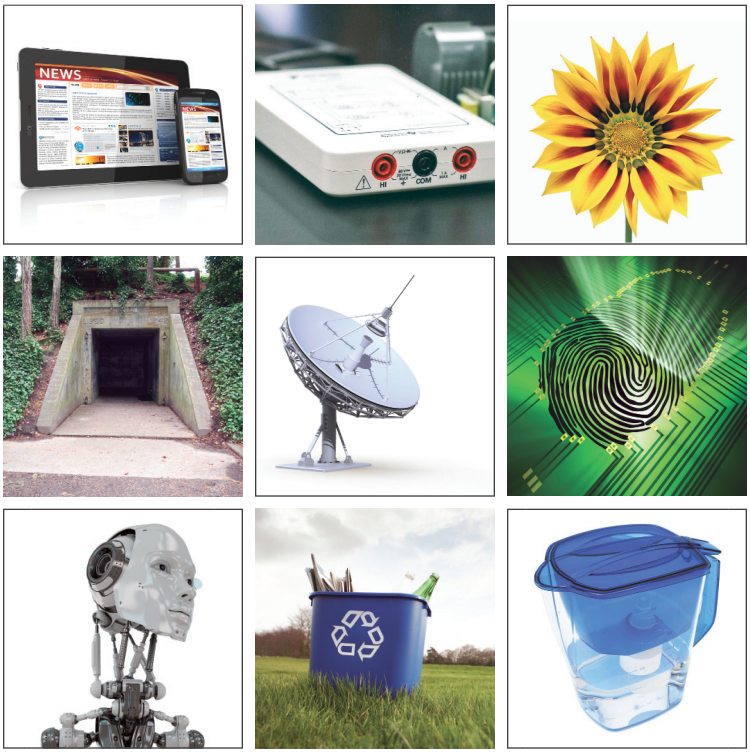
SREB | High Schools That Work

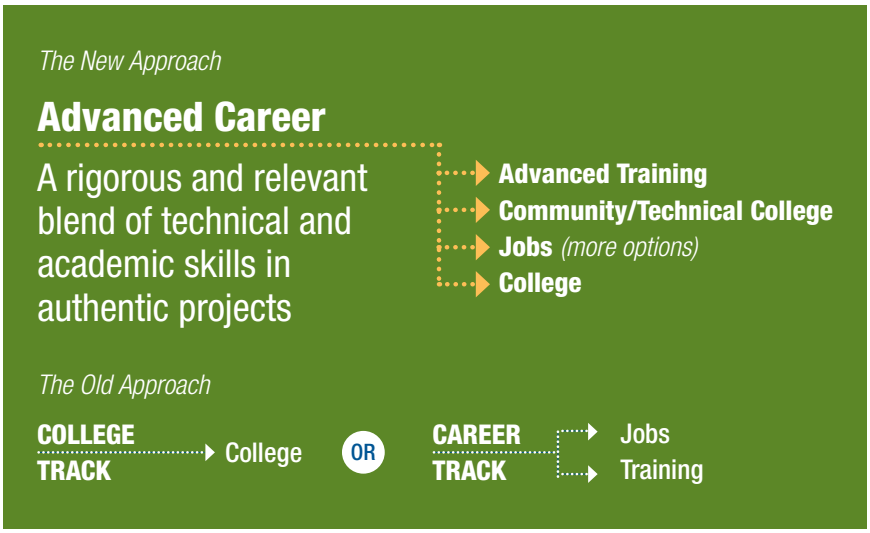
Advanced Career

Innovations in Science and Technology Curriculum



College or Career?...Why Not Both?

Advanced Career combines college-ready academics with authentic, hands-on projects.



Schools are under pressure to better prepare students for a wide array of postsecondary options. The workforce of today and tomorrow demands a higher level of skill — people who grasp complex problems, understand technology and troubleshoot problems.

Advanced Career (AC) answers both of these needs. By fusing a rigorous academic core with challenging project work and advanced technology in a career pathway program of study, AC courses give students a greater depth of knowledge and skills and prepare them for more options after high school.

