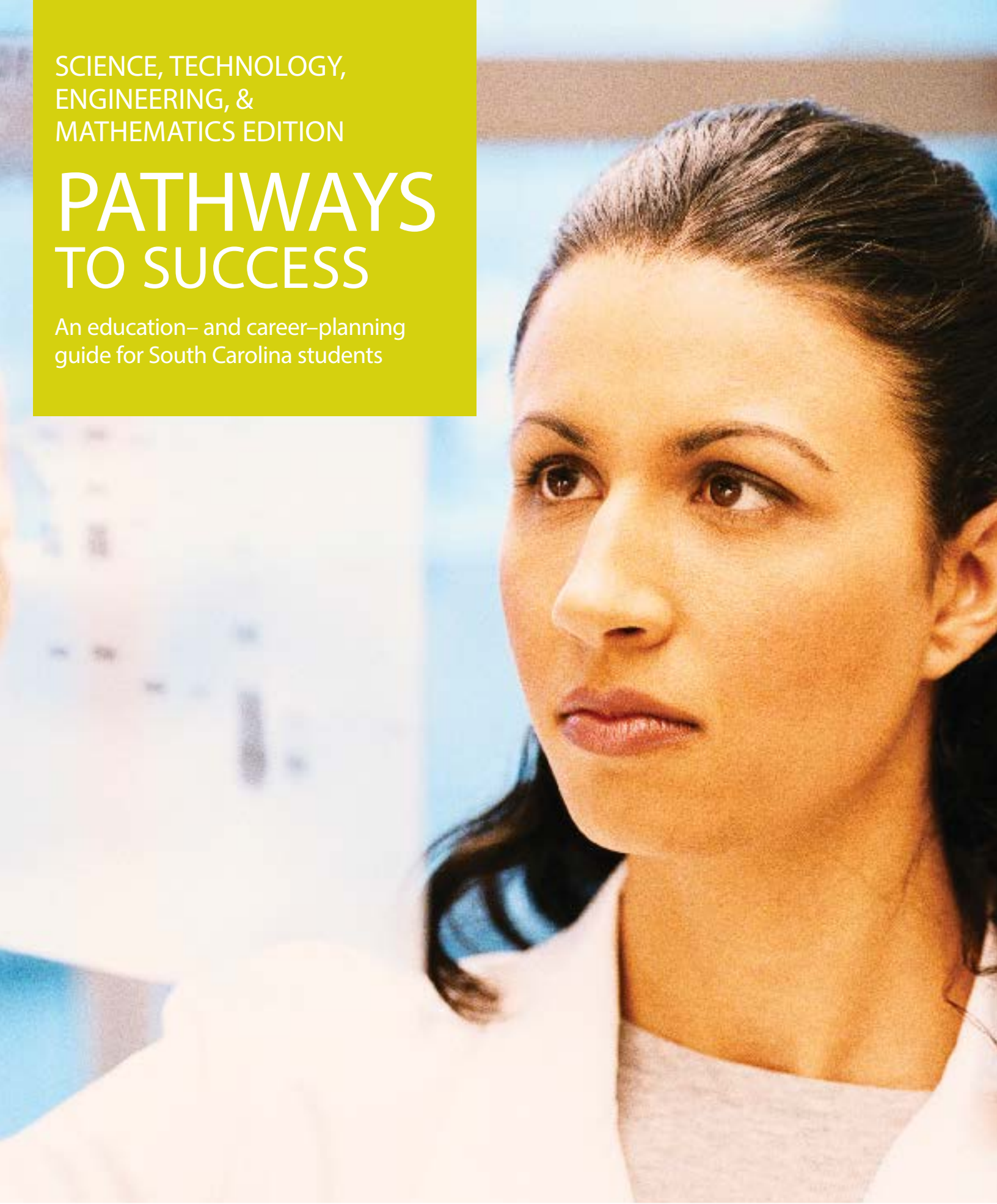
SCIENCE, TECHNOLOGY, ENGINEERING, & MATHEMATICS EDITION

PATHWAYS TO SUCCESS

An education– and career–planning guide for South Carolina students



South Carolina Department of Education
Together, we can.

Personal Pathways to success™

cerra SOUTH CAROLINA

Dear South Carolina Student,

"What do you want to be when you grow up?" You've heard it again and again, and if you're like most people in school, you probably feel pretty lost. However, knowing what appeals to you or, better yet, what you want to do, can help you focus on those subjects and activities that will prepare you for the future.

But with so much to think about in life right now, and so many career directions to choose from, choosing a career pathway can be overwhelming. Even worse, what if you were to decide and then change your mind?

How would you like to know more about your options? This guide offers you realistic insight into various career clusters and how they might fit into the way you think and feel.

Pathways to Success can help you get started. It is a series of education- and career-planning guides designed to help you make informed, smart career decisions. You can use this information to eliminate options that aren't attractive, so you can begin focusing on a career direction that is more appealing.

If you change your mind along the way, Pathways to Success can help you redirect your career plans, courses, and extracurricular activities.

In South Carolina, there are 16 career clusters that you can explore. This issue of Pathways to Success introduces you to one of these clusters. The clusters correspond to different fields within the job market (business, healthcare, the arts, agriculture, manufacturing, etc.).

Each issue of Pathways to Success explains what it is like to work in one of the career clusters, what kinds of jobs are available, and what parts of the career cluster are growing fastest. It also spells out the specific ways to prepare yourself for an occupation: majors to choose in high school, what classes to take, opportunities to learn outside of class, and the kind of education and training you can pursue after high school.

Believe it or not, being in school gives you a great chance to explore all of your options. So go for it. Figure out just how you feel about certain subjects. Seek out those things that you feel good about. Then start preparing yourself so you will be able to do the things you like to do "when you grow up."

Explore New Worlds in Science, Technology, Engineering, and Mathematics

To boldly go where no one has gone before is the hallmark of human progress and the prevailing spirit in Science, Technology, Engineering, and Mathematics careers. If you've got the urge to figure out how things work and advance the frontiers of knowledge, a career in Science, Technology, Engineering, and Mathematics might be right for you. These jobs pay well because technological progress is so important to the growth of our economy, to our country's security, and to the quality of future life on Earth. Read on to learn more about your opportunities in this exciting cluster of careers.

Contents

ATTENTION:

Parents, Teachers, and Counselors: This Guide Is for You, Too.

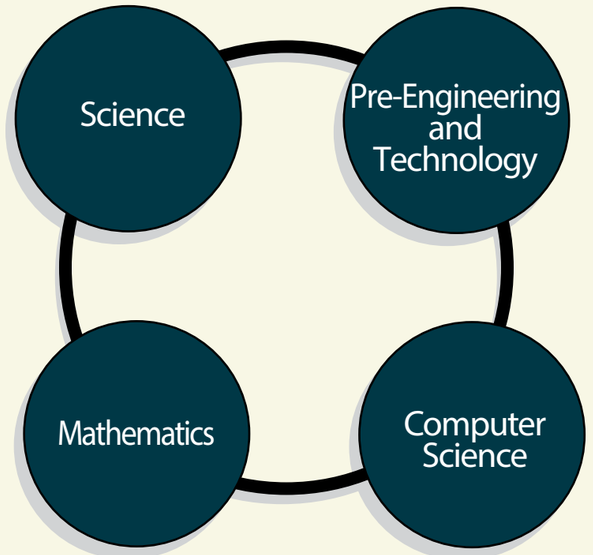
This career cluster guide speaks to students about their education and career paths, but you play a critical role by providing guidance as they plan their futures. Read this guide and learn more about the Science, Technology, Engineering, and Mathematics cluster. Then sit down and talk with your child or a student you are advising. Help craft an Individual Graduation Plan, or IGP, that puts that teen on a personal pathway to success (see "What is an IGP?" on page 6).

