



4-H in the Corridor

STEM Initiative Partnership

Abstract

The Corridor STEM Initiative in Iowa is an initiative in the Cedar Rapids/Iowa City Technology Corridor. The initiative is aimed at engaging Iowans to help shift the culture and mindset around science, technology, engineering, and math so that Iowa is recognized as a premier state in delivering this important brand of education.

4-H youth development staff in Johnson and Linn Counties in Iowa have been involved in the Corridor STEM Initiative since its inception, serving as leaders in “out-of-school” planning, implementation and program delivery. Research shows the importance of informal science education, and a partnership between in-school and out-of-school educational programming in implementing science education.

4-H Achievements to date include:

Afterschool STEM programming: Since 2007, Extension youth development specialist Janet Martin has led training for afterschool sites and supervised 4-H staff who taught Engineering is Elementary© and ISU Extension SET curriculum at program sites in Linn and Johnson Counties. More than 500 youth have participated.

Summer engineering/robotics camps in Linn/Johnson counties led by 4-H staff: Engineering is Elementary© has been offered to 500 youth; forty youth participated in GEAR-Tech-21 (Geospatial and Robotics Technologies for the 21st Century) camp.

Science/rocketry workshop with the Iowa Children’s Museum for afterschool staff: Forty staff members from Johnson County afterschool programs learned science and rocketry principles to share with their students.

4-H on Wheels: For more than 20 years, Summer 4-H on Wheels has travelled to parks, apartment complexes, and schools in Iowa City and Johnson County. Science has been the core of the “hands on” learning at the two-hour weekly sites for 7 weeks during the summer. Five hundred youth participated in summer 2010.

Program Needs

The United States is falling dangerously behind other nations in developing its future workforce of scientists, engineers, and technology experts. America now faces a future of intense global competition with a startling shortage of scientists. Only 18 percent of US high school seniors are proficient in science (NAEP, 2005). A mere 5 percent of current US college graduates earn science, engineering, or technology degrees compared to 66 percent in Japan and 59 percent in China. Couple these statistics with the fact that current scientists and engineers are retiring in record numbers, and it becomes clear the US faces a crisis in its ability to keep up with increasing demand for professionals trained in these fields. To ensure glob-

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al competitiveness, educators must act now to prepare the next generation of science, engineering, and technology leaders.

The 4-H Youth Development Program is directly connected to the research and resources of the 106 land grant universities and colleges of the Cooperative Extension System. This connection strategically positions 4-H to strengthen US global competitiveness and leadership.

Targeted Audience

The out-of-school audience includes kindergarten through sixth grade youth in the Iowa City/Cedar Rapids corridor. In afterschool programming, emphasis includes a focus on working with girls and youth from all socio-economic groups.

Program Goals and Objectives

- To increase youth's understanding of science, technology and engineering in everyday life.
- To teach youth to enhance and apply their knowledge in science, technology and engineering through hands-on experiments.
- To increase youth's understanding of STEM content and improve student interest in STEM learning and careers.

Program Design/Curricula and Materials

Curriculum for the out-of-school programs was based on:

- Iowa 4-H SET Initiative curriculum through Iowa State University Extension including aerospace, environmental, physical science, and engineering (<http://www.extension.iastate.edu/e-set/>).
- VAST (Van Allen Science Teaching) Center, Grant Wood Area Education Agency
The Corridor STEM Initiative is coordinated by the Grant Wood Area Education Agency, located in Cedar Rapids, Iowa. Leadership for the initiative, including curriculum design, is led by the science consultants at the Grant Wood AEA (<http://www.aea10.k12.ia.us/vastscience/index.html>).
- *Engineering is Elementary*®, Museum of Science, Boston
The curriculum was utilized for the summer programs coordinated through 4-H, the University of Iowa College of Engineering, and the Grant Wood AEA (<http://www.mos.org/eie/>).

Knowledge and Research Base

From *After-School Science and Technology Fact Sheet*, The Coalition for Science Afterschool, University of California, Berkeley, California, <http://afterschoolscience.org/projects/index.php>.

80% of future careers will demand knowledge of science and technology.

Scientists do not all work in labs, and not all engineers build bridges. Science and technology are needed in almost every career now and in the future. If children think science and technology is not for them, they will find themselves left out of most careers.

Being interested in science may be more important than being good at science.

It is no surprise that children will not pursue something that they do not find interesting or do not think is available to them. Interest in science among 8th graders is proven to be a better indicator than test scores for predicting future career choices.

Schools alone cannot create future scientists and engineers.

Science in school is necessary but not enough to support students' interest in science. Children need time to explore and discover on their own, with the help of programs that take place out of school. After school, weekend, and summer programs are important opportunities for youth to explore and discover science and technology.

There are thousands of resources available to build science and technology programs for kids before and after school and in the summer.

Communities must take the lead in using science and technology available resources in ways that are appropriate locally.

Partners

Through cooperation with the partners in the out-of-school committee of the Corridor STEM Initiative, 4-H was able to reach hundreds of youth in science, technology and engineering.

