay, and have the deep pockets to make that happen. A number of colleges and universities, such as Princeton, the University of Pennsylvania and the University of Chicago, have adopted no-loan or minimal-loan policies for many or all students with need. So a college with a high sticker price can sometimes be the cheapest choice.

2. You do have to fill out the FAFSA. The Free Application for Federal Student Aid determines how much a family is expected to contribute to college costs and must be completed for a student to receive any money from Uncle Sam’s coffers. You provide information about your income and assets (if the student is your dependent) and your child’s at fafsa.gov; the result is an “expected family contribution,” or EFC, that colleges use to put together an aid package. The value of your home and your retirement savings aren’t held against you in the federal aid formula. Many colleges require an additional form, the CSS/Financial Aid Profile, to calculate whether your student is eligible for non-federal awards.

3. Your “need” might not be what you think. The federal aid a college offers you is keyed not to how smart a student is but to need – the difference between expected family contribution and the cost of college. Families are sometimes shocked to discover that, based on income, their EFC runs to thousands of dollars that they haven’t socked away. Colleges that say they “meet full need” are talking about bridging the gap between EFC and the cost – not helping out with the family contribution, too.

4. There are several key parts to the package. They are: Outright grants such as the Pell Grant for lower-income students (the maximum award for 2014-15 is $5,730); student loans that don’t have to be repaid until college is over, the most common of which is the Stafford; and a work-study job on campus. Parents who qualify can borrow up to the full cost (minus aid received) under the PLUS loan program. State funds might be given out, too, and colleges often add “merit” aid, based not on need but on grades or leadership or musical talent, for example.

Students with need get “subsidized” Stafford loans, meaning the government covers the interest until after graduation. Any student, regardless of need, can take out an unsubsidized Stafford. Currently the cap on Staffords for a typical dependent freshman is $5,500, of which $3,500 can be subsidized. (Independent freshmen can borrow $9,500.) The caps rise in later years.

5. It’s critical to compare award letters carefully. Colleges have leeway in how they put their packages together, and often are more generous to students they really want. A $20,000 award from one school might include $5,000 in grants and merit aid, $2,500 in work-study and $12,500 in loans, while a $20,000 offer elsewhere might include $5,000 in federal grants and merit aid, $2,500 in work-study, $2,000 in a state grant and $10,500 in loans. Borrowing less is generally better. Tip: Students may improve their chances of getting generous merit aid by applying to schools where their grades and SAT or ACT scores put them near the top of the applicant pool.

6. It’s OK to ask for more. Colleges often say they don’t negotiate, but many will take a second look if a family gets a significantly better offer elsewhere. And they do want to know if your situation has suddenly changed – Mom lost her job, say, or Dad incurred big medical bills. Financial aid staffers might not be receptive to an angry phone call. But a polite request for a hearing could get results.
New York state has become an easier place for outstanding students to pursue high-tech careers, thanks to a new scholarship program. The New York State STEM Incentive Program will pay the full tuition for high school seniors who graduate in the top 10 percent of their class and major in a STEM field at any SUNY or CUNY campus. Recipients will have to work in a STEM field in New York for five years after graduation or pay back the grant, now worth up to $6,170 per year. (For more info, visit hesc.ny.gov.)

Scholarships are multiplying to reel students into STEM, and searching online will turn up hundreds of sources. Below is a taste of what students with the right qualifications can compete for, particularly members of underrepresented groups. Eligibility requirements vary. Collegebound seniors can apply for most; a few are open only to students already in college.