What Are Career Clusters and Majors?

Career clusters help you acquire the knowledge and skills you need to reach your personal career goals. They organize what you learn in school around specific professional fields such as Education and Training or Information Technology. Information Technology, for example, focuses on professions that require highly technical training, while Human Services emphasizes occupations that involve people skills. South Carolina recognizes these 16 career clusters offered at various schools across the state.

- Agriculture, Food, and Natural Resources
- Architecture and Construction
- Arts, A/V Technology, and Communications
- Business, Management, and Administration
- Education and Training
- Finance
- Government and Public Administration
- Health Science
- Hospitality and Tourism
- Human Services
- Information Technology
- Law, Public Safety, Corrections, and Security
- Manufacturing
- Marketing, Sales, and Service
- Science, Technology, Engineering, and Mathematics
- Transportation, Distribution, and Logistics

Majors Clustered Under Science, Technology, Engineering, and Mathematics



Each cluster consists of career majors, which are based on groups of professions that require similar talents, knowledge, and skills. For example, four majors fall within the Science, Technology, Engineering, and Mathematics career cluster (see diagram above). Each major provides the required courses, instruction, and experience necessary to move toward employment in a specific occupation, such as chemist or robotics technician, either right after high school or after additional education in college, the military, or elsewhere.

A Model Career Cluster System

Career Awareness (Grades K-5)

Grades K–2
- Students learn about different kinds of work.
- Students are instructed in diversity and gender equity in the workplace.
- Students learn about goal setting and decision making.
- Students learn what it means to be a good worker.

Grades 3–5
- Students use career assessment instruments to identify occupations.
- Students learn about occupations in the various career clusters.
- Students get involved in career guidance classroom activities.

Career Exploration (Grades 6-8)

6th Grade
- Students begin career exploration activities, including identification of learning opportunities in the community.
- Students take career assessment instruments.
- Students identify jobs within the clusters requiring different levels of education.

7th Grade
- Students identify the steps of the career decision-making process.
- Students identify and explore sources of career information.
- Students take career assessment instruments.
- Students explore work-based learning activities including service learning, job shadowing, and mentoring.

8th Grade
- Students pick a cluster of study that they are interested in exploring.
- Students explore work-based learning activities including service learning, job shadowing, and mentoring.
- Students meet with parents, counselors, teachers, guardians, and legal designees to develop both an academic and career portfolio consistent with their academic and career focus.
- Students take career assessment instruments.

Career Preparation (Grades 9-Postsecondary)

9th Grade
- Students may declare majors and focus their elective choices in particular areas.*
- Students review and update their IGPs.
- Students take career assessment instruments.
- Students explore work-based learning activities including service learning, job shadowing, and mentoring.

10th Grade
- Students should declare a career major.*
- Students review and update their IGPs.
- Students take career assessment instruments.
- Students explore work-based learning activities including service learning, job shadowing, and mentoring.

11th Grade
- Students review and update their graduation plans, with particular attention to postsecondary goals.
- Students take career assessment instruments.
- Students explore work-based learning activities including service learning, job shadowing, and mentoring.
- Students may change or modify their career majors.

12th Grade
- Students complete requirements for their majors.
- Students receive recognition for completion of career cluster majors at graduation.
- Students take career assessment instruments.
- Students explore work-based learning activities including service learning, job shadowing, and mentoring.
- Students may change or modify their career majors.

Postsecondary
- Students follow aligned career cluster pathways to a two- or four-year college, the military, other postsecondary education or training, or employment.
- Students obtain rewarding entry-level employment within their chosen clusters.
- Students continue to refine career choices throughout their lifetimes of learning.

* Students are encouraged to review their IGPs and modify or change this focus throughout their secondary school careers with the guidance of educators and parents.

Seven Steps to Success

Make your way, step by step, to a future in Science, Technology, Engineering, and Mathematics.

Your future career can be fun, or it can make you totally miserable depending on whether you choose one that fits your unique personality, interests, goals, and abilities. Planning to be a nurse, for example, makes no sense if you can't stand the sight of blood. Forget being an engineer if you aren't going to take on advanced math. And if you live to be outdoors, opt out of a profession that keeps you cooped up in an office all day. The truth is, earning a living for about 40 years is a lot more rewarding—financially and otherwise—if you find the profession that fits you perfectly.

The search for your perfect profession starts with creating an Individual Graduation Plan, often called an IGP, to guide you through high school (see "What is an IGP?" on page 6). Every South Carolina student is required to create an IGP, but don't think of it as a hassle. Instead, look at it as a chance to explore your interests and options and to start working toward your personal dream—whether it's to be a movie star or a minister, a CEO or a chef, an entrepreneur, or an engineer.

Here's a step-by-step guide to creating your own Individual Graduation Plan.

Step 1: Complete Assessments

Start putting together your IGP by determining your strengths and weaknesses, what you love (or hate) to do with your time, and your hopes and dreams in life. To find the answers to these and other questions, take advantage of career assessment tools such as Holland's Self-Directed Search, ASVAB (Armed Services Vocational Aptitude Battery), and the Kuder Interest Inventory available through your school and online (see "What is an IGP?" on page 6).

Step 2: Research Your Career Opportunities

After learning more about yourself, put together a list of careers you might want to research. Get the facts about what each possible profession pays, how many jobs in those professions are available in South Carolina (both now and in the future), and what kind of education you'll need to break into each of them. (For profiles of 25 career options in Science, Technology, Engineering, and Mathematics see page 8). Use the career information resources available through your school's library and the Internet, including SCOIS, O*NET, and COIN (see "Resource Roundup" on page 21). Go beyond the statistics, though, to get the inside story on what those who work in occupations on your list really do every day. Start by contacting professional associations and visiting Web sites, then arrange personal interviews and job shadowing.

n Step 3: Explore Your Education Options

Use your list of possible professions to investigate your education options in high school and beyond (see "Complete Your Eductaion" on page 18). Identify both two-year and four-year colleges with programs that best fit your career goals. In the same way, find out about obtaining associate's degrees at two-year technical colleges with programs in Science, Technology, Engineering, and Mathematics. Also, research opportunities for Science, Technology, Engineering, and Mathematics training in the military. Then look at the clusters, majors, and courses offered in high school as well as special programs such as co-op education and dual-credit courses. Learn about academic requirements and tests you may have to take to graduate and get into college, including PACT, PSAT, PLAN, SAT, ACT, and WorkKeys. Also, explore extracurricular activities (see "Study in the Real World" on page 16) related to your list of possible professions, including sports, community service groups, band, clubs, and student organizations such as SkillsUSA and TSA.

n Step 4: Talk About Your Options With Parents and Counselors

Assessments and research are essential, but input from your parents (or guardians), counselors, and teachers can also help as you narrow your career and education choices. Talk with them about what you are learning as you are assessed—they can help you further identify your strengths, opportunities, and interests. Tell them about your hopes and dreams. Discuss with them career options five, 10, or 20 years from now. Ask them to help with your research by providing resources or using their contacts to set up career exploration experiences such as job shadowing and internships. Time with your guidance staff person may be limited, so make the most of it. Come in with clear and well-researched ideas about your future, and ask what he or she can do to help you get where you want to go in life.