- ***University of Iowa College of Engineering***
Rebecca Whitaker, K-12 Coordinator for the University of Iowa College of Engineering, worked with 4-H to provide leadership to the summer *Engineering is Elementary*® programs. The initial 2007 summer program was funded through a grant written by the University of Iowa Foundation.
- ***VAST (Van Allen Science Teaching) Center at the Grant Wood Area Education Agency, Cedar Rapids, Iowa***
Jeanne Bancroft, VAST Center Director, and AEA science consultants were instrumental in securing funds from the Iowa Legislature for the afterschool grants. The Corridor STEM Initiative is funded through the Iowa Math and Science Education Partnership (IMSEP), located at the University of Northern Iowa (<http://www.aea10.k12.ia.us/vastscience/index.html>).
- ***The Iowa Children's Museum***
The museum partnered with 4-H to lead a "Take Flight" aerospace workshop for afterschool providers in Johnson County (<http://www.theicm.org/exhibits/take-flight>).
- ***Schools in Linn and Johnson Counties***
For the last three school years, 4-H Afterschool delivered weekly science education at four 21st Century Community Learning Center sites in the Iowa City Community School District.
- ***Rockwell Collins***
Rockwell Collins is an outstanding business partner in the Corridor STEM Initiative; they provide funding and support for the FIRST® Lego League and FIRST® Tech Challenge. At youth programs, Rockwell engineers encourage youth to participate in school day and out-of-school education; the engineers are excellent "role models" for the youth. In November 2010, Rockwell Collins awarded a \$10,000 grant to Johnson County Extension/4-H for robotics equipment for future out-of-school programming.





- Other CSI partners are: The Science Station in Cedar Rapids, Kirkwood Community College, The Workplace Learning Connection School Districts in Linn and Johnson Counties, and Alliant Energy.
- *GEAR-Tech-21 at the University of Nebraska, Lincoln (a 4-H SET program funded by the National Science Foundation)*
GEAR-Tech-21 teaches robotics, GPS, and GIS technologies through building and programming a robot, navigation, and mapmaking activities. The summer 2010 camps were funded through the GEAR--Tech-21 grant and the Johnson County Extension Council.

Funding

In summer 2007, the CSI Summer STEM Program Engineering is Elementary© was funded through a \$25,000 grant from the University Iowa College of Engineering and the University of Iowa Foundation through the Roy J. Carver Charitable Trust, and \$10,000 through the Grow Iowa Value Funds through Kirkwood Community College.

For the CSI afterschool grants, the Grant Wood Area Education Agency and the CSI partners were annually awarded \$180,000-\$200,000 for the 2007-2011 school years. This money from the Iowa legislature through IMSEP funded the afterschool mini-grants at up to 11 afterschool sites annually. These funds were also utilized for the afterschool staff training “Take Flight” at The Iowa Children’s Museum in Coralville.

The Johnson County Extension Council provides funding for the 4-H on Wheels program.

Staffing

Part-time staff have been employed for the summer and afterschool program; the majority of staff are students at the University of Iowa in Iowa City. 4-H teen volunteers have assisted at summer and afterschool programs. Each semester or season, the Johnson County Extension Council provides a \$100 honorarium for 10 hours of volunteer work with the urban 4-H program.

Program Delivery

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Recognition of Participants

Each May, a recognition event is held at the University of Iowa for all teachers and youth who participated in the mini-grants through the Corridor STEM grant program. Staff from the Grant Wood AEA, and representatives from businesses and the University of Iowa speak with the students about careers in STEM. The youth share their learning through an open house event. At each summer program, youth present their learning through a parent program at the conclusion of the experience.

Program Evaluation and Outcomes/Impact

From the 2007 summer program, parents and students pointed out that among the strengths of the program was its use of hands-on STEM experiences to encourage the students' use of higher-level thinking skills. The parents commented that their students' explanation of the Engineering is Elementary® activities included information about why certain designs did and didn't work, and what was needed to make improvements in the future. Written responses included:

- *He came home and wanted to try projects that you did with the kids at the program. He enjoyed it and learned.*
- *He said more than I can fit here. He enjoyed the projects, repeated them at home and told us of his accomplishments with the projects. He had fun.*
- *She was eager to come home and try things. We had to buy a half gallon of lemonade so she had the right container for a windmill. Cool!*
- *He loved the program and looked forward to it all week. He liked to explain how his designs worked and if they didn't why they didn't and what he did to make them work the next time.*
- *She enjoyed the hands on; it helped her to retain information when she is involved in the process. Much more effective learning style than reading and looking at pictures.*
- *He talked about races, made a boat at home and floated it in the tub, explained sail design process (had several tries until one made it), didn't want to miss a session.*

A parent and a process improvement engineer at Quaker Oats, said,

I am happy my daughter was able to participate in the STEM program this summer. I am a chemist and we like to do science projects together at home. I am happy to see an emphasis given to the Math/Science/Engineering subjects. I was also pleased to see the emphasis given to girls getting involved with the sciences. This will be a vital program for the future of the boys and girls to remain involved with the sciences.

Evidence of Sustainability

Cooperation between the partners has provided sustainability for CSI programs. Rockwell Collins, based in Cedar Rapids, Iowa, has been a key partner in the initiative; they support the FIRST Lego League and FIRST Tech Challenge programs for 4-H, schools and other youth organizations. Due to 4-H participation and partnership in CSI, Rockwell Collins has awarded \$10,000 to Johnson County 4-H for robotics and science programming.





Considerations for Replication

The Corridor STEM Initiative out-of-school committee meets monthly to review current programming and look for opportunities to expand the program. Through the grant from the Iowa Legislature, a coordinator and “teacher in residence” at the Grant Wood AEA provide leadership for the initiative. Monthly meetings for the partners are vital for success and continuation of the initiative. Since 2007, Dick Whitehead, superintendent, College Community School District, Cedar Rapids, Iowa has been the chair of the out-of-school committee for CSI and Jim Thornton has been the initiative coordinator; they have been vital for program growth and development.

For more than 20 years, Johnson County 4-H/Extension has led 4-H on Wheels summer science programming. The Corridor STEM Initiative brought together partners to expand the out-of-school science learning in the corridor. The funding and top notch partners in the initiative helped “launch” science programming in Johnson County 4-H Afterschool and summer programming.

References

Corridor STEM Initiative: <http://www.corridorstem.org/>

In Partnership With

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