



Stimulating
Minds.

Inspiring
Careers.

Engineering
Pathways
Program



SCIENCE IS COOL AGAIN

Think of all the amazing new gadgets at your fingertips, from iPads and flat-screen TVs to solar-powered backpacks and wind-powered watches. Engineers are responsible for many of the latest entertainment trends and modern conveniences.

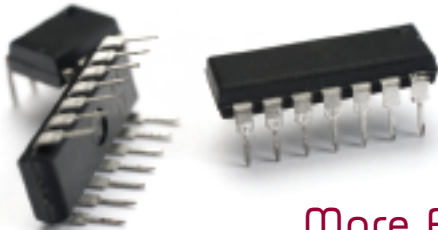
They're also responsible for much of the technology and industrial processes that shape your daily life—a bag of your favorite potato chips, the thrills you get at an amusement park, even the emotions you experience when you go to the movies.

And you can thank engineers for many of the things that make our society safe and productive, from bridges and roads to power plants and satellites.

In short, nearly everything that defines our world has the imprint of an engineering mind.

The future is only limited by our imaginations—and by the number of kids who choose to become engineers.

That's where Science Foundation Arizona comes in. Our Engineering Pathways program—part of an overall STEM (Science, Technology, Engineering, and Mathematics) initiative—is designed to get students interested in engineering and related careers and put them on the path toward the degrees and credentials they need to succeed.



More Fortune 500 CEOs have an engineering background than any other academic discipline.

What Does it Take to Succeed?

According to a 2010 University of California, Los Angeles study, many undergraduate students in STEM fields take more than four years to complete their degrees or drop out of their programs altogether. It's a sign that change is needed to better support, encourage and retain students in STEM fields.

Jerry Belverud, a retired aerospace executive who helps the Engineering Pathways program bring teachers into corporate internships, says that typically colleges "wait two years before exposing students to the things that make engineering interesting and exciting. They often focus only on complex math and theory at the expense of practical applications."

One of the key features of Science Foundation Arizona's program is to reverse this trend early in a student's academic career by combining academic coursework with hands-on experience that can be applied to real-life situations.

"Many people don't realize that engineering is also about teamwork and creative problem-solving, not just calculus and chemistry," says Karen Nicodemus, President Emeritus of Cochise College, which has been implementing pre-engineering programs with the support of Science Foundation Arizona for three years.

"The Engineering Pathways program succeeds because we help students recognize their capacity to do this kind of work," she says. "We're grabbing kids' attention with the exciting applications of engineering, while providing them with a high level of support that helps them realize their potential."

FOUR ARIZONA COLLEGES ARE LEADING THE WAY

Science Foundation Arizona is working with four rural colleges to find out what it takes to get kids on the path to rewarding engineering and related careers.

Through a combination of summer camps, early college opportunities, industry-driven certifications and degree programs, each unique pathway is designed to:

- Generate awareness of and enthusiasm for engineering
- Encourage students to pursue engineering careers
- Support improved math understanding and achievement
- Create internships and job opportunities for students at local mining, manufacturing, defense, agriculture and other companies
- Provide interdisciplinary professional development opportunities for teachers

The success of this program depends upon enhancing the connection between employers, community colleges and high schools.

Students who complete a pathway should be ready to work or transfer their credits toward a university engineering degree.

Educators at the colleges and local high schools are creating coursework and selecting students, while local businesses such as Pivot Manufacturing, Lockheed Martin, Intel, Siemens, Frito-Lay and Freeport-McMoRan Copper & Gold are defining occupational qualifications, providing work-study programs, and awarding recognized industry certifications to successful students.

Participating Colleges



“What we’re learning in these pilot projects will have a significant impact on the state, regional and even national level. Our goal is to find out what works best and replicate it.”

Karen Nicodemus
President Emeritus, Cochise College



Making Connections

Cochise College offers a multi-disciplinary approach that involves mechanical, electrical, computer, software, control and systems design engineering to create and produce useful products.

COCHISE COLLEGE: A STRONG AND GROWING PROGRAM

Since 2009, more than 119 high school students have participated in engineering programs at Cochise College. Additionally, 274 middle school kids have attended summer robotics, technology and science camps; 105 ninth- and tenth-graders were involved in STEM exploration programs; 197 eighth-graders have attended the Summer Math Academy; and more than 1,800 middle schoolers have taken part in the college's two Math and Science Experiences.