n Step 5: Make Your Choices and Document Your Decisions

Now that you are armed with valuable research and good advice from people you trust, it's time to make some decisions. Ask your counselor what format your IGP should follow—it likely will include most of the information shown in "What is an IGP?" on page 6. Select your career objective, cluster, and major, and write them down on your IGP. Fill in a tentative schedule for your high school years. Add to your plan lists of the out-of-class and work experiences you want to pursue and your goal after high school—college, the military, employment, or another option. It's also smart to create a career portfolio, which is a file of material related to the education and career choices in your IGP. This folder might include items such as a resume, samples of your schoolwork, and research and assessment information. Once you have documented your decisions, save your IGP and career portfolio as your school directs.

n Step 6: Review and Revise Your IGP Each Year

A good IGP is frequently updated. It expands and changes as you go through high school. At least once at the end of each year, go back to your IGP and revise it as needed. Ask yourself if your decisions are still sound or if you've changed your mind about your career objective or plans after high school. Be realistic, but don't feel locked in to the choices you made earlier. Switching your cluster or major as you learn more about your interests and options in life is okay. Some direction—even if it changes—is better than no direction at all. Use this annual review of your plan to make choices that are intentional, not accidental, as you grow and change.

n Step 7: Graduate and Move On to Additional Education or Employment

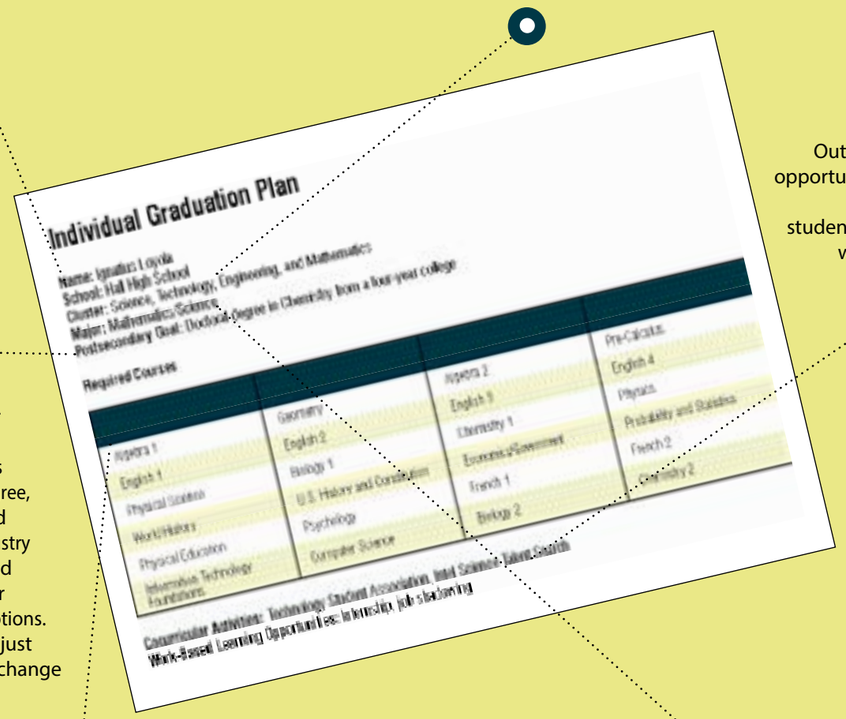
The goal of an IGP is to give you a clear path to high school graduation, but that's not the end of your road to success. The plan you created will carry you on to college, the military, an apprenticeship, other education or training, or directly into the job market. You likely will continue to evaluate, research, discuss, and refine your career choices after high school and throughout your life.

What is an IGP?

An Individual Graduation Plan (IGP) is like a road map to your future. If you stay on course, you'll reach your destination—graduation—with all the courses, skills, and experience you need to take your education or career to the next level. Here's what a basic IGP includes:

Information such as your name and school.

Your chosen career cluster is a field of study such as Information Technology or Hospitality and Tourism on which you plan to focus in high school and beyond. South Carolina recognizes 16 career clusters (see page 2), although local schools and districts may offer different clusters. This guide is an introduction to the Science, Technology, Engineering, and Mathematics cluster.


Individual Graduation Plan

Name: Ignatius Loyola
School: Hal High School
Cluster: Science, Technology, Engineering, and Mathematics
Major: Mathematics/Science
Postsecondary Goal: Doctoral degree in Chemistry from a four-year college

Required Courses

Algebra 1	Geometry	Algebra 2	Pre-Calculus
English 1	English 2	English 3	English 4
Physical Science	Biology 1	Chemistry 1	Physics
World History	U.S. History and Constitution	Economics/Government	Probability and Statistics
Physical Education	Psychology	French 1	French 2
Information Technology Foundations	Computer Science	Biology 2	Chemistry 2

Co-curricular Activities: Technology Student Association, Intel Science Talent Search
Work-Based Learning Opportunities: Internship, job shadowing

Out-of-class learning opportunities you want to pursue, such as student organizations or work experiences.

Your plan for what to do after high school—get an associate's or bachelor's degree, enter the armed forces, seek industry certification, find employment, or pursue other options. Be specific—it's just a goal you can change later if needed.

A grade-nine-through-twelve outline of classes you should take, including core academic classes required for graduation and electives. Fill in the specific classes your school offers.

Your chosen career major, a field such as Mathematics or Science, in which you plan to work when you enter the job market.

Your school may make this type of basic IGP part of your career portfolio—a file or folder that also may contain such information as results of your career-interest assessments, examples of your schoolwork, your scores from standardized tests, and records of your work experiences.

Create a Career in Science

If you have big ideas or find yourself thinking outside the box, a career in Science, Technology, Engineering, and Mathematics can meet the expectations of someone like you. Nothing is more satisfying than seeing your ideas come to life.

In recent years, advances in science, computer sciences, and engineering have produced more than half of the nation's economic growth. No other investment yields a greater long-term economic return than money spent on scientific research and development (R&D). Money spent on R&D annually exceeds $1 billion in South Carolina and most of the R&D is carried out by private industry. This creates career opportunities for those who want to make a contribution, further the cause of mankind, and enrich their lives. In addition, the U.S. Departments of Energy and Defense are looking to replace an ageing population trained in mathematics, science (physics, chemistry, and biology), and computation to solve problems in science.

The pay is in line with the high demand for big thinkers in this career cluster. Many of South Carolina's highest-paying jobs are in science and engineering (not including occupations in medicine or information technology), and tens of thousands of people are employed in different areas of the cluster.

The future looks bright. A recent presidential council reported to the White House that, "The most scientifically important and economically promising research frontiers in the 21st century will be conquered by those most skilled with advanced computing technologies and computational science applications."

The amount of education required in this cluster varies. For instance, Engineering Technicians, who usually start their careers with two-year associate's degrees, can make more than $40,000 a year.

Obviously, to succeed in this career cluster, you need to study science, computing, engineering, and math in school. Also, you need to develop communication and people skills since science and engineering projects are typically team efforts. If you combine study in technical fields with business-oriented courses, you will increase your value to employers who need people skilled in both science and management to run their research and development programs.

Quick Quiz

Answer "yes" or "no" to these questions to see if Science, Technology, Engineering, and Mathematics is the right career cluster for you.

