

Teacher: Shawn Kelly

Course: The Nature of Science and Technology

School: Pocahontas High School, Pocahontas, Arkansas

Principal: David Goodin

Advanced Career Students Develop a Flood Control Plan That Includes a Riverside Recreation Area for Local Residents

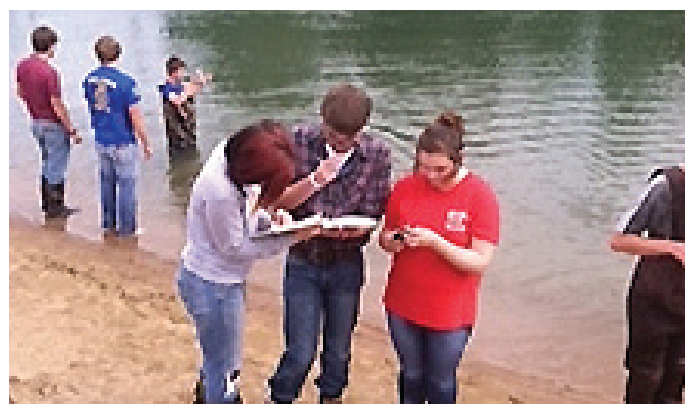
Imagine a rigorous high school science and engineering course where students arrive early and are so engaged in learning that they do not want to leave the room when the bell rings. Now discover that this class actually exists at **Pocahontas High School** (PHS) in Pocahontas, Arkansas.

The high school juniors — a mixture of career-tech and college-prep students — are enrolled in a yearlong Advanced Career (AC) course in Arkansas's challenging new Innovations in Science and Technology pathway. The curriculum is being field-tested at PHS and other high schools in the state in 2013-14. Advanced Career is a huge new undertaking by SREB's High Schools That Work initiative in partnership with nine states. The courses combine college-ready academic content with hands-on, project-based assignments. They will be available for adoption by schools and school systems nationwide in fall 2014.

"An AC course is different, because students do the work, and I prepare and guide them as needed," said **Shawn Kelly** who was a biology teacher before being selected to teach the AC course. He participated in two weeks of training in summer 2013 to become familiar with the curriculum and the new methods of instruction.

Civil Engineering

The six-week project that kicked off the AC course in fall 2013 challenged students to complete a civil engineering project to determine where and how to build a flood control levee on a local river. "This project, like the five others in the course,



Calculating flow rate

was hands-on, engaging and student-centered," Kelly said. "It was not theoretical. It was very authentic."

Titled "When the Levee Breaks," the project required students to select a river, do online and in-person research on levees, conduct scientific tests, use various formulas, conduct tests in the lab, develop a digital model and present their findings and recommendations to a panel of experts.

Students visited all five rivers in the county before selecting the Black River as the focus of the project. Their assignment was to recommend where and how to build an embankment alongside the river to prevent high water from flooding the bordering land and to provide a landing place that could be developed for recreational use by the community.

How to Use the Land

“I asked the students to decide what they as teens would like to see happen to the land,” Kelly said. “In addition to the levee, did they want the community to provide a site for such things as a boat ramp, baseball and soccer fields, and a playground?”

Students decided to recommend building a seven-mile-long levee on a low-lying area of the river that would include one mile of reclaimed land for community recreational facilities. They also decided that the facilities would be free of charge.

Organized into three teams, Kelly’s students worked hard to gather information for the project. They did background research on all five rivers and visited other communities. They consulted the U.S. Geological Survey website for earth science and biological information and interviewed government officials and other professionals, including local water department personnel.

Mathematics and Science



Turbidity calculations

Students needed a great deal of mathematics knowledge for the project. They gathered water samples from the rivers and measured the widths and flow rates of each one. “They used a tennis ball to see how far it floated down the river,” Kelly said.

In the school lab, they analyzed the samples for pH content (degree of acidity or alkalinity) and water temperature. They also conducted turbidity calculations to determine the amount of muddiness or cloudiness when the river sediment was stirred up.

The students had learned the formulas in previous classes, but they had never put them to use in real life. “Now I know why we learned the formulas,” one student said.

Enthusiastic Response

Students were enthusiastic about the project. “It opened our minds to different ideas and ways to solve problems,” one student said. Another student said the teams learned to “think outside the box.” Yet another praised the AC course for teaching teamwork, leadership skills and critical thinking. “I want to continue in the Advanced Career pathway,” the student said.

“They learned to deal with the ups and downs of working as a team, how to get along with others, how to relate to new people that they met in fact-finding interviews and how to conduct themselves professionally in the final presentation to a panel of local officials,” Kelly said.

Students presented their plan for a river levee to a panel of experts that included a county judge, a retired civil engineer, a local civil engineer, a local builder and catastrophe insurance adjuster, and an instructor at Black River Technical College. The panel was very impressed by the students’ work. They saw that the project could be done and that they could put the students’ plan in motion if needed.

“It was awesome to see our future leaders going through a program that involved authentic, real-life experiences,” Judge David Jensen of Randolph County said. “I was encouraged to see students working together and having fun while learning. This program appears to be a win-win situation for the students, the school and the community.”

Chris Lynch, physics and chemistry instructor at Black River Technical College, and a member of the panel that reviewed the project, was “wowed” by the students’ presentation. He said student engagement in Advanced Career Innovations in Science and Technology at Pocahontas High School is “through the roof.”

“They did a great job,” he said. “I was most impressed that they chose the same sites that the county judge and our local civil engineer would have chosen based on their studies of recent devastating floods. The actual cost estimates were not very far from the county’s own assessment. I was also impressed that the science content was field-based, authentic and applicable to the project.”

Although the AC course is one of the hardest the students are taking, they enjoy being in the class. They arrive early to find out what needs to be done that day and how they are going to solve problems uncovered earlier. They are so motivated that they want to stay and continue to be involved actively in learning.



Measuring stream width

“Parents love this class,” Kelly said. “They say it challenges students to think like they are in the workplace, meet and present their ideas to experts in a career field, and work with peers to solve problems.”

Challenges for Teachers

The biggest challenge for teachers of courses that are heavy with project-based learning is to change the way they teach and to move away from traditional classroom instruction. “We need to let the students explore and find the answers while we provide guidance,” Kelly said. “Even if students mess up, they are still learning.”

Kelly admits that he does more “coaching” in the classroom — guiding students as they complete the work. “I worked with gifted and talented students at one point in the past and was accustomed to ‘coaching’ students. My encouragement to other teachers is to be open-minded and give students the freedom to take action and learn.” He points the way for students to stay on course and motivates them by asking pertinent questions.

Assessing Achievement

Students’ grades were based on participation, teamwork, pre- and post-assessments and the presentation of the project to local experts. “After completing pre- and post-assessments, I was able to see growth in student learning,” Kelly said.

AC is being offered or developed by SREB and nine states: Alabama, Arkansas, Kansas, Kentucky, New Jersey, North Carolina, Ohio, South Carolina and West Virginia.

For information on Pocahontas High School project, contact Shawn Kelly at david.kelly@pocahontaspsd.com.

For information or to adopt this Advanced Career curriculum or others in fall 2014, visit sreb.org/AC or contact: Gene Bottoms, SREB Senior Vice President at (404) 875-9211 or gene.bottoms@sreb.org, Marna Young at marna.young@sreb.org or Jim Berto at james.berito@sreb.org