- **Whitney M. Young, Jr. Scholars Program:** The New York Urban League sponsors a number of scholarships for underserved youth (nyul.org).
- **Great Lakes Higher Education Corporation:** The student loan servicer offers up to 750 STEM scholarships of $2,500 (community.mygreatlakes.org).
- **Milton Fisher Scholarship for Innovation and Creativity:** Up to $5,000 per year for students from the New York metro area and Connecticut who show that they’ve solved a scientific, technical or artistic problem in an original way (rfbbfoundation.org).
- **Gates Millenium Scholars Program:** Tuition and living expenses, available to needy undergraduate minority students in any field (gmsp.org).
- **Xerox Technical Minority Scholarship:** Up to $10,000, available to minority students in a technical or engineering field (xerox.com/jobs/).
- **National Action Council for Minorities in Engineering (NACME) Pre-engineering scholarship:** For African-American, Latino or American Indian seniors in a precollege or high school program focused on STEM who are willing to work for the DOD upon graduation (smart.asee.org).
- **National Society of Black Engineers:** Awards of $1,000 to $3,000 targeted to students of Hispanic descent planning to pursue a STEM major (shpefoundation.org).
- **Hispanic Scholarship Fund:** This organization offers a host of scholarships for students studying the broad spectrum of disciplines (hsf.net).
- **The SMART Scholarship:** This Department of Defense program provides full tuition and a stipend to students in STEM behavioral and social science health-related research (training.nih.gov/programs).
- **Society of Hispanic Professional Engineers Foundation:** Awards of $1,000 to $3,000 targeted to students of Hispanic descent planning to pursue a STEM major (shpefoundation.org).

A search will turn up hundreds of sources of free college funds for students in STEM.
The STEM Riches at CUNY

The City University of New York offers a broad range of academic programs in STEM for your college- and high school-bound sons and daughters. Here’s a sample:

**College Now**
CUNY’s largest high school program draws some 20,000 students a year to before- and after-school courses, and it turns scientific in the summer when there’s time for lab and field work. Offerings range from computing and robotics to geology and engineering to biology and marine ecology. Participants on 10 CUNY campuses get free textbooks, MTA MetroCards and lunch vouchers.

» collegenow.cuny.edu/summer-programs-list

**STEM Research Academy**
This two-semester sequence of activities for high school juniors starts with a spring skills-building course that strengthens student literacy and numeracy skills. Interested students are then encouraged to apply for a six-week summer internship that matches them with a CUNY faculty member to work on a research project.

» nycsef.cuny.edu/summer-program

**Early College High Schools**
The university sponsors 17 early-college high schools; nine offer STEM programs. Designed for low-income youth from groups that have been historically underrepresented in higher education, these schools offer integrated six-year curricula. Students study at their high school and at a partner CUNY campus, graduating with both a high school diploma and a college associate degree or up to two years of transferable college credit, totally tuition-free.

» earlycollege.cuny.edu

**Accelerated Study in Associate Programs (ASAP)**
Community college students should consider Accelerated Study in Associate Programs. CUNY waives any gap between the financial aid award and tuition and fees for ASAP students, making the program tuition-free for those eligible for financial aid. ASAP students receive MTA MetroCards and free use of textbooks. CUNY is broadening ASAP majors to include more STEM fields, such as computer science, biotechnology, media technology, forensic science and engineering. It now operates at six CUNY community colleges and the College of Staten Island; New York City College of Technology and Medgar Evers College will join in 2016.

» cuny.edu/asap

**New York City Science and Engineering Fair (NYCSEF)**
Sponsored by CUNY and the New York City Department of Education, the NYCSEF is the city’s largest research competition for high school students. Each March, hundreds of city students present their research to a panel of judges in one of 14 different STEM categories. Top awards include scholarships to study at CUNY, as well as an all-expense-paid trip to represent NYC at the weeklong Intel International Science and Engineering Fair in May.

» nycsef.cuny.edu

**High School Initiative in Remote Sensing of the Earth Systems Science & Engineering (HIRES)**
A seven-week precollege summer program of the CUNY Remote Sensing Earth System (CREST) Institute that employs remote sensing in areas including global climate studies, atmosphere and weather, and ocean and coastal waters.

» crest.cuny.edu/hires

**CUNY Advanced Science Research Center**
A university-wide center that taps into the depth and diversity of CUNY’s research talent. The ASRC focuses CUNY initiatives in five disciplines – nanoscience, photonics, structural biology, neuroscience and environmental sciences – that position the university at the vanguard of 21st-century global science. ASRC’s Science Discovery and Education Center (scheduled to open in 2015) will promote science literacy to middle and high school students and the general public.

» asrc.cuny.edu
More NYC STEM Resources

New York City students of all ages have a wide – and growing – range of STEM enrichment programs available to them. Here’s a sampling of educational activities and places to embrace one’s inner scientist.