It all began when Bill Harris, President and CEO of Science Foundation Arizona, challenged the college to apply for a STEM-related competitive grant during a commencement address. The college decided to apply for a grant to launch a program that would bring together a number of disparate programs and move students onto a pathway toward STEM-related degrees and careers.

With STEM initiatives firmly in place, high school juniors and seniors can earn math and science credits at Cochise toward a degree in a STEM-related field, or they can earn valuable

industry certifications in engineering technology that can lead to employment as a technician.

The model has proven so successful on the Sierra Vista campus that elements are being expanded across the college through a grant from the National Science Foundation Advanced Technological Education program.

We Want You



In addition to working for local defense contractors, many Cochise pathway students can earn jobs at Fort Huachuca, home of the U.S. Army Intelligence Center, the Army Network Enterprise Technology Command (NETCOM)/9th Army Signal Command, the Army Military Affiliate Radio System (MARS), the Joint Interoperability Test Command (JITC) and the Electronic Proving Ground (EPG).

To learn more, contact Cochise College at 520-515-5413 or visit www.cochise.edu.

High school students can graduate with 37 transferable college credits, and they also may graduate with an internationally recognized certification from Siemens Corp.

YAVAPAI COLLEGE: THE BEST OF BOTH WORLDS

With more than 200 manufacturers in the Prescott area demanding more skilled technicians and engineers, Yavapai College (YC) has created a pathway for high school students that results in six industry certificates and 42 college credits that transfer toward two- or four-year degrees.

Twenty high school juniors and seniors with demonstrated math readiness have been selected for the first cohort, which is hosted through a partnership with the local Joint Technological Education District (Mountain Institute JTED).

Students learn a core set of practical skills, prior to enrolling in more complex math and math-based science classes.

Program Director Rick Peters says this is important “because it gives kids the ‘so-what’ of engineering and starts to get them excited about actual careers.” Through the Intro to Robotics course, for example, students study information from GE FANUC, the world leader in robotics, and learn what can be done with advanced math and science concepts. “We’re getting kids pumped up,” Peters says, “instead of beating them up with just math and science at the beginning of their course of study.”

By the time students complete the pre-engineering curriculum at YC, they’ll have attained an Applied Pre-Engineering

Degree, one certificate in robotics, one in electronics and four in computer-aided machining. “The certificates can help them get a good job right out of high school,” Peters says. “That can help fund their college education and give them a leg up over their peers who don’t have the advantages of applied knowledge.”

High School District Partners

Prescott
Bradshaw Mountain
Chino Valley

Ash Fork
Mayer



Mine, All Mine

Michael McDonald, an Earth Sciences teacher at Bradshaw High School, traveled 63 miles each way to participate in a two-week internship at the Freeport-McMoRan Mine in Baghdad, Arizona. Company executives wondered whether it would be a waste of his time to take a full week of safety training, but Yavapai College’s STEM Business Outreach Coordinator sees that as part of the benefit: “The goal is to bring a message of what’s really going on in the world of engineering into the classroom.”

To learn more, contact Yavapai College at 928-771-6114 or visit www.yc.edu.

Students earn industry-valued certifications while pursuing courses intended for transfer into an engineering degree program.

Building Better Bots

Thirty-six select middle and high school students participated in free robotics camps at Yavapai College in the summer of 2011. While applying concepts in physics, electronics, programming, machinery, sensor technology and process control, the high school students competed to see who had the smartest, most agile SumoBot®. “It was fun to see the high school kids try not to show how cool they thought all this was,” says Rick Peters, who taught the camps. “By the end they all let their guard down and were really thinking outside the box to build the best robots. . . . A lot of these kids are going to make really great engineers.”

Going Solar

The Guinness Book of World Records calls Yuma, Arizona, the sunniest place on earth. And Arizona Western College is taking full advantage with a utility-scale, 5-megawatt multiple-technology solar array on the main campus. The total solar installation will cover nearly 100% of the college's daytime energy needs, and it will function as a real-life learning laboratory for STEM students.