1. I am able to explain why different types of weather affect how crops and plants grow.
2. I am good at maintaining my savings account or checking account.
3. I can repair a broken item, such as a watch or radio.
4. I can add numbers in my head quickly and easily.
5. I am good at taking apart an item and then putting it back together again.
6. I like working with numbers, symbols, and ideas.
7. Changing raw materials into useful products, such as making paper from wood, sounds exciting to me.
8. I'd like to study and research space flight.
9. I can make preparations to protect myself and others from natural disasters, such as hurricanes and tornadoes.

Totals: "Yes" _____ "No" _____

If you answered "yes" to five or more of the questions, then you may have what it takes to make it in Science, Technology, Engineering, and Mathematics.

Source: SCOIS (Coin Career) Assessment Tests

About This Chart

This chart is a sampling of 25 of the more than 100 occupations that fall within the Science, Technology, Engineering, and Mathematics sector of the South Carolina job market. For more information about any Science, Technology, Engineering, and Mathematics occupation, check out the South Carolina Occupational Information System (SCOIS). This electronic database is packed with valuable information on careers, colleges, scholarships, and more. SCOIS is available in local schools and at more than 600 other locations throughout South Carolina. Here are explanations for the abbreviations and symbols used in this chart.

Education Requirement Abbreviations

C — 12- or 18-month certificate
AD — Two-year associate's degree
AP — Advanced Placement
BD — Four-year bachelor's degree
HS — High school diploma or GED
MA — Master's degree
NA — Information not available or item does not apply
OJT — On-the-job training
DD — Doctorate degree

Source: www.salary.com

25 Career Choices in Science, Technology, Engineering, and Mathematics

Occupation	SC Salary	Job Growth[1]	Education Required[2]	Career Readiness Certificate Level[3]	Description
Aerospace Engineer	$73,500	NA	BD, MA, DD	gold	Designs, develops, and tests commercial and military aircraft, missiles, and spacecraft.
Agricultural Scientist	$44,860	4.8%	BD, MA, DD	gold	Studies and performs research on soil, plants, animals, and animal products.
Anthropologist	$45,360	NA	BD, MA, DD	gold	Studies the physical, cultural, and social changes in order to form a more accurate picture of the origin and evolution of the human race.
Biomedical Engineer	$49,960	NA	BD, MA, DD	gold	Conducts research into the biological aspects of humans or other animals to develop new theories or test, prove, and modify known theories of life systems.
Botanist	$63,720	NA	BD, MA	gold	Studies plant structure, physiology, heredity, distribution, and economic value.
Chemical Engineer	$77,770	-5.8%	BD, MA, DD	gold	Designs chemical plant equipment and devises processes for manufacturing chemical products such as gasoline, synthetic rubber, plastics, and cement.
Civil Engineer	$61,830	14.9%	BD, MA, DD	gold	Designs and supervises the construction and maintenance of structures and facilities such as roads, airports, and water supply and sewage systems.
Computer Engineer	$63,700	10.7%	BD, MA	gold	Researches, collects, and reports information on the abilities of computers and computer systems in the design of new equipment and systems.
Computer Systems Analyst	$60,470	10.6%	AD, BD	gold	Decides how data is collected, prepared for computers, processed, stored, and made available for users. May design completely new systems.
Database Administrator	$51,250	11.9%	BD	gold	Finds ways to efficiently organize and store data, create computer databases, determine user requirements, and test and coordinate changes to databases.
Dietitian and Nutritionist	$38,140	20.0%	BD, MA	gold	Applies the principles of nutrition to plan and supervise the preparation and serving of meals.
Economist	$53,920	NA	BD, MA	gold	Conducts research and collects and analyzes data to aid in the solution of arising economic problems.
Environmental Science Technician	$37,810	12.1%	BD	gold	Solves environmental problems in land, air and water pollution, radiation, and toxic materials.
Forensic Scientist	$49,700	NA	BD	gold	Investigates crimes by collecting and analyzing physical evidence using a variety of scientific, mathematical, and problem-solving methods and instruments.
Forester and Conservation Scientist	$56,360	7.1%	BD, MA	gold	Manages forests, rangelands, wildlife, minerals, water, and other natural resources for consumption, conservation, and recreation.
Industrial Engineer	$64,600	-6.5%	BD, MA, DD	gold	Determines the most effective ways for an organization to use the basic factors of production—people, machines, materials, information, and energy.
Marine Biologist	$63,720	NA	BD	gold	Studies salt-water plants and animals.
Mathematician	$41,560	NA	BD, MA, DD	gold	Uses math for a variety of purposes, ranging from the creation of new theories and techniques to the solution of economic, scientific, and managerial problems.
Mechanical Engineer	$68,200	0.4%	BD, MA, DD	gold	Designs and coordinates systems for the production, transmission, and use of mechanical power and heat.
Meteorologist	$67,650	NA	BD, MA	gold	Studies the earth's atmosphere. Engages both in basic research to expand our knowledge and activities relating to its application, such as weather prediction.
Nuclear Engineer	$88,900	8.7%	BD, MA, DD	gold	Analyzes, researches, designs, and manages the use of nuclear energy for power plants, transportation, space exploration, and diagnostic health.
Oceanographer	$51,250	11.8%	BD, MA	gold	Studies the geological structure of the ocean and the movement and physical aspects of plant and animal life in it.
Physicist	$77,060	NA	BD, MA, DD	gold	Studies the laws of matter and energy and applies them to problems in science, engineering, medicine, and industry.
Statistician	$41,560	NA	BD, MA	gold	Collects, arranges, analyzes, interprets, and presents numerical data in applied or mathematical areas.
Zoologist	$49,800	NA	BD, MA	gold	Studies all aspects of the biology of specific groups of animals.

1 The expected percentage increase or decline in the number of positions in the profession in South Carolina through 2008.
2 The minimum educational attainment required to enter the profession; occupations may have different entry-level jobs for those with different degrees.
3 The South Carolina Career Readiness Certificate demonstrates to employers that you have the skills necessary to be successful in your chosen occupation. For more information on the CRC in South Carolina go to www.WorkReadySC.org.

Map Out Your Schooling

To achieve success in Science, Technology, Engineering, and Mathematics you should plan your education now.

10 Highest-Paying Science, Technology, Engineering, and Mathematics Professions

	Occupation	Salary
1.	Nuclear Engineer	$88,900
2.	Chemical Engineer	$77,770
3.	Physicist	$77,060
4.	Ceramic Engineer	$75,890
5.	Metallurgical/Materials Engineer	$75,890
6.	Aerospace Engineer	$73,500
7.	Electrical and Electronics Engineer	$73,080
8.	Marine Engineer and Architect	$72,960
9.	Mining and Geological Engineer	$70,500
10.	Mechanical Engineer	$68,200

Based on annual mean salary in South Carolina. Source: SCOIS

10 Fastest-Growing Science, Technology, Engineering, and Mathematics Professions

	Occupation	Job Growth
1.	Dietitian and Nutritionist	20.0%
2.	Laser Technician	16.5%
3.	Sound Engineer	16.1%
4.	Writer and Editor	15.6%
5.	Broadcast Technician	15.3%
6.	Civil Engineer	14.9%
7.	Computer Programmer	12.5%
8.	Surveyor and Cartographer	12.3%
9.	Environmental Science Technician	12.1%
10.	Database Administrator	11.9%

Based on expected growth in percentage of jobs available between 2001 and 2008 in South Carolina. Source: SCOIS

If your goal is a career breakthrough in science, you need a carefully researched and charted road map to success. You must examine your options, choose a target career, and then plot your way from where you are educationally right now to your final career destination.

That includes laying out your high school course work, considering the different opportunities for learning experiences available in the workplace, and getting a good idea of how to complete your education after high school. If the process seems more complicated than higher mathematics, it might help to break it down into smaller, simpler steps. That way, you can get a better handle on how to proceed. If you isolate the alternatives you have at different stages, you're left with a series of choices that you can make in order as you move through your master plan.

For example, one of your first decisions in exploring science careers will be to pick a high school major (see "What Are Career Clusters and Majors?" on page 2). Each career cluster is divided into specific areas of study, and the Career Major Maps that you'll find beginning on page 12 boil each major down to its essentials. The maps include sample high school schedules (your school, of course, may offer different programs or classes), information about extracurricular activities, options for training after high school, and jobs for which each major might prepare you.

In the Science, Technology, Engineering, and Mathematics cluster there are four majors:

- Science (page 12)
- Pre-Engineering and Technology (page 13)
- Mathematics (page 14)
- Computer Science (page 15)

These four majors correspond to the South Carolina job market in Science, Technology, Engineering, and Mathematics careers.* If you choose the Pre-Engineering and Technology major, for example, you can continue with that area of study after high school, pursuing an associate's degree in engineering technology at a two-year college, a bachelor's or higher level degree in engineering at a university, or engineering training in the military. Each of those paths can lead to different engineering occupations in the South Carolina economy. Generally, graduation with a high school career major requires the completion of four elective courses in the major area.

One thing to remember as you move through high school is that you can and should change your plans as the need arises. If you feel you're headed in the wrong direction, then by all means take the next exit and get on a different road. This is your future we're talking about, and you're in the driver's seat.

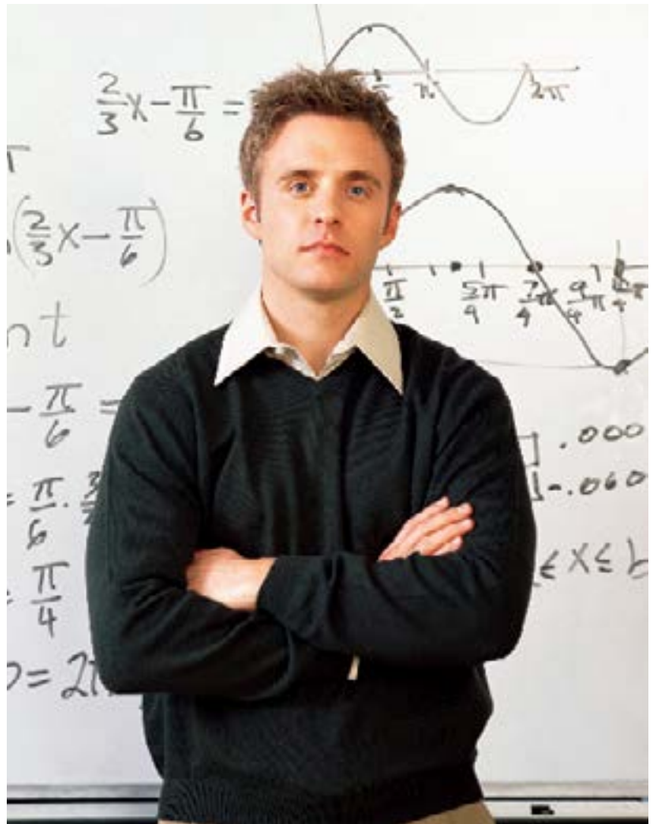
*Local South Carolina schools and districts may offer fewer career clusters and majors, clusters and majors that are organized differently, or clusters and majors with alternative names.

Project Lead The Way

Students often wonder, "Why do I have to learn calculus or physics? I won't ever use them in the real world." If you want to be an engineer, you will definitely use what you learn in these classes every day as you tackle complex topics and try to find the answer to "What if?"

So here's a question for you: what if no one wanted to be an engineer or scientist? In recent years, the United States has seen a decline in the number of students entering these fields of study. To help our country maintain its technical edge, more students need to pursue careers as engineers, scientists, mathematicians, computer whizzes, and big thinkers.

Project Lead The Way (PLTW) offers all students interested in engineering a hands-on introduction to the way things they learn in school are applied in the real world. Classes are project-based, so participating students don't just sit and study theories and formulas, they perform and get a feel for the rigors and rewards of involvement. Middle school students get a basic introduction to the field. High school students get more involved, taking PLTW core courses along with advanced science and math courses. In South Carolina, high school students may also receive college credit for completion of certain PLTW core courses.



Future engineers can get a look into their field through Project Lead The Way.

Start With the Basics

A Science, Technology, Engineering, or Mathematics career constructed on bedrock academic courses is a career that's built to last. Here are the core courses you need for success.

- **Science:** Ground yourself in the sets of knowledge – biology, chemistry, computer science, and physics – that are the basis of your chosen career.
- **Math:** Engineering, technology, and science rely heavily on mathematics, both as a tool and as an underlying mental discipline.
- **English:** Science, technology, engineering, and mathematics are team efforts based on the constant exchange of ideas. Clear communication is essential to scientific progress.
- **Social Studies/History:** Advances in travel and communications have made science a global enterprise. The more scientists know about people around the world, the greater their opportunities for career success.
- **Modern or Classical Language:** Since firms involved in scientific research and engineering do more and more business overseas, knowing another language increases your ability to land challenging, exciting jobs with these far-flung enterprises.
- **Arts:** Four-year colleges and universities require an arts credit for admission. Be sure to fulfill this requirement. It will be fun, since creativity is nothing more than thinking outside the box.

Career Major Map: Science

Workers in Science careers pursue, advance, and apply knowledge of science in a variety of settings. Employment possibilities include teaching or research, working in the laboratory or in the field, and pursuing science as technicians or even as astronauts.

Required Core for Graduation	Sample Core Choices For additional college entrance requirements, refer to the college of your choice.			
	9	10	11	12
English* Four Units Required	English 1	English 2	English 3	English 4
Math* Four Units Required	Algebra 1 or MathfortheTechnologies1	Geometry or MathfortheTechnologies2	Algebra 2 or MathfortheTechnologies3	Pre-Calculus or MathfortheTechnologies4
Science* Four Units Required	Physical Science	Biology or Applied Biology	Chemistry or Chemistry for the Technologies	Physics or Physics for the Technologies
Social Studies Three Units Required	Global Studies 1 or World Geography	Global Studies 2 or Social Studies Elective or World History	U.S. History	Economics/Government
Additional State Requirements	Physical Education or JROTC (one unit) Computer Science (one unit) Electives (seven units)		Pass High School Assessment CTE or Modern or Classical Language (one unit) Art (one unit)	

Courses for Major (Minimum of four credits required)	Complementary Course Work	Extended Learning Opportunity Options Related to Major
Advanced Math Elective Advanced Science Elective AP and IB Mathematics AP and IB Sciences Computer Science Probability and Statistics	Information Technology Principles of Engineering Biotechnical Engineering Modern or Classical Language	Career Mentoring Shadowing Internship SkillsUSA Technology Student Association (TSA) Senior Project

Professional Opportunities Upon Graduation		
High School Diploma	Additional Training to 2-year Degree Laboratory Technician Nuclear Technician Research Technician Technologist	4-year Degree & Higher Archeologist Science Teacher/Professor Computer Software Engineer Conservation Scientist Chemist Zoologist

*Course selection will depend on satisfying prerequisites.