Advanced Career provides:

- ready-to-implement AC course work for students
- comprehensive training for teachers
- access to tools and technology for project-based learning
- end-of-course assessments
- opportunity for industry certification and/or dual credit

Innovations in Science and Technology

The Innovations in Science and Technology program will develop students' technological literacy and stimulate their interest in pursuing a career in science, technology, engineering and mathematics (STEM). This STEM program will provide students with the knowledge and hands-on experiences they need to be successful in the new global workforce. The ideal candidate for this curriculum has an enthusiastic curiosity and enjoys challenges that involve solving complex real-world problems.

Through the four courses that make up this curriculum, students will learn to work in teams, think critically, identify problems, and design and test solutions. Students will learn to read and comprehend complex technical materials and communicate effectively their understanding of these materials in written, oral and electronic formats. Further, they will learn to apply math and science understandings, and use technology to effectively solve challenging problems. Through project-based assignments, students will explore the future of science and technology, and learn to apply the habits of mind and behavior unique to professionals in the field. They will learn how to program and use National Instruments' (NI) LabVIEW software and the myDAQ data acquisition device to work as engineers in making and analyzing scientific measurements.

The two foundational courses will engage students in hands-on assignments that challenge them to design, build and evaluate solutions to problems and projects such as *The Science of Survival, Cleaning Up Our Water Supply, and Designing and Building an Earthquake-Proof Shelter*. Each course will require students to employ the engineering design process. They will do research, follow a line of reasoning, organize and present information, and prepare a written report developed in a style appropriate for the task, purpose and audience. Students will follow a multi-step procedure when carrying out experiments; take measurements; use geometric shapes, measures, and properties to describe objects (e.g., modeling a tree trunk or a human torso as a cylinder); and draw on their creativity and imagination, and from their knowledge base when tackling problems.

Students completing the program may become an NI Certified LabVIEW Associate Developer (CLAD) and may be prepared for earning other relevant industry certifications.

Innovation in Science and Technology was developed by SREB and Arkansas as a part of a multi-state consortium to improve career and technical education in this country.

For more information about other Advanced Career curricula, visit sreb.org/AC.

Advanced Career Innovations in Science and Technology Curriculum

Innovations in Science and Technology will appeal to students who want to use a hands-on approach to solving STEM-related projects and problems that are authentic to the real world and the global workforce.

Course 1: The Nature of Science and Technology

This is a contextual-based course that introduces students to the core fundamental concepts of science and technology through authentic projects. Through these projects, students will develop an understanding of the relationship between the physical, biological and social world. Students will gain an understanding of the differences between science and technology, and learn that technology is a process for applying science. Students will develop a deeper understanding of scientific inquiry and the engineering design process when solving real-world problems. Students will experience the interaction of science, technology, engineering, math and literacy through a problem-based learning environment. Finally, the process will require students to use mathematics to analyze costs, develop budgets and make precise measurements to successfully implement project goals.

Course 2: Core Applications of Science and Technology

This course uses the concepts learned from Course 1 to further develop students' problem-solving strategies and skills needed by the 21st-century workforce. Students will continue to explore emerging technologies and techniques in the context of addressing authentic projects. Key concepts introduced in this course include sustainability and environmental trends, systems thinking, and trend analysis and prediction. Through engagement, students will experience the necessary connection between literacy, mathematics and science in a variety of hands-on, real-world projects requiring them to apply academic and technical concepts and skills and technology to complete.

Course 3: Impacts of Science and Technology

This course will examine the past, present and future impact of science and technology on culture, society and the environment. Students will explore how their predecessors worked to solve some problems that still exist today, and examine the potential of using modern technology to solve those problems. From these explorations, students will engage in a variety of hands-on design projects that will address tradeoffs, optimization, interconnectivity and the nature of complex systems.

Course 4: Creativity and Innovations

This course will allow students to brainstorm, use invention, innovation, creativity, predictive analysis and use technology to solve real-world problems. Dimensions covered will include research and development, troubleshooting, experimentation, design failures, patents and trademarks, and design under constraints.