ARIZONA WESTERN COLLEGE: TRANSFORMING THE COMMUNITY — FULL STEAM AHEAD

Yuma County has struggled with one of the highest unemployment rates in the nation. But there are jobs here for people who have the necessary knowledge and skills.

Many businesses in the area are looking for people to fill important engineering and technician positions. The Army testing facility regularly has 50 or more jobs available. The year-round agriculture business is always looking for smart minds to solve food production and safety challenges.

The ideal candidates for these jobs are graduating high school and college students with STEM backgrounds who already live in the area—but there just aren't enough students with STEM credentials to go around. So Arizona Western College (AWC)—in partnership with the Yuma Union High School District, the Yuma Proving Ground (a test facility for military equipment) and many local businesses—is providing a pathway for promising students.

Adding agriculture to the STEM concept, AWC and the Yuma Union High School District collaborated to create the STEAM Early College Academy. Accepted students can take college-level courses at Yuma and San Luis High Schools.

Students could earn an Engineering Technology certificate designed with the help of local businesses. And they can earn a two-year Associate of Science degree that will transfer to a four-year Engineering degree.

The STEAM Academy Advisory Board is made up of leaders from companies like Trax International, which provide role models, paid internships, and jobs to help students enrich their personal and professional lives—as well as enhance the community around them.

Lettuce Engineer You



Eighty percent of the country's lettuce comes from Yuma, along with broccoli, melons, cotton, wheat and other crops. Agriculture is an extremely scientific industry that relies on people with critical thinking and problem-solving skills. To maximize crop yield and keep food safe, agricultural engineers study land levels, irrigation, transplanting, mineral deficiencies, fertilizer distribution and more.

To learn more, contact Yuma High School at 928-502-5000 or Arizona Western College at 928-344-7587, or visit www.azwestern.edu.

“Yuma is a collaborative community,” says AWC’s Dean of Instruction, Linda Elliott-Nelson. “Local businesses want skilled technicians who come from the area because they’re more likely to stay.”

CENTRAL ARIZONA COLLEGE: TWO TRACKS FOR TARGETED INTERESTS

Central Arizona College (CAC) offers an Advanced Manufacturing pathway that leads to technician certification, as well as a Transfer Engineering pathway toward a university degree in engineering.

“Our goal is to match students with the type of training and education that fits their skills and interests,” says Donald Pearl, PhD, Vice President of Instructional Programs and Services at CAC. “A student might come in wanting one pathway, only to find that the other one is better for them.”

Students in the Advanced Manufacturing pathway work on industry-standard robotics equipment and learn how to problem solve on the manufacturing line. “Manufacturers want people who can repair equipment on the fly or give good information in the event of an equipment failure,” Pearl says.

The Transfer Engineering pathway focuses on computer programming and math skills. Students work on state-of-the-art workstations, loaded with the latest engineering and design software packages.

Students in both pathways are exposed to design principles and practices, and meet with engineers from local

companies like Frito-Lay, Abbott Laboratories and Daisy Manufacturing Company.

CAC works with local middle schools and high schools to encourage interest in STEM at an early age. “Pinal County has a higher poverty rate than other counties in Arizona,” says Georgia White, PhD, CAC’s Dean of Professional and Technical Education. “The sooner children can get excited and understand what it takes to succeed, the easier it will be for them to achieve their goals.”