Career Major Map: Pre-Engineering and Technology

Workers in Pre-Engineering and Technology apply advanced mathematics, life science, physical science, and technology to alter natural matter and energy, resulting in processes, facilities, and devices that improve people's lives.

Required Core for Graduation	Sample Core Choices For additional college entrance requirements, refer to the college of your choice.			
	9	10	11	12
English* Four Units Required	English 1	English 2	English 3	English 4
Math* Four Units Required	Algebra 1 or MathfortheTechnologies1	Geometry or MathfortheTechnologies2	Algebra 2 or MathfortheTechnologies3	Pre-Calculus or MathfortheTechnologies4
Science* Four Units Required	Physical Science	Biology or Applied Biology	Chemistry or Chemistry for the Technologies	Physics or Physics for the Technologies
Social Studies Three Units Required	Global Studies 1 or World Geography	Global Studies 2 or Social Studies Elective or World History	U.S. History	Economics/Government
Additional State Requirements	Physical Education or JROTC (one unit) Computer Science (one unit) Electives (seven units)		Pass High School Assessment CTE or Modern or Classical Language (one unit) Art (one unit)	

Courses for Major (Minimum of four credits required)	Complementary Course Work	Extended Learning Opportunity Options Related to Major
Calculus Advanced Mathematics Science Elective Computer Science Probability and Statistics	Introduction to Engineering Design Principles of Engineering Digital Electronics Computer Integrated Manufacturing Civil Engineering and Arhitecture Engineering Design and Development Aerospace Engineering Biotechnical Engineering Modern or Classical Language	Career Mentoring Shadowing Internship SkillsUSA Technology Student Association (TSA) Senior Project

Professional Opportunities Upon Graduation		
High School Diploma	Additional Training to 2-year Degree Chemical Engineer Technician Civil Engineer Technician Graphic Engineering Technician Industrial Engineer Technician Mechanical Engineer Technician	4-year Degree & Higher Architectural Engineer Chemical Engineer Civil Engineer Industrial Engineer Mechanical Engineer Nuclear Engineer

*Course selection will depend on satisfying prerequisites.

Career Major Map: Mathematics

Workers in Mathematics careers advance and apply knowledge of math in a variety of settings. Employment possibilities include teaching or research, working in business or in government, and pursuing math as data analysts, statisticians, or even professional code breakers.

Required Core for Graduation	Sample Core Choices For additional college entrance requirements, refer to the college of your choice.			
	9	10	11	12
English* Four Units Required	English 1	English 2	English 3	English 4
Math* Four Units Required	Algebra 1 or MathfortheTechnologies1	Geometry or MathfortheTechnologies2	Algebra 2 or MathfortheTechnologies3	Pre-Calculus or MathfortheTechnologies4
Science* Four Units Required	Physical Science	Biology or Applied Biology	Chemistry or Chemistry for the Technologies	Physics or Physics for the Technologies
Social Studies Three Units Required	Global Studies 1 or World Geography	Global Studies 2 or Social Studies Elective or World History	U.S. History	Economics/Government
Additional State Requirements	Physical Education or JROTC (one unit) Computer Science (one unit) Electives (seven units)		Pass High School Assessment CTE or Modern or Classical Language (one unit) Art (one unit)	

Courses for Major (Minimum of four credits required)	Complementary Course Work	Extended Learning Opportunity Options Related to Major
Calculus Advanced Math Elective Advanced Science Elective AP and IB Mathematics AP and IB Sciences Computer Science Probability and Statistics	AP and IB Mathematics AP and IB Sciences Information Technology Computer Science Introduction to Engineering Design Principles of Engineering Digital Electronics Modern or Classical Language	Career Mentoring Shadowing Internship SkillsUSA Technology Student Association (TSA) Senior Project

Professional Opportunities Upon Graduation		
High School Diploma	Additional Training to 2-year Degree CAD operator Communications Technologist Data Analyst Metallurgist Research Technician	4-year Degree & Higher Archeologist Mathematics Teacher Computer Software Engineer Mathematician Statistician Numerical Analyst

*Course selection will depend on satisfying prerequisites.

Career Major Map: Computer Science

People in the Computer Science pathway are analytical and detail oriented. They work with hardware and software to create and manage networks, databases, and digital communications systems. Computer Science requires a love of math and the ability to master highly technical skills, including various kinds of programming language.

Required Core for Graduation	Sample Core Choices For additional college entrance requirements, refer to the college of your choice.			
	9	10	11	12
English* Four Units Required	English 1	English 2	English 3	English 4
Math* Four Units Required	Algebra 1 or MathfortheTechnologies1	Geometry or MathfortheTechnologies2	Algebra 2 or MathfortheTechnologies3	Pre-Calculus or MathfortheTechnologies4
Science* Four Units Required	Physical Science	Biology or Applied Biology	Chemistry or Chemistry for the Technologies	Physics or Physics for the Technologies
Social Studies Three Units Required	Global Studies 1 or World Geography	Global Studies 2 or Social Studies Elective or World History	U.S. History	Economics/Government
Additional State Requirements	Physical Education or JROTC (one unit) Computer Science (one unit) Electives (seven units)		Pass High School Assessment CTE or Modern or Classical Language (one unit) Art (one unit)	

Courses for Major (Minimum of four credits required)	Complementary Course Work	Extended Learning Opportunity Options Related to Major
Calculus Math Elective Science Elective AP and IB Mathematics AP and IB Sciences Computer Science Probability and Statistics	Computer Applications E-Commerce Information Technology Internet Applications Introduction to Engineering Design Principles of Engineering Digital Electronics Modern or Classical Language	Career Mentoring Shadowing Internship SkillsUSA Technology Student Association (TSA) Senior Project

Professional Opportunities Upon Graduation		
High School Diploma	Additional Training to 2-year Degree Computer Programmer Communications Technologist Data Analyst Technician Research Technician	4-year Degree & Higher Computer Software Engineer Computer Systems Analyst Database Administrator Network and Systems Analyst Computer Science Teacher

*Course selection will depend on satisfying prerequisites.

Study in the Real World

Your preparation for a Science, Technology, Engineering, and Mathematics career extends beyond the classroom to the world of work.

Learning Laboratories

Classroom study is crucial in Science, Technology, Engineering, and Mathematics, but the best test of your capabilities is in the laboratory of the real world. Scientific work experience enables you to:

- improve your personal skills by working with experienced researchers or engineers;
- get the facts you need about different jobs to make informed career choices;
- build your career portfolio and resume;
- graduate from high school with the skills and experience colleges and employers want;
- earn college credits or even a paycheck before you graduate;
- create an IGP that is effective and efficient;
- jump-start your career or college education.

Scientists and engineers deal with the world, either explaining why it works or transforming it so it works better. Is it any wonder that one of the best places for you to prepare for a career in science or engineering is in the big laboratory of the real world? Approach life as an ongoing experiment, and you won't go too far wrong.

n Big Ideas Lead to Virtual Experiments

You've got ideas, but what if your idea would blow up the world? One of the best ways to find out what will happen in the real world is to test your idea using a computer model. Computers are everywhere these days and computing can be applied to virtually any area of study. If you are interested in the Science, Technology, Engineering, and Mathematics cluster, make sure to immerse yourself in computing in school.

n Step One

Your challenge right now is finding the best way to combine this real-life education with the learning you pursue in the classroom. Science, technology, engineering, and mathematics are knowledge-heavy disciplines. Before you can tackle a full-blown, major-league science career, you have to digest a significant helping of basic information in the classroom. But if you manage things well, you can begin your study in the real world at the same time you're hitting the books in school.

n Get Your Bearings

The first step is to get a feel for the different occupations available in science and engineering. One of the best ways to determine which work environment you prefer is to arrange to follow people in different occupations as they make their way through a typical workday. Called "job shadowing," this simple introduction to job exploration lets you observe how and where different people do different jobs. Job shadowing is so useful in getting your career bearings that a national day each February, Groundhog Job Shadow Day, is dedicated to it. Each year more than a million middle and high school students take part. You don't have to wait for February to job shadow. Start now by asking your guidance counselor, teachers, parents or guardians, and family friends for help finding shadowing opportunities.

n Get to Work

Because science, computing, and technology are so important to the economy and our country's future, initiatives to encourage talented students to enter the field are common. That means there are a lot of different opportunities for high school students to get on-the-job experience in science and engineering. Internships in laboratories and businesses last for extended periods of time, typically two to four hours a day for the course of a semester or full-time during the summer. Whether paid or unpaid, such experiences definitely improve your future chances of getting a science or engineering job. Internship programs are often organized to help recruit particular groups of workers, such as women and African-Americans, whose talents are underrepresented in the field. The National Aeronautics and Space Administration (NASA), for example, sponsors its Summer High School Apprenticeship Research Program (SHARP) each year at NASA facilities and selected universities across the country. Learn more about the program at www.mtsibase.com/sharp.

n Compete with the Best

Among the most valuable learning experiences available to technical and engineering students outside the high school classroom are the competitions held regularly across the country. Because engineering is project work, it lends itself to competition; each team designs a widget and the best widget wins. Here are some of the premier high school competitions.

n FIRST High School Robotics Contest

Conceived and organized by For Inspiration and Recognition of Science and Technology (FIRST), a nonprofit organization founded in 1989 by inventor Dean Kamen, the FIRST Robotics Competition involves high school students in recruiting corporate and academic sponsors for their robotics projects, completing the robots in a six-week design and construction period, and taking the robots to regional and national championships. More than $8 million in scholarships are awarded to prizewinners each year. (www.usfirst.org)

n Intel Science Talent Search (STS)

STS brings high school seniors together to present the results of original scientific research projects before a national jury of highly regarded professional scientists. STS is the oldest and most highly regarded high school science competition in the country. Over the years, participants in STS have gone on to win three National Medals of Science and five Nobel Prizes. (www.sciserv.org/sts)

n Tests of Engineering Aptitude, Mathematics, and Science (TEAMS)

TEAMS, sponsored by the Junior Engineering Technical Society, pits groups of high school students against each other in problem-solving competitions in math, chemistry, physics, biology, and other areas. Students solve problems as a team in open-book, open-discussion sessions. The competitions are designed to introduce high school students to the teamwork model common in professional engineering. For information on other science and engineering competitions for high school students, visit www.jets.org/teams/index.cfm.

"Part-time jobs in computing are very plentiful and most students can get valuable work experience and good money starting no later than their second year of college."

– Duncan A. Buell, Professor and Chair of the Department of Computer Science and Engineering at the University of South Carolina

Science, Technology, Engineering, and Mathematics Student Organizations

High school student organizations can give you your first step from the world of classroom learning toward the kind of experiences and training you'll encounter in your working career. You can practice communication and teamwork skills while experimenting with the practical applications of math and science. Give your science career education a boost by participating in these in-school organizations.

- Technology Student Association (TSA) – The only student organization dedicated exclusively to students interested in technology careers, TSA serves more than 150,000 middle and high school students in 47 states nationwide, including South Carolina. Students in TSA chapters learn leadership skills, participate in community service projects, and prepare for state and national competitions. Events at high school competitions include agriculture and biotechnology design, radio controlled transportation, structural engineering, and technological systems. www.tsaweb.com

- SkillsUSA – The annual competitions of this career-oriented student organization include a number of science and engineering events, while the activities of its individual chapters help students develop teamwork and networking skills. SkillsUSA serves high school and college students in more than 14,700 chapters nationwide. The emphasis in SkillsUSA is on career development, but technical competitions are so broad in scope that there is plenty of opportunity to apply your technical knowledge. Choose from events in precision machining technology, robotics, total quality management, and "Mechatronics," the industrial discipline integrating pneumatic, electronic, mechanical, and automated systems. www.skillsusa.org

Complete Your Education

Continue your education beyond high school for a successful career in Science, Technology, Engineering, and Mathematics.

College Connections

Every South Carolina two- and four-year college has a Web site that includes information about admission requirements, majors, fees, financial aid, internships, and scholarship opportunities.

You can find the Web site for any South Carolina public, private, or technical college through one of these sites:

- South Carolina Public Colleges/Universities
  www.state.sc.us/edu/univcoll.html
- South Carolina Technical Colleges
  www.scteched.tec.sc.us
- South Carolina Independent Colleges/Universities
  www.scicu.org

In Science, Technology, Engineering, and Mathematics, the correlation between education and career performance may be a little closer than in other career clusters. Why? Because in science, technology, engineering, and mathematics careers, you must first master some fairly complicated information before you can get a job. The best place to master the basic knowledge requirements is in school. However, there are always exceptions to the science/school connection.

For example, research technicians in a variety of fields work happily for good money without earning PhDs or even bachelor's degrees. Those people who do go on to get high-level degrees don't all end up in an auditorium lecturing to college students, either. In fact, most science, technology, engineering, and mathematics PhDs don't work for colleges at all, but for private industry in a wide variety of jobs. South Carolina offers a wealth of education opportunities to people interested in science, technology, engineering, and mathematics, and there are a number of creative (and profitable) ways to use this training.

n Two-Year Colleges

All of South Carolina's two-year technical colleges offer associate-in-science degree programs that enable their students to transfer credit to four-year in-state colleges. Generally the associate-in science programs lead to the completion of bachelor's degrees in academic subjects such as biology, chemistry, engineering, and physics. Many students in these fields continue their professional development by pursuing graduate degrees at the state's universities. The technical colleges also offer degrees in engineering technology that qualify students for technicians' jobs after just two years of training. In South Carolina, technicians in environmental engineering, engineering graphics, civil engineering, mechanical engineering, and a number of other fields can earn $40,000 a year and more.

South Carolina's two-year colleges, supported by the National Science Foundation, have embraced a program called South Carolina Advanced Technological Education (SCATE) to increase the number and quality of students graduating with associate's degrees in engineering technology. In doing so, the technical colleges have increased opportunities for students who train as engineering technicians. SCATE's Technology Gateway program helps high school students get involved as well. The program sets up dual-credit agreements between high schools and two-year colleges that enable students to prepare in high school for training as engineering technicians in the two-year colleges. Another program that prepares students for engineering study is Project Lead The Way, which sponsors a multi-course pre-engineering curriculum in high schools across the state. See more about Project Lead The Way on page 11.

n Four-Year Colleges

Students pursuing scientific training past the two-year-degree level find a full spectrum of education and career opportunities in South Carolina. The University of South Carolina (USC), Clemson University, and other public and private four-year colleges in the state offer the bachelor's and graduate degrees that are required to join the highest paying professions in the field (see "25 Career Choices in Science and Engineering," on page 8). In a number of areas, the education opportunities in South Carolina are exceptional. For instance, USC's interdisciplinary marine science program and Clemson's science, engineering, and environmental engineering programs are nationally recognized.

n Military Training

Service in the U.S. Military can offer a variety of opportunities for career development, particularly in technical subjects. All branches of the service have internal training programs and all offer, in return for commitments to serve, aid for education that recruits may pursue outside the military. The U.S. Air Force even operates its own technical college, the Community College of the Air Force (CCAF). CCAF is the nation's largest community college, and it offers study in areas including civil engineering, applied physics, bioenvironmental engineering, geophysical sciences, mathematics, environmental science, and mapping. Learn about other educational options available through the military at www.usace.army.mil (U.S. Army Corps of Engineers), www.goarmy.com (Army), www.navy.com (Navy), www.uscg.mil (Coast Guard), www.airforce.com (Air Force), and www.marines.com (Marines).

Financial Aid Basics

If you're interested in a career in science or engineering, you should be able to find a way to finance your education after high school. The training of talented people to meet the technical challenges of the future has been a national priority ever since the 1950s, when the Russians beat us into space and Americans began to worry about the quality of our science programs. However, we got to the moon first, and with a bit of persistence, you can find the means to get to college, too.

The National Science Foundation (NSF), the independent federal agency charged with promoting scientific and engineering research, funds Computer Science, Engineering, and Mathematics Scholarships (CSEMS) at colleges across the country to help talented, financially needy students train in math and engineering. NSF distributes millions of dollars to support new scholarships each year. Contact two- or four-year colleges of your choice to find out if they take part in CSEMS.

Also, South Carolina distributes more than $110 million each year in some 25,000 scholarship packages to state residents. The aid is financed by the South Carolina Education Lottery and other sources. Funds available include LIFE Scholarships, Lottery Tuition Assistance, Palmetto Fellows Scholarships, and the South Carolina HOPE Scholarship. Talk to your guidance counselor to learn more about these financial aid options.

You likely will apply for state and federal aid at the same time you apply for college by completing the "Free Application for Federal Student Aid" (FAFSA). Visit www.fafsa.ed.gov to fill out the form online; if necessary, you can usually get a paper FAFSA from a high school or college.

Core Requirements for Graduation

High School Graduation

Subjects	Units Required
English/Language Arts	4
Mathematics	4
Science	3
U.S. History and Constitution	1
Economics	0.5
U.S. Government	0.5
Other Social Studies	1
Physical Education or Junior ROTC	1
Computer Science	1
Modern or Classical Language or Career and Technology Education	1
Electives	7
Total *	24

* Must pass the exit examination.

State Certificate

Subjects	Units Required
English/Language Arts	4
Mathematics	4
Science	3
U.S. History and Constitution	1
Economics	0.5
U.S. Government	0.5
Other Social Studies	1
Physical Education or Junior ROTC	1
Computer Science	1
Modern or Classical Language or Career and Technology Education	1
Electives	7
Total *	24

* Must have failed to meet the standard on all subtests of the exit examination.

College Entrance

Subjects	Units Required
English/Language Arts	4
Grammar and Composition	2
English Literature	1
American Literature	1
Mathematics	4
Algebra 1 and 2	2
Geometry	1
Pre-Calculus	1
Modern or Classical Language	2
Laboratory Science Biology, Chemistry, or Physics	3
Social Sciences U.S. History, Economics, and Government	3
Electives	1
Physical Education/ROTC	1
Arts	1
Total	19

Resource Roundup

Click your way to more career, educational, and scholarship resources by using the Internet. Here are some useful Web sites to get you started:

Science, Technology, Engineering, and Mathematics Web Sites

- American Society for Engineering Education, www.asee.org
- Association for Women in Mathematics, www.awm-math.org
- Careers in Science and Engineering, www.nap.edu/readingroom/books/careers
- National Academies, www.nationalacademies.org
- National Science Foundation, www.nsf.gov
- Project Lead the Way, www.pltw.org
- Sloan Career Cornerstone Center, www.careercornerstone.org
- Technology Student Association, www.tsaweb.org
- Vocational Information Center Engineering, Science and Math Careers, www.khake.com/page53.html

Search the Internet for other professional organizations related to careers in Science, Technology, Engineering, and Mathematics.

Education and Career Planning Web Sites

Inside South Carolina

- Career Guidance Model, www.careerguidancemodel.org
- South Carolina Chamber of Commerce, www.scchamber.net
- South Carolina Commission on Higher Education, www.che400.state.sc.us
- South Carolina Employment Security Commission, www.sces.org
- South Carolina Higher Education Tuition Grants Commission, www.sctuitiongrants.com
- South Carolina Independent Colleges and Universities, www.scicu.org
- South Carolina Occupational Information System, www.scois.net
- South Carolina Public Colleges and Universities, www.state.sc.us/edu/univcoll.html
- South Carolina Technical College System, www.sctechsystem.com
- WorkKeys, www.workreadysc.org

Outside South Carolina

- America's Career Resource Network Association, www.acrna.net
- Career Communications, Inc., www.carcom.com
- Armed Services Vocational Aptitude Battery (ASVAB), www.todaysmilitary.com/app/tm/nextsteps/asvab
- Career Interests Game, career.missouri.edu/students/explore/thecareerinterestsgame.php
- Career Key, www.careerkey.org
- Coin Career College System, community.coin3.com
- College Board, www.collegeboard.com
- Holland's Self-Directed Search, www.self-directed-search.com
- Kuder, www.sc.kuder.com
- Mapping Your Future, www.mapping-your-future.org
- National Career Development Association, www.ncda.org
- O*NET Online, online.onetcenter.org
- Occupational Outlook Handbook, www.bls.gov/oco
- The Princeton Review, www.review.com
- Salary Information, www.salary.com

* Web site addresses were correct at time of publication but may have changed. If an address is no longer valid, please use an Internet search engine to locate the resource.

Note: Local South Carolina schools and districts may choose to use fewer career clusters, clusters that are organized differently, or clusters with alternative names.

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Find more information on education and career planning for Science, Technology, Engineering, and Mathematics.

Career Guidance Information Sources

Check out these comprehensive sources of career and education information, which are available through your school or public libraries:

SCOIS (South Carolina Occupational Information System)— www.scois.net. An electronic database of information about careers, salaries, job requirements, educational options, scholarships, and more.

O*NET (Occupational Information Network)— online.onetcenter.org. A national occupational information database that helps students make informed decisions about education, training, career choices, and work.

COIN (Coin Career Guidance System)— community.coin3.com. A comprehensive software program with career and college planning information, especially for South Carolina students.

WorkKeys— www.workreadysc.org. A comprehensive resource for information about the South Carolina Career Readiness Certificate – how and where to qualify, as well as its value to students and the community.

Kuder— sc.kuder.com. A comprehensive online college and career planning system with links to government and educational information and organizations.

Knowledge. *Pass it on.*

Education: It's the passing of knowledge, skills, and values from one generation to the next. So where will the next generation learn their ABCs? Or how to design sustainable buildings? Or to master foreign languages, like Spanish and Mandarin Chinese, so they can compete in a global economy? They learn from educators — people with knowledge and experience in every walk of life who make the time to share their knowledge. They learn from people like you.

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