### After-School and Summer Programs
- All Star Code (allstarcode.org)
- Boys & Girls Clubs of America (bgca.org)
- Brooklyn Robot Foundry. For adults, too (brooklynrobotfoundry.com)
- 4-H (4-h.org)
- Harlem Biospace’s HYPOTHEkids (hypothekids.org)
- Math-M-Addicts (mathmaddicts.com)
- MathMatters! (nycmathmatters.org)
- New York Academy of Sciences Afterschool STEM Mentoring Program (www.nyas.org/landing/afterschool.aspx)
- New York University GSTEM (cims.nyu.edu/gstem)
- New York Urban League EXperiential Technology (NEXT) Academy. For parents and students (nyul.org/NEXT)
- New York Urban League STEM Ready Afterschool Program (nyul.org/STEM)
- School’s Out! Innovation Camp at the New York Hall of Science (nysci.org/schools-out-innovation-camp-registration)
- Science and Technology Entry Program (STEP) (stepforleaders.org)
- YMCA of Greater New York STEM programs (ymcanyyc.org)

### Museums and Education Centers
- American Museum of Natural History (amnh.org)
- Bronx Zoo (bronxzo.com)
- Brooklyn Children’s Museum (brooklynkids.org)
- National Museum of Mathematics (momath.org)
- New York Hall of Science (nysci.org)
- New York Transit Museum (web.mta.info/mta/museum)
- Sony Wonder Technology Lab (sonywondertechnologylab.com)

In 2009, Time Warner Cable launched its signature initiative, Connect a Million Minds, to address America’s declining interest in STEM. TWC’s commitment is to inspire the next generation of problem solvers by introducing young people to the wonders of STEM. As a result, it has created “The Connectory,” a comprehensive search tool for families seeking STEM resources and activities in their community. You can search by ZIP code and by keyword for a list of the many programs available near your home or child’s school.

» connectamillionminds.com/connectory

The Comprehensive After School System of NYC (COMPASS NYC) comprises more than 800 programs serving young people enrolled in grades K-12. Through its network of providers, COMPASS NYC offers high-quality programs with a strong balance of academics, recreation, enrichment and cultural activities to support and strengthen the overall development of young people. A key element of all COMPASS NYC programs is the integration of STEM to expose elementary and middle school participants to professions of the future. The Department of Youth and Community Development also offers School’s Out New York City (SONYC) after-school programs for middle school students as well as other STEM opportunities.

» nyc.gov/dycd
The New York Urban League was founded in 1919 and is one of 98 affiliates of the National Urban League. The mission of NYUL is to enable African-Americans and other underserved communities to secure a first-class education, economic self-reliance, and equal respect of their civil rights through programs, services and advocacy. Throughout its history, the NYUL has been responsible for integrating trade unions and industries, developing educational programs for overage and undercredited high school students, providing parents and students with quality educational supports and providing over $20 million in scholarships to deserving collegebound students.

Headquartered in Harlem, NYUL serves Manhattan, Brooklyn, Staten Island, Queens and the Bronx. Our current service areas are employment, education and empowerment through financial literacy and access to technology. Through our comprehensive Absolute Success College Access Program, we provide resources for academic improvement, Empowerment Days for career exploration and shadowing, scholarships for collegebound students, and tools for leadership development. In all, our college readiness-centered approach reflects a belief that in order to change a young person’s life trajectory, he or she must have family support, access to additional educational opportunities and the linkages that lead to informed decisions.

STEM Engagement Initiative
The League has taken a lead role in helping African-Americans move from being perpetual consumers of technology to becoming the men and women who create and support technology that solves problems, innovates and generates jobs for 21st-century generations. The NYUL has launched its STEM Engagement Initiative to close the digital divide and STEM talent gap in low-income communities and to provide students and families access to STEM education supports. Our approach has three components: 1) the NEXT Academy STEM Education Program for students and parents; 2) a parent’s guide to STEM education and parent workshops; and 3) a multimedia campaign to highlight the achievements of minorities in STEM-related fields and the citywide resources available to families.

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“We want to thank you for providing our son with such a great learning opportunity over the summer. The STEM program was great. He constantly talks about the trips and the friends that he made. He grew so much and had a different outlook on life. He told me that he did some soul-searching and realized that he has to do better in school. He asked that I enroll him in extra math and English classes on Saturdays because he wants to excel in school this academic year.”

—A Proud Mom
This guide was produced in partnership with: