ARKANSAS Department of WORKFORCE EDUCATION

FUTURE FOCUS

SCIENCE, TECHNOLOGY, ENGINEERING AND MATH

A PUBLICATION OF THE **ARKANSAS DEPARTMENT OF WORKFORCE EDUCATION**

6 cutting-edge industries in ARKANSAS

what to study NOW to ensure future success

HOT COOL JOBS & DEGREES

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Dear Student:

Everywhere we look today, technology is making an undeniable impact on us and the world we inhabit. The pace at which technological advancements are being made is truly breathtaking. And as these advancements are made, it's becoming more apparent every day that employers now require workers who are familiar with technology and who are capable of keeping up with its rapid evolution.

High school students who prepare early by becoming involved in the Science, Technology, Engineering and Mathematics (STEM) career clusters will develop an invaluable head start in securing employment in the high-skill, high-wage, high-demand jobs that are part and parcel of the technological explosion of the 21st century.

For high school students, it's never too early to begin preparing for a career and looking at a wide variety of options. STEM-cluster education provides that preparation and opens up a world of career possibilities, while giving STEM students a distinct advantage in the workforce. This publication, *Future Focus: A Career Planner for Arkansas Students*, centers on six career areas that have unlimited growth potential in a technology-driven economy: engineering, nanotechnology, biotechnology, aerospace, precision agriculture and computer technology.

Benjamin Franklin once said that death and taxes were life's only certainties. Let me add another certainty to that statement: In this day and age, technology is an indispensable part of our economy, and those who can understand and maneuver within it will always be in demand. Students with an education that includes science, technology, engineering and mathematics will be the ones best able to compete in this ever-increasing job market. Just as the future of technology is unlimited, so is your own future when you prepare yourself for it. Your ideas, your efforts and your decisions will collectively shape our tomorrow.

Sincerely,

Mike Beebe
Governor

BILL WALKER
DIRECTOR, ARKANSAS DEPARTMENT OF WORKFORCE EDUCATION

ARKANSAS Department of WORKFORCE EDUCATION

Dear Students,

Right now, your high school graduation may appear to be light years away. Life after high school likely seems so distant that it feels far too early to make plans for that point in time. Actually, both graduation and life after high school are right around the corner, and now is the perfect time to begin planning for your future and career.

Which careers interest you? What are your salary goals? Will you attend a two- or four-year college? You probably don't have definite answers to these questions now. Don't worry. No one expects you to have all the answers, and it would be highly uncommon if you did. But it is time to start considering your future seriously and realistically. Your high school coursework, many student organizations and your current work experience can influence your decisions and help steer you in the right direction. The Arkansas Department of Workforce Education (DWE) wants to give you some additional assistance.

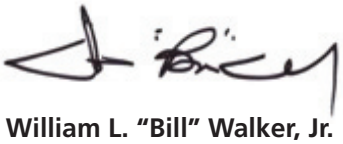
This DWE publication, *Future Focus: A Career Planner for Arkansas Students*, is designed to help you with some of these crucial choices by giving you a glimpse at six of today's fastest-growing and most-promising career fields: engineering, nanotechnology, biotechnology, aerospace, precision agriculture and computer technology. Along with being high-demand, high-wage and high-skill fields, each requires a Science, Technology, Engineering and Mathematics (STEM) education. If any of these career paths sound appealing to you, I strongly encourage you to pursue a STEM education as soon as possible – during your high school years.

STEM courses will give you a head start on what could easily become a successful, lucrative and enduring career in one of the fields highlighted within this publication and many others. It won't be easy. A STEM education is hard work, but nothing worthwhile comes easily.

I hope you'll begin giving your career path at least some consideration now. *Future Focus: A Career Planner for Arkansas Students* will help you explore technological careers that are at the forefront of today's job market and will also be hot for many years to come. Read this publication thoroughly and thoughtfully, and then discuss what you've learned with your family, teachers, counselors and US!

You hold the future in the palms of your hands. Good luck!

Sincerely,



William L. "Bill" Walker, Jr.
Director

aerospace

IF YOU'VE EVER FLOWN IN AN AIRPLANE, seen the space shuttle lift off, or watched reporters on the news hovering in a helicopter over the scene of an accident, then you've seen the aerospace industry at work. What makes it possible for all of these flying machines to get off the ground? Students like you.

That's right. Aircraft and spacecraft are designed and built by people who were once in high school and decided to commit themselves to careers as aerospace engineers. Air travel and space exploration would simply not be possible without them. The aerospace industry in Arkansas is in need of engineers now more than ever. A recent study of the industry in Arkansas showed that our educational system is not producing enough students interested in aerospace science. Aerospace (as we call it for short) is an exciting field, and educators statewide are encouraging students like you to consider the idea.

Don't careers in aerospace require a lot of science and math?

Most careers do, particularly aerospace engineering. The most important thing you can do in high school to prepare for a career as an aerospace engineer is take as many physics and mathematics classes as you can.

Do Arkansas high schools offer any classes in Aerospace?

Yes, but only a few schools do so right now. Project Lead The Way (PLTW) is introducing a very exciting and hands-on set of classes in engineering to more and more public middle and high schools in the country. In middle school, part of PLTW's curriculum is a nine-week unit called "Flight and Space." The unit was developed by NASA, and introduces students to basic concepts in aeronautics, propulsion and rocketry. In the high school program, students have the opportunity to take an entire class called Aerospace Engineering.

But you should understand that PLTW has been implemented in only a few Arkansas schools thus far. In the future, the program will expand, but in the meantime your best bet is to work hard in your physics and mathematics classes.

Can I study aerospace engineering in college here in Arkansas?

Although there are no degree programs in aeronautical engineering in the state, you can major in engineering or physics. These majors will then enable you to pursue graduate degrees in aerospace engineering elsewhere. But it is important to keep in mind that many scientists who work in Aerospace have degrees in fields like physics, applied mathematics, and mechanical engineering. Undergraduate and graduate degrees in these areas are available at several universities in Arkansas.

CHARTING YOUR COURSE FOR A CAREER IN AEROSPACE

ARE THERE REALLY AEROSPACE COMPANIES IN ARKANSAS?
Yes. Although most people think of Aerospace in connection with major corporations in (for example) California and Washington, there are Aerospace companies in Arkansas. In fact, out of the 75 counties in the state, more than 30 are home to companies involved in the aerospace industry.

ARE AIRCRAFT OR SPACECRAFT DESIGNED IN ARKANSAS? WHAT DO THE COMPANIES HERE DO?
No, but many of the essential pieces of aircraft and spacecraft are designed and manufactured here. The Aerospace companies in Arkansas do a lot of things, from the design and manufacture of parts for aircraft, spacecraft, and even missiles.

For example, Little Rock is home to two major completion centers for corporate jets: Dassault Falcon Jet and Hawker Beechcraft. And central Arkansas companies are always on the lookout for entry-level aircraft completion technicians.

How long does it take to get a graduate degree in physics or engineering?

The length of time you will need to earn a graduate degree useful in Aerospace varies a lot. Master's degree programs generally take one or two years. Doctoral degrees (PhD's) commonly take longer. But the effort you put into your studies and research pays for itself in the long run in the form of better-paying, more exciting jobs.

Isn't it expensive?

Typically, scholarships are available to students interested in earning an advanced degree in an Aerospace-related field. Often, these scholarships not only pay all expenses (tuition, room and board), but even offer you a stipend – a fixed amount of money paid out to you over the year so that you can spend your time doing research instead of worrying about money or taking a job. Such scholarships commonly are granted to students by the universities where they study, by the government, the military, and by Aerospace companies interested in educating Aerospace scientists.

Do I have to pursue a college degree to work in the Aerospace industry?

No. High school graduates can complete hands-on programs to become aircraft completion technicians – the people responsible for the building and installation of cabinets in corporate jets, as well as sheet metal components, galleys, seating, headliners and other interior surfaces.

Little Rock's Metropolitan Career-Technical Center and Pulaski Technical College's Business and Industry Center offer Aviation Technology I, a two-semester course that teaches basic skills in aircraft completion and includes an internship with a local aircraft completion company. The main components of the training are: cabinetry, sheet metal work and upholstery. Students also receive instruction in electrical, water, wiring, hydraulic and pneumatic systems of aircraft.

CAREER OPTIONS

AEROSPACE ENGINEERS: Perform a variety of engineering work in designing, constructing, and testing aircraft, missiles and spacecraft. Also may conduct basic and applied research to evaluate adaptability of materials and equipment to aircraft design and manufacture. Recommend improvements in testing equipment and techniques. **Median salary in Arkansas: $94,348.**

AIRCRAFT COMPLETION TECHNICIANS: Build and install cabinets in corporate jets to detailed engineering specifications, as well as fabricate sheet metal components, galleys, seating, headliners and other interior surfaces. **Median salary in Arkansas: $36,700.**

AIRCRAFT MECHANICS AND SERVICE TECHNICIANS: Measure, remove, inspect, repair, and assemble electrical, plumbing, mechanical, hydraulic, and structural components and accessories using hand tools and power tools. Maintain, repair, and rebuild aircraft structures, functional components, and parts such as wings and fuselage, rigging, hydraulic units, oxygen systems, fuel systems, electrical systems, gaskets, and seals. Test operation of engines and other systems. Conduct routine and special inspections as required by regulations. **Median wage in Arkansas: $17.59/hour.**

AEROSPACE TECHNOLOGY

DEREK KING, 24

AIRFRAME AND POWERCRAFT MECHANIC

WITH HIS LOVE FOR AVIATION, Derek King always knew he wanted to work in the aerospace field. Working for a crop dusting service in high school led him to his dream of becoming a pilot. But after 9/11, he decided that he would be of more use in the maintenance arena, learning how to fix the parts of a plane. Going through a 20-month airframe and powerplant program at Pulaski Tech, he took his FAA test required for licensure and received his Airframe and Powercraft (A&P) certification to begin his mechanical career in the aerospace industry.

How did you end up where you are today?
I started at Dassault Falcon Jet through an internship program, and after I got my license, I became a full-time employee. After Falcon Jet, I decided that I wanted to be in the service center environment. I talked to a friend at Hawker Beechcraft and followed through to get this A&P mechanic position.

Describe a typical day for you at Hawker.
A typical day for me is fairly fast-paced with new challenges daily, and every day is different. When airplanes come in, the crew has about three or four days to comply with the inspection for that particular aircraft. Working carefully, I focus on the engine or the airframe of the aircraft, depending on my assignment. Other challenges I faced when I first began were learning new company procedures and processes for how tasks are completed when working on the aircraft and learning to work with different tools and test equipment that we didn't have in school. In reality, an A&P license is a license to learn.

What advice would you give students interested in the mechanical side of the aerospace industry?
I think that students should learn as much as they can and get as much training in as many areas of the aircraft field as possible. Also, they need to know that the aerospace field is a volatile industry that has ups and downs and swings with the economy.

TRY MAJORING IN: Aeronautical engineering, applied mathematics, applied science, engineering, mechanical engineering, physics or certification in aerospace mechanics and electronics

WHY IT'S HOT: The aerospace industry needs more engineers and technicians than ever before because of stricter regulations for aircraft.

WHAT IT PAYS: $30,000 to 85,000

biomedical technology

EVERY TIME YOU GO TO THE DOCTOR, you're coming into contact with more than just one person. In a way, you're reaping the benefits of the work of thousands of people. How? Think about it: People educated the doctor, people conducted the research needed to create the medicines the doctor gives you, people designed and produced the instruments the doctor uses to make sure you're healthy, people are even there – nurses and lab technicians, for example – to help the doctor examine you and run any necessary tests. All of these people are involved in the biomedical sciences. At some point – in high school, or perhaps, in college – they decided to pursue a career in a field that contributes to the improvement of human health.

Careers like these are available to you right here in Arkansas. In fact, for the foreseeable future, there will be a shortage of people in biomedical careers in our state, so the opportunities for employment after you finish your training are outstanding!

In Arkansas high schools are there complete programs in the biomedical sciences or just single classes?

Right now, in most schools, there are simply single classes (like Biology) that teach you a little bit about biomedical science. But programs such as Project Lead the Way (PLTW) are working with Arkansas high schools to develop entire curricula in the biomedical sciences. Project Lead the Way is a federally sponsored non-profit program that aims to introduce a very exciting and hands-on set of classes in engineering and the biomedical sciences into as many public middle and high schools as possible.

What kinds of biomedical courses does Project Lead the Way offer?

Project Lead the Way offers four courses in the biomedical sciences: Principles of Biomedical Sciences, Human Body Systems, Medical Interventions, and what is called a Capstone Course in which students have the opportunity to work with a mentor (a biomedical professional) on a research topic and to write a paper reporting the results of the research.

Are these courses available in Arkansas high schools right now?

Currently, Project Lead the Way has only pilot programs in the state. That means that only a handful of schools have implemented the program, and right now those schools only teach PLTW's engineering curriculum, not its biomedical curriculum. But according to the Department of Workforce Education, expanding the program to other schools around the state and making the biomedical sciences part of the curriculum is in the works.

However, there are several science courses that you can take in high school that will help you on your path to a career in biomedical science. These include

CHARTING YOUR COURSE FOR A CAREER IN BIOMEDICAL SCIENCE

CAN I BECOME A BIOMEDICAL PROFESSIONAL RIGHT OUT OF HIGH SCHOOL?
No. You will need further education. How much depends on what you want to do, but almost all biomedical jobs require college degrees and further specialized training.

HOW LONG DOES THIS SPECIALIZED TRAINING TAKE?
That depends on what kind of biomedical professional you want to become. At the University of Arkansas for Medical Sciences (UAMS), the pharmacy program takes four years. In other words, if you want to become a pharmacist, you will need to spend four years in school after college. If, on the other hand, you want to become a surgeon or a biomedical researcher, your training will take even longer.

WHAT KINDS OF PROGRAMS DOES UAMS OFFER?
UAMS has six divisions: the Colleges of Medicine, Pharmacy, Nursing, Public Health and Health Related Professions as well as the UAMS Graduate School.

MOST OF THESE DIVISIONS SOUND FAMILIAR TO ME, BUT WHAT ARE THE COLLEGE OF HEALTH RELATED PROFESSIONS AND THE GRADUATE SCHOOL? WHAT KIND OF PROFESSIONALS ARE TRAINED IN THEM?
The College of Health Related Professions trains students in areas like dietetics and nutrition (so that they can become Nutritionists), in dental hygiene (so that they can become dentists), and medical technology (so that they can become, for example, lab technicians who conduct medical testing in the laboratory). The Graduate School, on the other hand, trains students primarily to become research scientists. So if you want to learn to develop new medicines or to conduct other kinds of medical research, you will study at the Graduate School.

anatomy, biology, physiology, medical terminology and medical procedures.

If I'm interested in a biomedical career, what courses should I take at my high school?

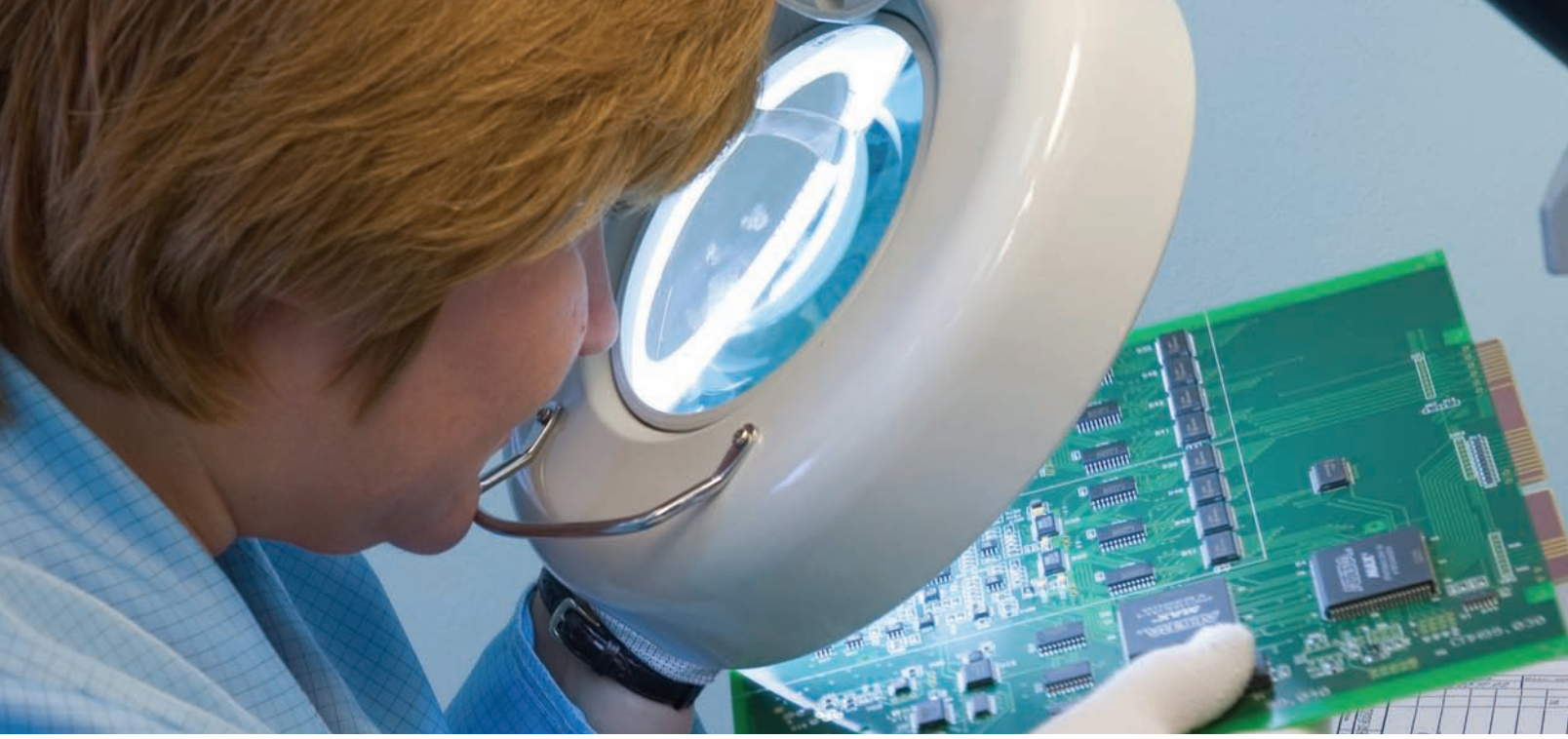
The most important classes you can take right now are biology and chemistry. Taking as much mathematics as you can is also a good idea. Even though doctors and nurses don't use much complicated mathematics in their work, the chemistry courses they take as part of their training require a fair amount of math. And other kinds of biomedical professionals – drug researchers, for example, and the designers of machines like CAT scans (a kind of X-ray machine) – use a lot of math.

CAREER OPTIONS

BIOMEDICAL EQUIPMENT TECHNICIANS: Specialize in the use, maintenance, and repair of medical equipment such as heart-lung machines, dialysis machines, medical imaging machines and defibrillators. Training courses are available at junior and community colleges. During the training period, students learn how to operate and repair many different types of medical equipment. **Average starting salary: $37,232.**

RADIOLOGIC TECHNOLOGISTS: Also referred to as radiographers, produce x-ray films (radiographs) of parts of the human body for use in diagnosing medical problems. **Average starting salary: $48,170.**

RADIATION THERAPIST: Administer radiation therapy to patients afflicted with tumors or cancer. Employers generally require an Associate's degree from a radiation therapy program. **Average starting salary: $57,700.**



computer technology

AS COMPUTERS HAVE BECOME MORE AND MORE a part of our daily lives, the number of careers in computer technology and computer science has skyrocketed. Just like other students all around the country, you have the opportunity here in Arkansas to take classes that can launch your career in computer technology, the limits of which are defined only by your energy and enthusiasm.

In Arkansas high schools, are there complete programs in computer technology or just single classes?

In many high schools, there are individual elective courses in computer science and technology, courses as diverse as digital imaging, multimedia, Web design, computerized business applications, and AP Computer Science. But more and more, major computer corporations and non-profit organizations are working with Arkansas high schools to implement entire programs in computer science and technology.

What are some of these programs?

Cisco Systems sponsors an expanding program called the Cisco Networking Academy. If you enjoy learning how computers are built, are networked together and how they interact with servers you may be interested in what Cisco has to offer.

Oracle Corporation sponsors the Oracle Academy. Not only is Oracle the second largest software manufacturer in the United States, but it is now offering Oracle certifications worldwide. Basically, Oracle is involved in database design, database management and programming. If you ever thought about how a Web site knows your information when you log in, chances are Oracle is involved. EBay™ and Yahoo™ are just two Web sites that use Oracle software to store user information.

Both programs offer students the chance to learn through in-class projects and often require you to work alone and with others. They also enable students to earn various certifications.

What do you mean by "certification"?

Programs such as the Cisco Networking Academy and the Oracle Academy offer what are, in a sense, degrees in very specific areas of computer technology. These "degrees" let employers know that students have been thoroughly trained in those areas. If you enter the Cisco Networking Academy in high school or college, you will have (depending on the program) the opportunity to earn one or more certifications, such as the CCNA (Cisco

CHARTING YOUR COURSE FOR A CAREER IN COMPUTER TECH

CAN I FIND A JOB IN COMPUTER TECHNOLOGY RIGHT AFTER HIGH SCHOOL?
If your high school offers a complete training course, like the Cisco program, and you complete it and pass your certification exams, then yes, job opportunities are available immediately. But in the long run you will find a much better and higher paying job if you continue your education first. Some students choose to enter two-year programs in community colleges to complete their certifications or to earn additional ones. Other students choose to enter four-year programs. The basic, common-sense rule is the better trained you are, the more you will interest employers.

IF I PURSUE A CAREER IN COMPUTER TECHNOLOGY, CAN I ONLY WORK FOR COMPUTER COMPANIES?
No. In fact, computers and computer networks can be found almost everywhere—in library systems, in banks, in retail store chains, in the military, in government, and in virtually every major industry. If you earn your certifications and continue your computer education in college then there is almost no limit to the number of opportunities available here in Arkansas, across the country and around the world.

Certified Networking Associate) and CCDA (Cisco Certified Design Associate). The Oracle Academy offers the Oracle Certified Associate (OCA) certification. If you continue beyond these associate-level certifications and begin to earn professional certifications, the possibilities multiply – and so do the career opportunities!

How long does it take to earn the CCNA or the OCA?

Both the CCNA and OCA programs can be completed in two years (four semesters). Some schools, particularly community and four-year colleges, compress this so that you can earn your certifications in less time.

How much math do I need to know to begin working toward certifications through Cisco or Oracle?

The programs are designed so that you learn the math you need while you work on the projects. Some students finish projects and only then realize they have been learning math all along!

What kinds of projects do the programs involve?

The Cisco and Oracle programs adopt a very hands-on approach, so you spend a lot of time in the classroom actively engaged in various kinds of activities. As the following examples show, the kinds of projects the programs involve can vary a lot and can be very exciting:

- You might work with your classmates on designing a database program for an imaginary bank that needs all of the data it collects stored in certain ways.
- You might really get your hands dirty by building the cables that connect a computer to a wall-jack or that connect one computer to another.
- If that's not hands-on enough for you, you might even be given a box of computer components and be taught how to build an entire computer.
- Once you've built the computer, you might then be asked to install software on it and build a network that links it to computers other groups in your class have created.

CAREER OPTIONS

COMPUTER SOFTWARE ENGINEERING: A program that prepares individuals to apply scientific and mathematical principles to the design, analysis, verification, validation, implementation and maintenance of computer software systems using a variety of computer languages. Also includes instruction in discrete mathematics, probability and statistics, computer science, managerial science, and applications to complex computer systems. **Median salary in Arkansas: $63,585.**

COMPUTER SYSTEMS TECHNICIAN: Installs, maintains, troubleshoots and upgrades computer hardware, software, personal computer networks, peripheral equipment and city-wide electronic mail systems; assesses user training needs and trains users in effective use of applications; makes recommendations regarding hardware and software acquisitions; prepares documentation and provides user assistance to city staff; and performs related work as required. **Median salary in Arkansas: $53,200.**

NETWORK TECHNICIAN: Under general supervision, identify, troubleshoot and resolve problems encountered by district-wide users of various servers, the mainframe, desktop systems, district network Internet and other computer technology; troubleshoot and solve local-area network problems; provide technical support to end-users regarding computer hardware and software; install, test, certify and troubleshoot networking cabling systems; install configured network equipment; provide technical expertise to end-users regarding optimal set-up for software, hardware and network use; install, configure, monitor and troubleshoot a wide range of network and data communications software and hardware; train users in various software applications and network-related procedures; provide work direction for student assistants; and perform related work as required. **Median salary in Arkansas: $40,300.**

BIOINFORMATICS: A program that focuses on the application of computer-based technologies and services to biological, biomedical, and biotechnology research. Includes instruction in algorithms, network architecture, principles of software design, human interface design, usability studies, search strategies, database management and data mining, digital image processing, computer graphics and animation, CAD, computer programming, and applications to experimental design and analysis and to specific quantitative, modeling, and analytical studies in the various biological specializations. **Median salary in Arkansas: $73,171.**

COMPUTER SOFTWARE ENGINEERING: A program that prepares individuals to apply scientific and mathematical principles to the design, analysis, verification, validation, implementation, and maintenance of computer software systems using a variety of computer languages. Also includes instruction in discrete mathematics, probability and statistics, computer science, managerial science, and applications to complex computer systems. **Median salary in Arkansas: $63,585.**

ARTIFICIAL INTELLIGENCE: A program that focuses on the symbolic inference, representation, and simulation by computers and software of human learning and reasoning processes and capabilities, and the modeling of human motor control and motions by computer-driven machinery. Also includes instruction in computing theory, cybernetics, human factors, natural language processing, robot design, and applicable aspects of engineering, technology, and specific end-use applications. **Median salary in Arkansas: $70,800.**

ELECTRONIC COMMERCE/E-COMMERCE: A program that prepares individuals to plan, manage, supervise, and market electronic business operations, products, and services provided online via the Internet. This field includes instruction in business administration, information technology, information resources management, web design, computer and Internet law and policy, computer privacy and security, e-trading, insurance, electronic marketing, investment capital planning, enterprise operations, personnel supervision, contracting, and product and service networking. **Median salary in Arkansas: $50,880.**

COMPUTER TECHNOLOGY

R.J. MARTINO, 26, ROXANE MARTINO, 27

CO-FOUNDERS, IPROV LLC

WHEN R.J. MARTINO WAS LITTLE, he wanted to be a baseball player — a far cry from his older sister's aspirations to go into the military like their father. They didn't expect that they would found a company together. R.J. and his older sister, Roxane, graduated from Bryant High School and attended college at the University of Arkansas at Little Rock. R.J. got his degree in computer science and minored in business finance, and Roxane majored in studio art with an emphasis in graphic design. While in school, R.J., Roxane and their friend, Matt Willis, entered a business competition where they submitted a plan for what would later become their software development company, iProv LLC. They didn't win, but they did start iProv in 2001.

R.J., what are your responsibilities as president and CEO of iProv?
Although I have a great title, my job really boils down to something quite simple. As a group, we create a plan of where we want the company to go, and then it's my job to make decisions that help our organization get there quicker. I also manage and work on client projects, do administrative work and keep employees, clients and vendors updated on our progress.

Roxane, what advice do you have for people who want to work in the computer technology industry?
Really know your stuff, do good work, and be competent and reliable. That's what turns jobs into careers. Read daily and keep up with the new stuff. Stay focused. As technology changes, altering your ideas and goals is fine, but abandoning them completely means possibly missing out on something fantastic.

R.J., what do you think students should know before choosing a career in computer technology?
Be innovative. You don't need millions of dollars; you could get started today. The skills taught in Arkansas are the same skills taught in Silicon Valley, the equipment is the same and you're just as smart.

THE PAY: The national starting salary for employment in a technological field is about $42,000, though it varies depending on location.

TRY MAJORING IN: Information science, computer science, information systems and security, computer programming, graphics and multimedia, network management, Web development or medical technology.

engineering

LOOKING FOR AN ECO-FRIENDLY CAREER? Like to help others? Want to change the world? Have a creative mind? Engineering is a great way to do all these and much more.

Everything around you – the toaster you used to make breakfast, the bus you rode to school, Razorback Stadium, your cellular phone, even your iPod – has been engineered in some way. Engineers ask questions like, "How can we develop a better recycling system to protect the environment, design homes that can withstand hurricanes, tornadoes or earthquakes, or create cutting-edge special effects for the movies?"

What is an engineer?

At its foundation, engineering is about problem-solving. They use math and science along with skills in communications, critical thinking and management to find practical solutions that will benefit people or society. According to Carolyn Helm, Project Lead the Way Director for the Southern Regional Education Board, "The work of engineers is stimulating, fun, creative and quite profitable." Engineers design, create, build, improve and invent everything from heart valves to roller coasters, skyscrapers and space vehicles.

Why would engineering be a good career for me?

According to the National Academy of Engineering website, a career in engineering provides:

- The power to make a difference. By becoming an engineer, you can help solve problems that are important to society. You could be controlling and preventing pollution, developing new medicines, creating advanced technologies or even exploring new worlds.
- Money and job security. Engineers have significantly higher starting salaries than do college graduates with bachelor's degrees in many other fields. After four years of college, you could be making $36,000 to $60,000 a year. And society will always need people, like engineers, who solve problems and come up with new ways of thinking about and doing things.
- Lots of options. Engineers work everywhere—in big and small cities, rural communities, even remote wilderness areas. Some work in business offices or classrooms, while others work in factories or research labs; some work outdoors or even in outer space! Some engineers go into medicine, law, business management or policy.
- The chance to do cool stuff. Be the

CAREER OPTIONS

COMPUTER SPECIALIST: Depending on the employer, computer specialists perform a variety of functions, ranging from technical support to coordinating network security. Hiring managers prefer graduates with an Associate's degree in a computer-related field. **Average starting salary: $42,400.**

NUCLEAR TECHNICIAN: Nuclear technicians monitor radiation and operate nuclear test and research equipment. They may also assist nuclear engineers and nuclear physicists with research projects. An Associate's degree program in an applied science or specific technology should provide good training. **Average starting salary: $59,200.**

NUCLEAR MEDICINE TECHNOLOGIST: Nuclear medicine technologists administer diagnostic tests that involve using radioactive materials to monitor organ functions. An Associate's degree in nuclear medicine technology is standard, and many employers also require licensure. **Average starting salary: $55,840.**

TWO-YEAR PROGRAM

AEROSPACE ENGINEERING AND OPERATIONS TECHNICIAN: Aerospace engineering and operations technicians construct, test and maintain aircraft and space vehicles. An Associate's degree in engineering technology is standard, and certification can be a competitive edge for job seekers. **Average starting salary: $49,920.**

ENGINEERING TECHNICIAN: Engineering technicians perform a variety of research- and development-related tasks, including building and setting up equipment, conducting experiments, collecting data and recording results. Employers prefer Associate's degrees in engineering technology, which are widely available at technical institutes. **Average starting salary: $49,440.**

Source: Careerbuilder.com.

first to develop or try out a new technology, like a flying car or an undersea house. Design and build virtual reality amusement parks. Discover and patent a new material that can mend broken bones or cure arthritis. Engineers will be involved in making all the wonders of the future a reality.

How long do you have to go to school?

You can start working as an engineer with a four-year college degree. Many engineers go on to earn Master's degrees (usually in another 2 to 3 years), and some get a Ph.D. (4 to 6 years beyond the Bachelor's degree).

What can I do in high school to prepare myself?

Dr. Wayne Helmer, Director of Project Lead the Way and a professor of mechanical engineering at Arkansas State University, recommends today's high school students enroll in Project Lead the Way classes such as Introduction to Engineering Design, Principles of Engineering and Computer Integrated Manufacturing. In addition to advanced placement classes in subjects such as English, algebra, chemistry and physics, Helmer recommends classes in World and American History and Government/ Economics.

Helmer also recommends students participate in robotics competitions like BEST robotics and any of the numerous summer camps that focus on pre-engineering.

Regardless of which career your pursue, your future success will be determined in large part by your ability to work in teams, communicate your ideas, use different kinds of technology and think critically.

CAREER
OPTIONS

ARCHITECTURAL ENGINEERING: The discipline concerned with the planning, design, construction, and operation of engineered systems for commercial, industrial, and institutional facilities. Engineered systems include electric power, communications and control, lighting, heating, ventilation, and air conditioning; and structural systems. An Architectural Engineer works closely with those in all areas of the building process to design and possibly to construct the engineered systems that make buildings come to life for their inhabitants. **Average starting salary: $48,664.**

CHEMICAL ENGINEERING: Basically applied chemistry, it is the branch of engineering concerned with the design, construction and operation of machines and plants that perform chemical reactions to solve practical problems or make useful products. Some chemical engineers make designs and invent new processes. Some construct instruments and facilities. Some plan and operate facilities. Chemical engineers have helped develop atomic science, polymers, paper, dyes, drugs, plastics, fertilizers, foods and petrochemicals. **Average starting salary: $59,361.**

CIVIL ENGINEERING: Includes designing and overseeing projects to construct roads, buildings, airports, tunnels, dams, bridges, or water supply and sewage systems. Civil engineers must consider many factors in their designs, from the costs to making sure the structure will stay intact during bad weather. This is one of the oldest types of engineering. Many civil engineers manage people and projects. A civil engineer may oversee a construction site or be a city engineer. Others may work in design, construction, research, and teaching. There are many specialties within civil engineering, such as structural, construction, environment and transportation. **Average starting salary: $48,280.**

ELECTRICAL ENGINEERING: Concerned with the basic forms of energy that run our world. Whether it's gas, hydro, turbine, fuel cell, solar, geothermal or wind energy, electrical engineers deal with distributing these energies from their sources to our homes, factories, offices, hospitals and schools. Electrical engineering also involves the exciting field of electronics and information technology. Do you have a cellular phone or a computer? Wireless communication and the Internet are just a few areas electrical engineering has helped flourish. **Average starting salary: $55,292.**

FOUR-YEAR PROGRAM

ROBOTICS: A branch of engineering that involves the conception, design, manufacture and operation of robots. This field overlaps with electronics, computer science, artificial intelligence, mechatronics, nanotechnology and bioengineering. Robotics engineers design robots, maintain them, develop new applications for them and conduct research to expand the potential of robotics. To become a Robotics Engineer, a BE in Robotics or electronics is a must to begin with. An additional master's degree or a doctorate opens the arena of research and design. It is a prerequisite that the engineers are able to anticipate industry needs to be able to successfully develop a robot for a particular purpose. Robotics companies require a host of other professionals such as programmers, systems engineers, technicians, database and simulation experts, and industrial engineers. People with these qualifications may also enter the field of robotics. **Average starting salary: $54,627.**

INDUSTRIAL ENGINEERING: Is concerned with quality and safety in all areas of industrial, service, and government activity. Industrial engineers work in hospitals, transportation and communication companies, research laboratories, banks, and education agencies, as well as in all types of manufacturing industries. Putting solutions to work in real-life situations requires, above all, an understanding of how people and technology work together; how to manage operations; how to respond to new ideas; and what it takes to implement changes. **Average starting salary: $55,067.**

MECHANICAL ENGINEERING: Is concerned with the design, planning and development of machines and equipment ranging from jet engines to minute instruments used in medicine and surgery. Mechanical engineers work on teams responsible for developing a wide range of products and systems including, for example, space shuttle vehicles, aircraft of all sizes and shapes, automobiles, turbines, pumps, power plants, and factories. **Average starting salary: $54,128.**

ENGINEERING

B.J. BAYER, 30

REACTOR OPERATOR
ARKANSAS NUCLEAR ONE, RUSSELLVILLE

B.J. BAYER KNEW FROM AN EARLY AGE that he wanted to incorporate math into his future career. Therefore, after graduating from Gentry High School, he decided to pursue a degree in Mechanical Engineering. He graduated with a Bachelor's of Science in Mechanical Engineering from Arkansas Tech University and moved on to obtain his Master's of Business Administration from Arkansas State University. B.J. began working as a civil engineer immediately after college, but five months later, he was offered a position at Arkansas Nuclear One in Russellville as a reactor operator. Today, B.J. continues his work at "Nuke One" and enjoys using his degree in a wonderful career near his hometown.

What influenced you to choose the career you have today?
I initially took the job because of its geographical location, but I soon discovered all of the advancement opportunities in the nuclear industry for someone with an engineering degree and experience in nuclear operations.

What is your day at Arkansas Nuclear One like?
Our department is responsible for starting up and shutting down the plant and we continuously monitor plant parameters while the unit is at 100% power. We have administrative control of the plant's entire configuration.

What do you love about your job?
The thing I like most about my job is the people. I have the privilege of working with intelligent, outgoing individuals in an environment with high standards.

What is your advice to those interested in the engineering field?
Take school seriously and learn as much as you can throughout your educational experience. I would also like to recommend doing summer CO-OPS or internships during your college years. There seems to be a considerable gap between theory and practical application in a lot of recent graduates that we have hired. I think high school students should be reminded that you generally get out of something what you put into it and can get a valuable education at any school regardless of size or location.

WHAT'S THE PAY: Salaries vary depending on specialties and high-need areas, but the average annual salary for someone employed in the engineering industry is $69,000.

TRY MAJORING IN: Engineering, civil engineering or mechanical engineering

nanotechnology

THERE ARE SOME VERY SMALL ANIMALS IN NATURE. Think of the smallest bug you've ever seen. An ant, perhaps? Or a mite? Insects like common ants are perhaps a centimeter in length. Mites are usually smaller. In our everyday lives, we're used to thinking of the idea of small size in these terms. In your science classes, though, you've learned to think about things that are even smaller, like bacteria and viruses. Atoms, too, and the things they are made of (electrons, protons, and neutrons) are even smaller.

But did you know that there are units of measurement that are even smaller? There are as many nanoseconds in one second as there are seconds in a month. In the last few years, scientists have been thinking very creatively on this tiny scale. Why? Because they have realized that, with current and developing technology, it is possible to make useful materials and even machines that are smaller than bacteria and viruses – so small, in fact, that they are only a little larger than the largest atoms.

The branch of engineering these scientists have created is called nanotechnology, or the science and technology of building electronic circuits and devices from single atoms and molecules. Specialists in nanotechnology – called nanotechnologists – are now doing research to figure out what is possible in nanotechnology, and nanotech companies – quite a few here in Arkansas – are already using the tiny materials and machines to make products. It's a new, amazing and very exciting field, and you can be a part of it!

What are some of the possibilities of nanotechnology? What can it do?

Scientists are already using nanotechnology to change the way materials are manufactured. Think about an airplane. The metal materials that make up a large part of an airplane's structure have a certain weight. Aircraft designers typically choose metals (like aluminum) that are very light so that the plane weighs as little as possible.

Nanotechnologists are working on ways to coat metals with nanomaterials to increase the strength of those metals. Think about it. If the metals are made stronger, you don't have to use as much of them to build an airplane. This saves those metals for other uses. It also makes it possible to build larger airplanes, since with nanotech materials, 'larger' no longer has to mean 'heavier'.

CHARTING YOUR COURSE FOR A CAREER IN NANOTECHNOLOGY

IF I STUDY NANOTECHNOLOGY IN COLLEGE, CAN I GET A JOB WITH JUST A BACHELOR'S DEGREE?
Yes, employers hire nanotechnologists who only have bachelor's degrees. But higher degrees (master's degrees and PhDs in Physics or Mechanical Engineering) boost your understanding of the subject enormously and result in better, higher-paying jobs.

CAN I FIND EMPLOYMENT IN NANOTECHNOLOGY HERE IN ARKANSAS?
Absolutely. In fact, there are a number of nanotechnology companies in the state. For example, the companies Nanomech and Garden Fresh are located in Fayetteville. Synanomet and Chemical ID are just two of several nanotechnology companies in Little Rock.

Nanotechnology also makes it possible for oil companies to change the way they refine oil and gas by increasing the efficiency of the processes they already use. This has a very important result: the production of gasoline and other petroleum products won't create as many pollutants. Nanotechnology can help make our environment cleaner!

Is nanotechnology something I can study in high school?

While there are no specific high-school courses in nanotechnology, the subject is being incorporated, even if only in a small way, into physics and engineering classes. And some students around the state have had the opportunity to go on field trips to learn about nanotechnology from scientists at companies and universities.

In fact, the University of Arkansas at Little Rock has its own Nanotechnology Center. One of the aims of the center is to reach out to middle schools and high schools to help students like you understand what nanotechnology is, what it can do, and how you can get involved. As federally-funded programs like Project Lead the Way increase the number of high-school engineering classes throughout the state and as nanotechnology itself continues to develop, the possibilities for learning about the subject will increase.

If I can't take classes in nanotechnology in high school, what classes should I take if I want to study it in college?

Chemistry, physics and mathematics are the most important subjects you can take right now to prepare for college coursework.

Can I study nanotechnology in an Arkansas college?

Absolutely. At the University of Arkansas at Fayetteville, there are faculty in the Departments of Physics and of Mechanical Engineering who teach classes in the subjects ("Nanotechnology" and "Physics at the Nanoscale," for example) and are involved in nanotechnology research. Faculty at UALR, Henderson State University and Arkansas Tech are also conducting research in the field and, through UALR's Nanotech Center, are helping students involved in research expand their understanding of the subject and what they can do with it.

CAREER OPTIONS

NANOTECHNICIANS: Support scientists and engineers in laboratories conducting experiments in research and development of new materials and understanding structure-property relationships of nanomaterials. **Average starting salary: $40,000**

PRECISION ASSEMBLY (TECHNICIANS): Assemble MEMS (Micro Electro Mechanical Systems). Typically requires associate's degree. **Average wage: $20/hour**

ADVANCED MANUFACTURING TECHNICIANS: Produce photovoltaics, batteries, fuel cells, thin films, composite materials and other new materials for applications in automotive, aerospace, energy, clean technology, biomedical devices, biotechnology and biofuels industries. **Average starting salary: $40,000 - $50,000, depending on experience and industry.**

METROLOGY TECHNICIANS: Use optical, scanning electron, and atomic force microscopes, profilometers, and other test equipment to ensure the critical dimensions of products (coating thickness, surface finish, feature size) are within specification. They perform routine tests, and occasionally help solve engineering and manufacturing problems. **Average starting salary: $30,000.**

NANOTECHNOLOGY

JUSTIN LOWERY, 27

ENGINEER, NANOMECH

WHILE JUSTIN DID NOT ALWAYS KNOW that nanotechnology would be his future career, after attending the University of Arkansas in Fayetteville and majoring in mechanical engineering, he immediately accepted a job out of college to work full time in the engineering world at NanoMech where he had been working during college as a research assistant. Justin has worked as an engineer for Nanotech for two-and-a-half years and enjoys many different elements of his job.

What influenced you to choose the career you have today?
Engineering was attractive because it requires both scientific knowledge and hands-on experience. Mathematics and science are your tools, but at the end of the day, you can have all the scientific knowledge in the world, and it won't make you a good engineer if you don't know how to apply it to reality. In high school, I was very interested in physics and mathematics, and engineering is essentially applied physics and math. That is what led me to Mechanical Engineering.

What is your job like on a day-to-day basis?
Daily activities include designing equipment, designing testing procedures, performing tests on materials and equipment, and collecting and analyzing data.

What do you love most about working at NanoMech?
There are lot of different areas of research we are involved with, so it keeps things challenging since there is always something new to learn.

Do you have any future career goals in your field or plans to advance in engineering?
I enjoy materials science and working with nanomaterials, but my primary skill set focuses around mechanical design, so it is very possible that I will move to other fields of work during my career.

What advice do you have for anyone who would like to pursue a career in nanotechnology?
Develop good study habits now. You will have to take calculus and Differential Equations tests that will require a lot out of you, so be prepared.

WHATS THE PAY: The average annual salary in the state of Arkansas for someone employed in Nanotechnology is $65,000 yearly.

TRY MAJORING IN: Engineering, computer science, mechanical engineering, engineering design, chemical engineering, biochemistry, physics, chemistry or biology

precision agriculture

PRECISION AGRICULTURE IS NOT ALL ABOUT FARMING. A career in this field does not necessarily mean that you buy land and start planting soybeans and cotton, nor does it mean you have to become a forester. While many do indeed put precision ag technology and practices to work in the fields and forests, even more have used those degrees to pursue careers in Arkansas's growing utility and technology industries. Some have started their own companies, joined environmental engineering firms, become archeologists, attorneys specializing in land law, historians or crime scene analysts.

And, yes, precision agriculture is also changing the face of Arkansas's largest industry, agriculture. According to Dr. Robert Weih, Director of Spatial Information Systems (SIS) Program and the Spatial Analysis Laboratory at the University of Arkansas at Monticello, "Today's farming involves a great deal more site-specific methods for crop management. Instead of treating a large piece of land as one uniform area, which can be not only wasteful and costly but environmentally challenging, precision agriculture allows farmers to gauge the needs of a specific area of their crop whether that be with fertilizers, pesticides or herbicides."

What's the technology behind precision agriculture?

Precision agriculture is a term used to describe a new concept that aims to reduce the cost of food production while maintaining environmental quality. These two goals are achieved through the use of innovating information technologies and field practices.

Precision Ag is all about using technology to "do the right thing, in the right place, in the right way, at the right time." Doing so requires an expert knowledge of a number of cutting-edge technologies—global positioning system (GPS), geographical information systems (GIS), remote sensing, soils and plant sensors. For example, GPS technology allows farmers to identify locations in their fields where seed, fertilizer, or water are needed to yield the most efficient crops. GIS technology allows better visualization of field data, which allows users to make wiser decisions for improving yield and profitability.

In addition to GPS, another technology used is real time kinematic (RTK). It is used for implementing practices that require a high level of accuracy, such as drip-tape irrigation and strip tillage. The benefits of this technology are regulated water application, reduced fertilizer use, optimum field quality maintenance, improved soil drainage, soil conservation and higher yields.

What is GIS?

According to the Center for Advanced Spatial Technologies (CAST) at the University of Arkansas at Fayetteville,

CHARTING YOUR COURSE FOR A CAREER IN PRECISION AG

HOW CAN I TAKE GAIN EXPOSURE TO PRECISION AGRICULTURE TECHNOLOGIES AND PRACTICES?
The John Deere program at ASU-Beebe is a great way for interested youth who are technologically savvy to learn more about precision agriculture. ASU-Beebe offers an Associate of Applied Science degree designed for students looking to gain the skills and preparation needed to enter the workforce as John Deere service technicians. The curriculum is designed by John Deere and ASU-Beebe to focus on the entire line of John Deere products. The goal is to provide students with experience in hydraulics, electrical systems, engines, power trains, air conditioning, machine adjustments and the entire service system. One of the required classes is precision farming.

According to Roger Long, Department Head and Instructor of Agriculture Equipment Technology at ASU-Beebe, students receive certifications in electrical systems, hydraulic systems and as ag service advisors. These certifications are prerequisites for further training in the field of precision agriculture, which is offered by John Deere University. JDU offers both on-line and traditional classes, and completers of the program at ASU-Beebe are normally sent there by the John Deere dealerships where they are employed. The program at ASU-Beebe is one of only 23 in the United States and Canada.

WHAT COURSES SHOULD I STUDY IN HIGH SCHOOL TO PREPARE?
High school classes related to this field include agriculture mechanics, forestry, natural resources management, agricultural surveying, ag science and technology, and environmental natural resources. Many Arkansas high schools have EAST/Workforce Technology computer learning labs that include classes in GPS.

GIS allows you to collect, manipulate, analyze and display spatial data and information. Spatial data is any data that deals with the locations of things and just about anything you can imagine has a spatial component to it – fire hydrants, golf courses, schools, homes, even pets and people.

What is GPS?

The Global Positioning System (GPS) is a satellite-based navigation system made up of a network of 24 satellites placed into orbit by the U.S. Department of Defense. GPS was originally intended for military applications, but in the 1980s, the government made the system available for civilian use. GPS works in any weather conditions, anywhere in the world, 24 hours a day. There are no subscription fees or setup charges to use GPS.

GPS satellites circle the earth twice a day in a very precise orbit and transmit signal information to earth. GPS receivers take this information and use triangulation to calculate the user's exact location. Essentially, the GPS receiver compares the time a signal was transmitted by a satellite with the time it was received. The time difference tells the GPS receiver how far away the satellite is. Now, with distance measurements from a few more satellites, the receiver can determine the user's position and display it on the unit's electronic map.

During Hurricane Katrina, GPS was used to map the movement of the storm. It was also used in the aftermath to survey, map and plan for restoration of disaster areas throughout Mississippi and Louisiana.

Surveyors use GPS technology for simple tasks every day such as defining property lines, building infrastructures in urban areas and mapping road and rail systems to help municipalities save taxpayers time and money.

Can learning about GIS and GPS help me get a good job?

Absolutely. A few of the industries that employ GIS specialists include :

- **Banking**: ATM location planning; customer service; marketing
- **Health Care**: Emergency response planning; site and facility inspection; outbreak investigation
- **Government**: Crime prevention; 911 response; economic development; elections
- **Real Estate**: Title and property searches; property appraisals; lease negotiation
- **Telecommunications/Utilities**: Call-Before-You-Dig; wireless communication services; cellular tower location
- **Transportation**: Traffic flow analysis; civil engineering; route planning; in-car navigation.

PRECISION AGRICULTURE

TREY COFFMAN, 22

STUDENT, ASU-BEEBE

GROWING UP ON A FARM, Trey Coffman realized early on that there was more to learn than just tilling the land. His interest grew in how things worked, why they broke and how to fix them. Agriculture was a natural choice for him, but his curiosity also led him to the technical side of the field. To be close to his family, he chose ASU-Beebe's John Deere program. Majoring in agribusiness with an Associate's degree in Applied Science, Trey will graduate in May 2009 with a good idea of where his career is heading.

Where do you see yourself after you graduate?

Right now, I work as an Ag Tech for John Deere at the Barton Ag Center in Marion. They have been really good to me. When I get my Ag Business degree in one more semester, I will either continue working at Barton Ag Center or become a shop manager at another John Deere dealer.

How does ASU-Beebe's John Deere program prepare you for your future career?

It gives you a great start on the competition. The instructors here at ASU-Beebe will tell you everything they know and help you in any way they can. You will learn how the machine runs, works and communicates with the computers on board the tractor and how to repair it. Knowing how the tractor works and diagnosing the problem properly, you are 70 percent ahead of the workers at your shop, making you more valuable.

What advice do you have for anyone who would like to pursue a career in Precision Ag?

If you choose this career path, I recommend that you learn the electrical side of it. Everything is going to and through computers these days, so you need to know how things are processed. Anyone off the street can repair a broken part or rebuild an engine. The person diagnosing the problem is the one getting paid the big bucks.

THE PAY: Salary ranges from $40,000 to $50,000.

TRY MAJORING IN: Agribusiness, applied science or math, environmental science, forestry, geology, marine biology

WHY IT'S HOT: With the field turning more to computers, the technical side of agriculture has few qualified qualified workers to fill the numerous job positions available.

PLAN FOR SUCCESS

EVERY STUDENT NEEDS A CAREER ACTION PLAN (CAP). HERE'S HOW TO CREATE ONE THAT WILL GET YOU OFF TO A GREAT START TOWARD YOUR CHOSEN CAREER.

WHAT DO YOU WANT TO DO WITH YOUR LIFE?

That can be a frightening question. You might dream about it, awed by the possibilities and freedom. Or perhaps you dread the future, afraid of the responsibilities and uncertainties. You might just shrug the question off, thinking there's plenty of time to worry about that later in high school or after you graduate. Why worry about it now?

You do have time to think about what you'll do after high school, but a little thought and planning now can help you find a career focus that will give your life meaning and fulfillment. Planning can prevent you from winding up at a job that makes your life dreary and miserable.

You don't need to map out your entire life right now, but it is smart to figure out a direction you'd like to go—and start moving that way. The first step is to devise a Career Action Plan—a map for your future.

Your CAP will help you make better decisions about what classes to take, what kind of education you might need after graduating from high school, what activities to get involved in and which jobs to consider.

Every student entering high school should have a CAP covering the high school years to help navigate the maze of academic classes, career electives and extracurricular activities.

You should revise your CAP every year, refining it to reflect your changing interests, goals and desires.

"Career placement is a personal thing. It's not something you're completely locked into. Even grownups change their careers," says Susan Prater, Arkansas Department of Workforce Eductiation Family and Consumer Sciences Public School program advisor. "It's never a place to stop. It's always a place to start."

Your teachers and counselors have developed the following step-by-step process to help you create your own Career Action Plan. Keep in mind that these steps are just a guide. You should read them carefully and apply what you learn to your particular interests and goals.

STEP 1: COMPLETE ASSESSMENTS

The first step in figuring out what kind of career you might enjoy is to get a better understanding of yourself—what activities you like and which ones you don't. Think about the kind of life you'd like to lead and your goals. Ask yourself questions such as: Do you want to work outdoors? With children? Do you like tinkering with machines? Or would you prefer a high-pressure job where you compete against others?

Several tools can help you figure these things out. These quizzes aren't the last word on the subject, but they can help you focus.

Many schools in Arkansas use Kuder (see "Test Yourself" on page 23) and ACT's Explore assessments. There are several of these questionnaires that your teachers can give you or that you can take on your own.

The questionnaires will help pinpoint what you're interested in, what your skills are and what things are important to you. The results shouldn't be all that surprising, but they will help you focus your search. Ask your teachers or counselors what assessment tools are available through your school.

STEP 2: RESEARCH YOUR CAREER OPPORTUNITIES

Once you've identified your interests and talents, you should select some careers you think might fit best and learn more about them. You can research each of these careers on the Internet and at the library. Better yet, talk in person to people who work in these fields to find out what their jobs are really like. Follow them around for a day to get a feel for what they do; this is called job shadowing. You'll want to know how much education or training

is required beyond high school, what each job pays, and whether demand for people in the field is growing or shrinking. Some Web sites to help you research the professions that interest you include www.careerclusters.org, www.discover.arkansas.gov and O*NET (online.onetcenter.org). Ask your guidance counselor about ArkOTIS, another great career resource available on CD-ROM.

STEP 3: EXPLORE YOUR EDUCATION OPTIONS

Once you've narrowed down the professions that might be a good fit for you, you need to know what education or training will be required to get you into them. Most jobs require some kind of education or training beyond high school, but that preparation could be anything from a stint in the military to a two-year degree from a technical school or community college or a bachelor's degree from a college, such as the University of Arkansas, to several years of advanced graduate work. When you have a better idea of the education requirements, you can prepare to meet them.

For instance, if you know you want to study engineering, you'll want to take as many advanced math classes as possible. Also consider Project Lead the Way classes, if your high school offers them.

You'll want to look for clubs, student competitions and activities from which you can learn and get experience. And you can look for internships or part-time jobs that relate to the professions in which you're interested.

STEP 4: TALK ABOUT YOUR OPTIONS

Any good plan needs input from others. Talking with your parents, teachers, counselors, friends and siblings is a good way to help refine your career plan and give you new ideas. Tell them about your career assessments, what you dream about doing when you're older, what you think you'd do well. They can help you research your choices and connect you with people who work in those professions, making it easier to do job shadowing and internships. The final decisions are yours to make—it's your life, after all—but it's smart not to go through the process alone. Take advantage of all the knowledge the people who care about you and your future can offer.

STEP 5: DOCUMENT YOUR CHOICES AND PROGRESS

As you research your future and make choices, document your decisions. This will make it easier to review what you've done and help you visualize your journey. In eighth grade, you'll be asked to create the CAP, which includes selecting a career cluster. Included in the CAP might be the electives you plan on taking in high school, extracurricular activities in which you might get involved or training and education you plan on pursuing after high school, as well as your long- and short-term goals. The information will be kept in a folder at your school to be reviewed each year. You won't be bound to the CAP for the rest of high school. You can switch to a different career cluster or pathway (an area of concentration within a cluster) whenever you want.

STEP 6: REVIEW AND REVISE YOUR CAP

Whether or not you stick to the same cluster, it's important to revise your CAP at least once a year. Ask yourself: Do you like the decisions you made earlier? Have you accomplished what you wanted so far? Do you have new dreams or plans you'd like to pursue? What went well and what went wrong in the past year, and why? Examining what you've done so far is a good way to prepare for the future. Changing your mind is okay, and there's no shame in failing to meet some of your goals. Having an intentional plan, based on all the information you have at the time, will keep you from haphazard decisions that will end up making you unhappy. With a plan, you'll know what you're doing and why, and you'll have a goal for which to strive.

STEP 7: GRADUATE AND BEGIN YOUR WORK LIFE OR ADDITIONAL EDUCATION

When you graduate from high school, your career development won't be over. Most likely, it'll just be starting. You'll be able to apply your career planning skills as you enter college, begin technical training in the military or elsewhere, or search for employment. Even if you end up in a career much different from what you'd originally expected, the time you spent exploring your interests, talents, values and goals

TEST YOURSELF

Want to get a better idea of what jobs match your interests?

Visit the Arkansas Career Planning System online at ark.kuder.com. Based upon Arkansas's 16 career clusters and powered by the Kuder Career Planning System, the Web site helps determine what kinds of jobs in which clusters would best suit you.

The system consists of three tests. One set of questions assesses your interests, another assesses your skills and a third helps identify your personal values. Once you know yourself better, it's easier to identify the right career for you.

The system provides advice for preparing your Career Action Plan and information on your options for continuing your career preparation in high school.

It also lets you create and maintain an online portfolio listing the courses you've taken, the activities you have been involved in at school and any special achievements you've accomplished. When you actually start searching for jobs, you can use your portfolio as a resume.

The system is available to students at more than 500 middle and high schools throughout the state and at all 22 of Arkansas's two-year colleges. Check with your guidance counselor to find out if your school participates in the program. If it does, your counselor will give you a special code that lets you enter the program when you go online.

CAREERS in STEM

ADVANCES IN SCIENCE AND ENGINEERING ARE ESSENTIAL FOR ENSURING AMERICA'S ECONOMIC GROWTH AND NATIONAL SECURITY. Of the 30 fastest-growing occupations projected through 2016, the U.S. Bureau of Labor Statistics' Occupational Outlook Handbook concludes that 16 of them will require substantial mathematics or science preparation. The STEM cluster will take you there.

The STEM cluster involves working with abstract ideas, as well as observing, understanding and discovering things. It usually requires more education than the other career groups. This includes engineering, chemistry, all levels of medicine (from doctor to lab technician) and mathematical sciences, especially computer science. However, STEM occupations can be found in every cluster.

The job outlook for engineers and technologists continues to look promising because competitive pressures and advancing technology will force companies to improve and update product designs and to optimize their manufacturing processes.

Students should study and apply principals from advanced mathematics, life science, physical science, earth and space science, and technology.

ANIMAL SCIENCE PATHWAY

NATURAL RESOURCES/ENVIRONMENT PATHWAY

PLANT SYSTEMS PATHWAY

AQUACULTURE: Go Fishing! Aquaculture is a program that will prepare you to select, breed, harvest and market domesticated fish, shellfish and marine plants, both freshwater and saltwater. This field will introduce you to aquatic and marine biology; health and nutrition of aquatic and marine life; design and operate fish farms, breeding facilities and culture beds; and issues of safety, regulation, logistics and supply. Median salary in Arkansas for supervisors in this area: $44,410.

ENVIRONMENTAL SCIENCE: Want a dream job? Choose a "green" job! The green industry holds some of the 21st century's hottest employment opportunities. In this program you will study the physical environment and help find solutions to environmental problems such as controlling pollution and erosion; human impact on the natural environment; and natural resources management, which includes management of our earth's land, water and minerals. If you like science and math, this program is for you! Courses include biology, chemistry, physics, geosciences, climatology, statistics and mathematical modeling. Median salary in Arkansas: $46,090.

CARTOGRAPHERS AND PHOTOGRAMMETRISTS: Measuring, mapping and charting the Earth's surface are just a few of the duties in these great jobs. Cartographers and photogrammetrists do everything from performing geographical research and gathering data to produce maps in digital or graphic form. Though these employees spend most of their time in offices using computers, certain jobs may have them working in the field gathering data and verifying results. These jobs may also use the Geographic Information System (GIS). The GIS helps you answer questions and solve problems by looking at your data in the form of maps, globes, reports and charts. Good with computers and interested in geography and earth science? This job's for you! Median salary in Arkansas: $46,400 with a Bachelor's Degree.

INTERNATIONAL AGRICULTURE: This program focuses on combining agricultural management and scientific principles to the problems of global food production and distribution and to the study of the agricultural systems of other countries. You will study agricultural economics; comparative agricultural systems; international agribusiness and law; third-world development studies and economic development; global applications of climate, soil, water resources, ecological and environmental studies; and animal and plant sciences. Median salary in Arkansas: $44,410.

GEOSPATIAL TECHNOLOGY PATHWAY

DESIGN/PRE-CONSTRUCTION PATHWAY

GEOGRAPHERS: Study nature and the earth's surface and the interactions of the physical and cultural wonders of the world. Conduct research on physical aspects of a region, including land forms such as mountains and valleys, climates, soils, plants and animals, and conduct research on the implications of human activities within a given area, including the social characteristics, economic activities and political organization. Also research how the earth is intertwined, from your own hometown to places a world away. Median salary in Arkansas: $58,750.

CONSTRUCTION ENGINEERING TECHNOLOGY/TECHNICIAN: This exciting field will teach you to apply basic engineering methods and skills to support engineers, engineering contractors and other professionals who work in the construction industry. Courses in this program of study include basic structural engineering principles and construction techniques, building site inspection, site supervision, construction personnel supervision, plan and specification interpretation, supply logistics and procurement, applicable building codes, and report preparation. What is the average pay in this field? Median salary in Arkansas: $43,920 with an associate's degree.

ARTS AUDIO VISUAL TECHNOLOGY AND FILM PATHWAY

TELEVISION PRODUCTION PATHWAY

CINEMATOGRAPHY AND FILM/ VIDEO PRODUCTION: Are you the next Steven Spielberg? Let your creativity flow by choosing this field of study. Cinematography and film/ video production will show you how to communicate your ideas, moods and feelings through the production of films and videos. In this program you will study film technology and equipment operation; production; directing; editing; cinematographic art; audio; the use of computers to record or enhance images, special effects; and the planning and management of film/video operations. If you want to be in the movie making business, you will want to start here. Median salary in Arkansas: $40,500.

MANAGEMENT PATHWAY

ACTUARIAL SCIENCE: A program that focuses on the mathematical and statistical analysis of risk, and their applications to insurance and other business management problems. An actuary's work includes instruction in forecasting theory, quantitative and non-quantitative risk measurement methodologies, development of risk tables, secondary data analysis, and computer-assisted research methods. National median salary: $53,754 with Bachelor's Degree.

TEACHING AND TRAINING PATHWAY

ENGINEERING TEACHER: Teach courses pertaining to the application of physical laws and principles of engineering for the development of machines, materials, instruments, processes and services. This field includes teachers of subjects such as chemical, civil, electrical, industrial, mechanical, mineral and petroleum engineering. It includes both teachers primarily engaged in classroom instruction and those who do a combination of both teaching and research. Median salary in Arkansas: $49,520 with a Bachelor's degree.

BUSINESS AND FINANCE MANAGEMENT PATHWAY

E-COMMERCE/ELECTRONIC COMMERCE: A program that prepares individuals to plan, manage, supervise and market electronic business operations, products and services provided online via the Internet. This field includes instruction in business administration, information technology, information resources management, web design, computer and Internet law and policy, computer privacy and security, e-trading, insurance, electronic marketing, investment capital planning, enterprise operations, personnel supervision, contracting, and product and service networking. Median salary in Arkansas: $50,880.

NATIONAL SECURITY PATHWAY (JROTC)

INTELLIGENCE SPECIALISTS: Military intelligence is information needed to plan for our national defense. Knowledge of the number, location and tactics of enemy forces and potential battle areas is needed to develop military plans. To gather information, the services rely on aerial photographs, electronic monitoring using radar and sensitive radios and human observation. Intelligence specialists gather and study the information required to design defense plans and tactics. Median national salary: $77,000.

THERAPEUTIC HEALTH INFORMATICS PATHWAY

PERFUSION TECHNOLOGY/ PERFUSIONIST: A program that prepares individuals, under the supervision of physicians and nurses, to operate extracorporeal circulation and auto-transfusion equipment during medical procedures and surgeries where the support or temporary replacement of a patient's own respiratory or circulatory system is required. Studies include instruction in equipment selection and operation; physician and medical team consultation; patient condition

monitoring; procedural techniques; and principles of respiratory and circulatory physiology. Median salary in Arkansas: $76,806 with an Associate's degree.

MEDICAL INFORMATICS: A program that focuses on the application of computer science and software engineering to medical research and clinical information technology support, and the development of advanced imaging, database, and decision systems. Studies include instruction in computer science, health information systems architecture, medical knowledge structures, medical language and image processing, quantitative medical decision modeling, imaging techniques, electronic medical records, medical research systems, clinical decision support, and informatics aspects of specific research and practice problems. Median national salary: $36,000.

NEUROANATOMY: A program that focuses on the scientific study of the structure and function of the brain and central nervous system. This field of study includes instruction in the molecular biology of neural cells and circuits, cognitive biology, neural transmitters and receptors, neuronal signaling and control of physical function, membrane and synapse structure and communication, autonomic function, nervous system circuitry and mapping, anatomy of neurological disease and disorders, brain studies, protein chemistry, and computational biology. Median salary in Arkansas: Between $75,000 and $100,000.

RESTAURANT, FOOD & BEVERAGE PATHWAY

DIETITIANS AND NUTRITIONISTS: Plan and conduct food service or nutritional programs to assist in the promotion of health and control of disease. Some may supervise activities of a department providing quantity food services, counsel individuals, or conduct nutritional research. Median salary in Arkansas: $41,121.

THERAPEUTIC HEALTH INFORMATICS PATHWAY

INDUSTRIAL-ORGANIZATIONAL PSYCHOLOGISTS: Apply principles of psychology to personnel, administration, management, sales, and marketing problems. Activities may include policy planning; employee screening, training and development; and organizational development and analysis. Some may work with management to reorganize the work setting to improve worker productivity. National median salary: $80,820.

INTERACTIVE MEDIA PATHWAY

MULTIMEDIA PATHWAY

WEB DESIGN PATHWAY

PROGRAMMING/SOFTWARE ENGINEERING – INFORMATION MANAGEMENT/PROGRAMMING PATHWAY

PROGRAMMING/SOFTWARE ENGINEERING – ORACLE PATHWAY

NETWORK SYSTEMS PATHWAY

DATABASE ADMINISTRATORS (ORACLE): Coordinate changes to computer databases, test and implement the database applying knowledge of database management systems. May plan, coordinate, and implement security measures to safeguard computer databases. Supervise the installation and testing of new products and improvements to computer systems such as the installation of new databases. Median salary in Arkansas: $59,500.

MULTI-MEDIA ARTISTS AND ANIMATORS: Have fun and get paid too. Create special effects, animation, or other visual images using film, video, computers, or other electronic tools and media for use in products or creations, such as computer games, movies, music videos, and commercials. Design complex graphics and animation, using independent judgment, creativity and the latest computer software available. Create two-dimensional and three-dimensional images depicting objects in motion or illustrating a process, using computer animation or modeling programs. Median salary in Arkansas: $47,900.

WEB DEVELOPERS: Develop and design Web applications and Web sites. Create and specify architectural and technical parameters. Direct Web site content creation, enhancement and maintenance. Design, build, or maintain Web sites, using authoring or scripting languages, content creation tools, management tools, and digital media. Median salary in Arkansas: $54,700.

LAW ENFORCEMENT SERVICES PATHWAY

CRIMINAL INVESTIGATORS AND SPECIAL AGENTS: Investigate alleged or suspected criminal violations of federal, state, or local laws to determine if evidence is sufficient to recommend prosecution. Agents analyze evidence in laboratories or in the field while investigating crimes, from kidnapping to bank robbery to copyright infringement. Median salary in Arkansas: $40,400.

MAINTENANCE, INSTALLATION & REPAIR PATHWAY

MECHANICAL ENGINEERS: Perform engineering duties in planning and designing tools, engines, machines, and other mechanically functioning equipment. Oversee installation, operation, maintenance, and repair of equipment such as centralized heat, gas, water, and steam systems. Median salary

in Arkansas: $62,046.

MARKETING INFORMATION MANAGEMENT & RESEARCH PATHWAY

MARKET RESEARCH ANALYST: Research market conditions in local, regional, or national areas to determine potential sales of a product or service and gather information on competitors, prices, sales, and methods of marketing and distribution. Position may also use survey results to create a marketing campaign based on regional preferences and buying habits. Median salary in Arkansas: $50,939.