The Future Looks Bright



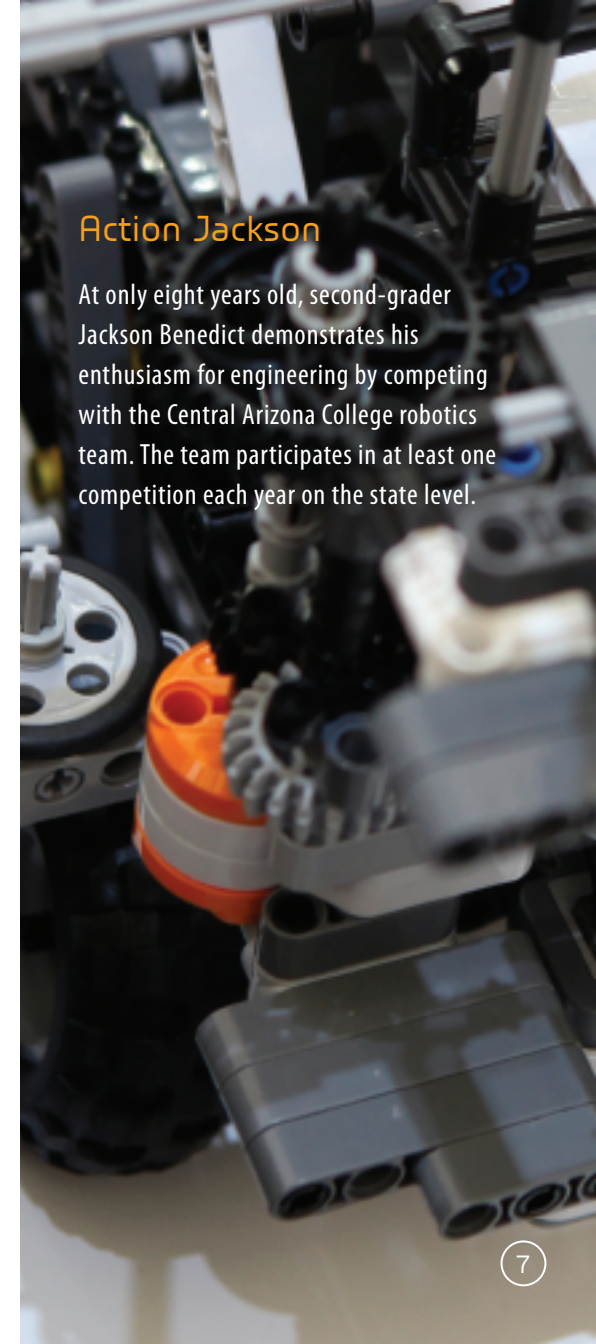
CAC’s 2011 Next Generation STEM Leaders Project attracted 160 middle school students interested in related careers. The annual event is designed to create excitement around STEM careers and show kids what it takes to succeed.

To learn more, contact Central Arizona College at 520-494-5317 or 520-494-5324, or visit www.centralaz.edu.

Local companies with advanced automated production systems — like Frito-Lay — are depending on talent from Central Arizona College.

Action Jackson

At only eight years old, second-grader Jackson Benedict demonstrates his enthusiasm for engineering by competing with the Central Arizona College robotics team. The team participates in at least one competition each year on the state level.



SCIENCE FOUNDATION ARIZONA

Science Foundation Arizona (SFAz) was created in 2006 as a 501(c)(3) non-profit public-private partnership to diversify Arizona's economy and be a catalyst for high-wage, knowledge-based jobs. Since then, SFAz has invested nearly \$120 million in 142 grants in strategic research areas and education. In 2008, SFAz launched the STEM Initiative with operational funding from Freeport-McMoRan Copper & Gold Foundation.

In the education sphere, SFAz has invested more than \$36 million in multiple STEM education programs to build a pipeline of talent. This includes \$18 million at the K-12 and community level and another \$18 million to develop more than 260 Graduate Research Fellows at Arizona's three research universities. Funding comes from Arizona's 21st Century Fund, the State Board of Education for Math Science Achievement Grants and the Governor's Office of Economic Recovery.

As of June 2011, the K-12 programs alone had impacted more than 5,000 teachers and 240,000 students throughout Arizona, improving math and science teaching and learning in skills critical to a vibrant, globally competitive economy.

To learn more, contact SFAz at 602-682-2800, visit www.sfaz.org or find us on Facebook.

ENGINEERING PATHWAYS PROGRAM

With funding from the Arizona 21st Century Fund, Science Foundation Arizona (SFAz) invested in building an Engineering Pathway at Cochise College that has served as a model for other colleges. SFAz expanded the program to three other rural community colleges with 2010 funding from the Governor's Office of Economic Recovery. The three colleges that have established their own Engineering and Applied Engineering Pathways include Arizona Western College in Yuma, Central Arizona College in Coolidge and Yavapai College in Prescott.

Each college is meeting local demands in high-technology industries by aligning appropriate curricula with industry input, as well as incorporating other K-12 STEM activities and programs to engage students in college-level course work early. Their Pathways programs are now ready for student enrollment.



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**This project was funded in part by the U.S. Department of Education
and the Governor's Office of Economic Recovery.**