Key Features of Advanced Career

Fully Developed Pathway Programs

Advanced Career (AC) encompasses a coherent sequence of four ready-to-implement courses; comprehensive training for teachers; access to tools and technology for project-based learning; and end-of-course assessments. To ensure fidelity from site to site, each course has a syllabus that includes instructional philosophy, instructional delivery and support systems, assessment and a recommended grading system.

Advanced Career Programs of Study

Each AC program of study (POS) is a progression of non-duplicative courses joined with a college-ready academic core and aligned from high school to postsecondary studies. The integration of academic and technical content in each POS prepares students for more options after high school graduation, offers opportunity for dual credit and leads to an industry-recognized credential, advanced training, or an associate's or bachelor's degree. The high-skill, high-wage career fields represented among the AC programs of study are important to the economy.

Project-Based Learning

Each course is designed around project-based units — featuring essential questions, project descriptions, authentic roles and tasks that require students to utilize an industry-recognized decision-making process. Assignments in AC courses encompass essential elements of good project-based learning to engage students in an extended process of asking questions, using resources and developing answers. Students collaborate and work in teams and develop important 21st-century skills.

Blended Learning Experiences

AC course work creates rigorous blended learning experiences for all students. Students apply their academic and technical skills to real-world projects in ways that advance their literacy, math, science and technical knowledge and skills, and strengthen their habits of behavior and mind for success.

Technology and Software

Students employ industry-standard data acquisition hardware and software systems to complete authentic tasks simulating the work of professionals in the field.

Assessments

Each project unit includes formative and summative assessments. Each course has an end-of-course assessment that measures both academic and technical achievement with the performance level needed for jobs, advanced training and postsecondary credit-bearing courses. In addition, students and teachers complete surveys about what works or does not work in the AC course. This serves to inform continuous improvement of the AC program.

Counseling for Careers

Student and parent orientation to each AC program of study highlights the career field, including requirements for jobs and postsecondary study in the career field. Each AC course has a career and education exploratory component. Counselors trained to support the AC program will assist students in developing a career and education plan aligned with students' goals and aspirations.

Teacher Selection, Professional Development and Support

Teachers are selected who have strong math skills and experience in the pathway career field. Staff development is essential and includes an intensive two-week summer institute for teachers to prepare them to teach each course and to use a project-based approach. They will perform students' assignments and use the tools developed by national industry partners. A support team including the principal, counselor and academic teachers in literacy, math and science learn how to support AC teachers and students in course implementation.

Dual Credit and Industry Certification

Courses three and four in the AC program offer the potential for dual credit when a state or district has an established process for approving such courses. Each AC program of study also offers opportunities for industry certification for students who complete the program.

Collaboration and Partnerships

Ongoing relationships among education, business and other stakeholders are central to AC pathway programs. Representatives from industry and postsecondary institutions have helped shape the curriculum design and technical content. Serving as an expert panel, they have collaborated with secondary educators and state education agency staff to identify authentic learning experiences for students that can lead to additional opportunities after high school. In addition to the secondary teachers who contributed to design and field-testing, the organizations represented in the development of the Advanced Career Innovations in Science and Technology Pathway Program include:

Accelerate Arkansas
Arkansas Department of Career Education
Arkansas Department of Education
Arkansas Experimental Program to Stimulate Competitive Research
Arkansas Research and Educational Optical Network
Arkansas State University
Arkansas STEM Coalition
Arkansas Technical and Community College System
Arkansas Tech University
AT&T Mobility
Audubon Arkansas
Digital Quest
Environmental and Spatial Technology (EAST Initiative)
George Fischer Sloan LLC
Mid-America Science Museum
National Aeronautics and Space Administration
National Instruments
SFC Fluidics, LLC
Southern Regional Education Board
University of Arkansas for Medical Sciences
University of Arkansas, Fayetteville
University of Arkansas, Little Rock
University of Central Arkansas