ENGINEERING AND TECHNOLOGY PATHWAY

ELECTRONICS PATHWAY

PRE-ENGINEERING PATHWAY

SCIENCE AND MATH PATHWAY

ASTROPHYSICS: A program that focuses on the theoretical and observational study of the structure, properties, and behavior of stars, star systems and clusters, stellar life cycles, and related phenomena. Studies include instruction in cosmology, plasma kinetics, stellar physics, convolution and non-equilibrium radiation transfer theory, non-Euclidean geometries, mathematical modeling, galactic structure theory, and relativistic astronomy. Median salary in Arkansas: $62,520.

ATMOSPHERIC CHEMISTRY AND CLIMATOLOGY: A program that focuses on the scientific study of atmospheric constituents, reactions, measurement techniques, and processes in predictive, current, and historical contexts. Studies include instruction in climate modeling, gases and aerosols, trace gases, aqueous phase chemistry, sinks, transport mechanisms, computer measurement, climate variability, paleoclimatology, climate diagnosis, numerical modeling and data analysis, ionization, recombination, photoemission, and plasma chemistry. Median salary in Arkansas: $70,200.

ATMOSPHERIC SCIENCES AND METEOROLOGY, GENERAL: A general program that focuses on the scientific study of the composition and behavior of the atmospheric envelopes surrounding the earth, the effect of earth's atmosphere on terrestrial weather, and related problems of environment and climate. Studies include instruction in atmospheric chemistry and physics, atmospheric dynamics, climatology and climate change, weather simulation, weather forecasting, climate modeling and mathematical theory; and studies of specific phenomena such as clouds, weather systems, storms, and precipitation patterns. Median salary in Arkansas: $48,460.

BIOSTATISTICS: A program that focuses on the application of descriptive and inferential statistics to biomedical research and clinical, public health, and industrial issues related to human populations. Studies include instruction in mathematical statistics, modeling, clinical trials methodology, disease and survival analysis, longitudinal analysis, missing data analysis, spatial analysis, computer tomography, biostatistics consulting, and applications to such topics as genetics, oncology, pharmacokinetics, physiology, neurobiology, and biophysics. Median salary in Arkansas: $53,100.

MOLECULAR BIOCHEMISTRY: A program that focuses on the scientific relationship of physiological function to the structure and actions of macromolecules and supramolecular assemblies such as multienzyme complexes, membranes, and viruses. Includes instruction in the chemical mechanisms of regulation and catalysis, protein synthesis and other syntheses, and biomolecular chemical reactions. Median salary in Arkansas: $64,771.

MATHEMATICS

STATISTICIANS: Statistics is a growing field full of different job opportunities and great pay. In this field, you will engage in the development of mathematical theory or apply statistical theory and methods to collect, organize, interpret, and summarize numerical data to provide usable information. You may specialize in fields such as bio-statistics, agricultural statistics, business statistics, economic statistics, sports, or other fields. Median salary in Arkansas: $38,700.

MATHEMATICAL STATISTICS AND PROBABILITY: A program that focuses on the mathematical theory underlying statistical methods and their use. Includes instruction in probability theory parametric and non-parametric inference, sequential analysis, multivariate analysis, Bayesian analysis, experimental design, time series analysis, re-sampling, robust statistics, limit theory, infinite particle systems, stochastic processes, martingales, Markov processes, and Banach spaces. Median salary in Arkansas: $41,600.

CARTOGRAPHERS AND PHOTOGRAMMETRISTS: Collect, analyze, and interpret geographic information provided by geodetic surveys, aerial photographs, and satellite data. Research, study, and prepare maps and other spatial data in digital or graphic form for legal, social, political, educational, and design purposes. Also may work with Geographic Information Systems (GIS). May design and evaluate algorithms, data structures, and user interfaces for GIS and mapping systems. Median salary in Arkansas: $46,400.

AVIATION PATHWAY

AEROSPACE ENGINEERS: Perform a variety of engineering work in designing, constructing, and testing aircraft, missiles and spacecraft. Also may conduct basic and applied research to evaluate adaptability of materials and equipment to aircraft design and manufacture. Recommend improvements in testing equipment and techniques. Median salary in Arkansas: $94,348.

CAREER DEVELOPMENT

SAMPLE **HIGH SCHOOL** SCHEDULE

9TH GRADE	10TH GRADE	11TH GRADE	12TH GRADE
English I or Pre-AP	English II or Pre-AP	English III or AP	English IV or AP
Algebra I or Geometry	Geometry or Algebra II	Algebra II or Trigonometry Pre-AP Calculus	AP Calculus College Algebra AP Statistics
Physical Science	Biology Pre-AP Chemistry	Chemistry Physics Anatomy & Physiology Principals of Technology	AP Biology AP Chemistry AP Physics Earth & Space Science
Civics	World History	American History	Economics/Government

SIX UNITS IN A CAREER FOCUS ARE REQUIRED FOR GRADUATION

FOUNDATION & SUPPORT COURSES

- Keyboarding
- Career Orientation
- Foreign Language
- Word Processing or Computer Business Applications (CBA)
- Computer Technology
- Agriculture Science and Technology
- Family & Consumer Science

PROGRAM OF STUDY ELECTIVES

- EAST/Workforce-Technology
- Workplace Readiness
- Internship
- Senior Seminar

SCIENCE, TECHNOLOGY, ENGINEERING AND MATHEMATICS (STEM) PROGRAMS OF STUDY

- Advertising & Graphic Design
- Agricultural Animal Science
- Aviation
- Computer Engineering
- Computer Programming
- Drafting and Design-Architectural CAD
- Drafting and Design-Engineering CAD
- Electronics
- Geospatial Technology
- Graphic Communications
- Health Science
- Agricultural Horticulture
- Machine Tool Technology
- Multimedia
- Natural Resources/Environmental Science
- Oracle Internet Academy
- Pre-Engineering
- Radio/TV Broadcasting
- Web Design

WORK-BASED LEARNING OPTIONS

- Job Shadowing
- Internship
- Mentoring
- On-the-Job Training
- Youth Apprenticeship
- JAG

EXTRA CURRICULAR ACTIVITIES

- SKILLS USA
- Oracle Global Academy
- Gifted and Talented
- Science and Engineering Fairs
- Mathematics Competitions
- FBLA

STEM EDUCATION

SCIENCE TECHNOLOGY, ENGINEERING AND MATHEMATICS (**STEM**) DEGREES

ASSOCIATE'S DEGREES	BACHELOR'S DEGREES	DOCTORATE'S DEGREES
Automotive Technology	Agricultural Engineering	Aerospace
Aviation Maintenance	Biochemical Engineering	Architecture
Biomedical Technology	Biomedical Engineering	Computer Technology
Business Technology	Chemical Engineering	Engineering
Computer Aided Drafting CADD	Civil Engineering	Environment
Computer Technology	Clinical Engineering	Geological
Electronics	Computer Engineering	Geospatial
Engineering Technology	Computer Science	Medical
Graphic Design	Education	Nanotechnology
Multimedia Technology	Environmental Engineering	Nuclear
Pre-Engineering	Mechanical Engineering	Nursing
Veterinary Technology	Petroleum Engineering	Veterinary

RELATED **STEM** OCCUPATIONS BY DEGREE

CAREERS WITH AN ASSOCIATE'S DEGREE	CAREERS WITH A BACHELOR'S DEGREE	CAREERS WITH A DOCTORATE'S DEGREE
Architectural Drafter	Aerospace Engineer	Architect
Biomedical Technician	Chemical Engineer	Biochemist
CADD Technician	Chemist	Biophysicist
Cardiovascular Technician	Computer Hardware Engineer	Computer Information Scientist
Chemical Technician	Computer Software Engineer	Dentist
Civil Engineering Technician	Computer Systems Analyst	Engineering
Computer Repairer/Technician	Environmental Engineer	Environmental Scientist
Computer Support Specialist	Geneticist	Geologist
Electronics Drafter	Mechanical Engineer	Medical Doctor/Surgeon
Electronics Repairer/Technician	Microbiologist / Biologist	Medical Scientist
Environmental Science Technician	Network Systems Analyst	Physicist
Lab Technician	Petroleum Engineer	Postsecondary Teacher
Network Installer/Technician	Statistician	Researcher
Veterinary Technician	Teacher	Veterinarian

/ FUTURE **FOCUS** /

CAREERCLUSTERS

The production, processing, marketing, distribution, financing, and development of agricultural commodities and resources including food, fiber, wood products, natural resources, horticulture, and other plant and animal products/resources

Business Management and Administration careers encompass planning, organizing, directing and evaluating business functions essential to efficient and productive business operations. Business Management and Administration career opportunities are available in every sector of the economy.

Executing governmental functions to include Governance; National Security; Foreign Service; Planning; Revenue and Taxation; Regulation; and Management and Administration at the local, state, and federal levels.

Preparing individuals for employment in career pathways that relate to families and human needs.

Planning, managing and performing the processing of materials into intermediate or final products and related professional and technical support activities such as production planning and control, maintenance and manufacturing/ process engineering.

Careers in designing, planning, managing, building and maintaining the built environment.

Planning, managing and providing education and training services, and related learning support services.

Planning, managing, and providing therapeutic services, diagnostic services, health informatics, support services, and biotechnology research and development.

Building Linkages in IT Occupations Framework: For Entry Level, Technical, and Professional Careers Related to the Design, Development, Support and Management of Hardware, Software, Multimedia, and Systems Integration Services.

Planning, managing, and performing marketing activities to reach organizational objectives.

Planning, management, and movement of people, materials, and goods by road, pipeline, air, rail and water and related professional and technical support services such as transportation infrastructure planning and management, logistics services, mobile equipment and facility maintenance

Designing, producing, exhibiting, performing, writing, and publishing multimedia content including visual and performing arts and design, journalism, and entertainment services.

Planning, services for financial and investment planning, banking, insurance, and business financial management.

Hospitality & Tourism encompasses the management, marketing and operations of restaurants and other foodservices, lodging, attractions, recreation events and travel related services.

Planning, managing, and providing legal, public safety, protective services and homeland security, including professional and technical support services.

Planning, managing, and providing scientific research and professional and technical services (e.g., physical science, social science, engineering) including laboratory and testing services, and research and development services.