

## Pre-Advanced Career Middle Grades STEM Curriculum

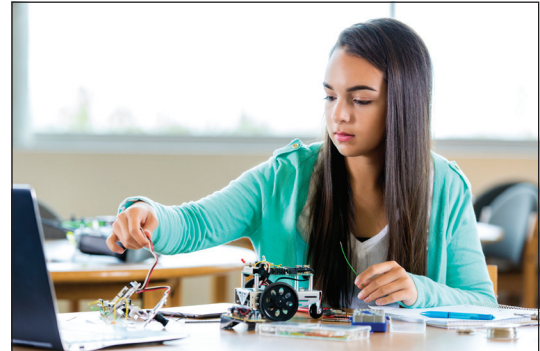


# Pre-Advanced Career STEM Courses

Spark discovery with project-based STEM courses for middle grades students.

Skills in STEM (science, technology, engineering and math) are essential to many of today's jobs, but too many students lack opportunities to explore these jobs and understand the academic skills, credentials and degrees needed to secure them.

Early learning experiences are key to introducing students to rewarding STEM degrees and careers. SREB's Pre-Advanced Career (Pre-AC) courses provide these early experiences that middle grades students need to prepare for future STEM learning in rigorous Advanced Career programs in high school.



Each course consists of hands-on projects that require students to draw upon a full range of academic, technical, technological, cognitive and personal skills to complete. All projects require students to work in teams to conduct research, develop and test prototypes, analyze data and make presentations. These are the skills students need to ensure they are both college and career ready.

## Advanced Career STEM Courses

Build on the middle grades program to provide students pathways to STEM opportunities after high school.

Schools are challenged to prepare students for a wide array of postsecondary options. The workforce of today and tomorrow demands a higher level of skill. To be successful, students need to be able to grasp complex problems, understand technology and troubleshoot problems.

Advanced Career (AC) addresses the needs of students by addressing college and career readiness and building on the foundation of the Pre-AC curriculum. By connecting a rigorous academic core with challenging project work and advanced technology in a focused career pathway, AC courses give students the greater depth of knowledge and skills they need for more options after high school in the following STEM pathways:

- Aerospace Engineering
- Automated Materials Joining Technology
- Clean Energy Technology
- Energy and Power
- Global Logistics & Supply Chain Management
- Health Informatics
- Informatics
- Innovations in Science and Technology
- Integrated Production Technologies

# Pre-Advanced Career Middle Grades STEM Curriculum

These middle grades STEM-based courses allow students to use science, technology, engineering, mathematics and literacy to solve authentic real-world problems.

## Course 1: Fundamentals of Science and Technology

This course introduces students to the core fundamental concepts of science and technology through authentic projects. Students experience the interaction of science, technology, engineering, math and literacy through a problem-based learning environment. Students will develop a deeper understanding of scientific inquiry and the engineering design process when solving real-world problems.

In this course, student teams apply the engineering design process to create solutions to problems and challenges. They explore a number of technology and engineering tools while learning the basics of design, scale, form and function. The teams utilize CAD systems and 3D printers in their solutions. They explore forces and loads and apply knowledge to the design of structures. They design systems to convert wind energy to electricity. They apply coding by writing computer code for a gaming environment.

Projects include:

- Computer Science – Coding
- Engineering – Bridging the Gap
- Logistics – Sound the Alarm
- Manufacturing – 3D Imaging
- Material Science – Reducing Waste
- Renewable Energy – Harnessing the Wind

## Course 2: Applications of Science and Technology

This course continues the application of science and technology through authentic projects. Students experience the interaction of science, technology, engineering, math and literacy through a problem-based learning environment. Students will develop a deeper understanding of scientific inquiry and the engineering design process when solving real-world problems.

In this course, students research control systems for drone flight, analyze data and plan flight routes. They investigate natural and artificial selection and cloning techniques. Students create a plan to provide lighting and power to a home utilizing LED and photovoltaic technologies. Students apply local demographic, historic or geological data and create a virtual tour applying programming skills to GIS mapping technologies. Students research viral outbreaks and prepare a protocol for dealing with an unknown virus and prepare public service announcements about preventing the spread of disease. Students investigate human activity and apply research to the creation and marketing of nutritious vegetable products.

Projects include:

- Aerospace – Eye in the Sky
- Biotechnology – Artificial Selection and Cloning
- Energy and Power – What Happened to the Lights
- Food Science – Product Creation
- Health Science – Outbreak
- Informatics – Take a Tour

# Pre-Advanced Career Middle Grades STEM Curriculum

## Introduction

The Southern Regional Education Board (SREB) and West Virginia, with support from Benedum Foundation, have developed two full-year STEM-based courses, each comprising six projects that allow middle grades students to engage in hands-on learning that requires them to apply science, technology, engineering, mathematics knowledge and skills in solving authentic problems. To complete projects, students will research technical materials, prepare written designs, keep an engineering notebook and use mathematics. They deepen their understanding by applying science and technology to their problem solution.

## Cost for Access

There is a onetime access fee of \$2,000 for schools outside of West Virginia. Schools follow state/district credentialing and experience requirements for hiring qualified instructors and provide financial support for teacher training. Schools implement the curriculum with fidelity and administer the end-of-project exams.

## Equipment and Supplies

The equipment and supplies necessary to teach the two courses are available from Studica Inc., supplier to the Advanced Career courses. The prices below represent the current pricing for equipment, supplies and consumables for a class of 24 students. For schoolwide implementation, SREB can assist in determining equipment and supply needs for large groups of students.

Course 1: Approximately \$3,900 per classroom for equipment and \$30 per student for consumables

Course 2: Approximately \$2,300 per classroom for equipment and \$23 per student for consumables

## Training for Teachers

Teachers selected should have strong math, science or technical skills. Access to the curriculum is dependent on teachers participating in professional development that engages them to complete projects so they can facilitate students' participation in a project-based learning experience. Training, which is required, is available for each course at a cost of \$2,000 per teacher, per course.

## Joining the Network of Schools

Schools interested should contact: [mmgw@sreb.org](mailto:mmgw@sreb.org)