

Science



Technology



Engineering



Math

### STEM: Preparing Youth For Success

STEM Pathways provides hands-on, problem-based and inquiry learning to support the “inspire to prepare” approach for propelling young people on a STEM career path. The jobs of the future are in STEM! Ohio State University Extension is working to inspire young people to want to pursue a career in STEM.

Current scientists and engineers are retiring in record numbers. Coupled with colleges not meeting STEM graduate needs by industries, there is a need Extension can help meet. In general, no job is completely isolated from the influence of new technologies and new ideas derived at least in part from STEM.

This report highlights what has happened to continue to forge the STEM Pathway ahead across Ohio and beyond.

### Summary of STEM Pathways Accomplishments

- 11,658 participants reported directly under the POA
- Production of STEM Pathways Challenge Videos
- Grants - \$40,000
- 2 Peer Review Scholarly Presentations Given
- Collaborations and Partnerships  
OSU Cares Grant, Submission and North Central Region Ag Innovators Challenge Lead State for 2014 and 2015

#### STEM Pathways

An Ohio State University Extension  
Signature Program  
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THE OHIO STATE UNIVERSITY

COLLEGE OF FOOD, AGRICULTURAL,  
AND ENVIRONMENTAL SCIENCES



# STEM PATHWAYS

## Train-the-Trainer Programs

Increasing the capacities of Extension Professionals to successfully implement STEM Pathways across Ohio.



**80 Jr. Fair Board Members and Volunteers participate in STEM Pathway Challenges. 100% indicated interest in conducting one or more challenges at their 2014 Fairs.**



**STEM Pathways  
Signature Program  
In-service  
February 4, 2014  
Ohio 4-H Center**

*Fifty Ohio Extension professionals experienced the STEM Pathways formula.*

**Engagement +  
Problem Solving =  
Learning**



The in-service gave me the confidence to implement STEM activities in the community and also train youth educators to facilitate activities." In a recent survey, attendees indicated that they increased or significantly increased their STEM programming as a result of the professional development training. "It was easy to take what we learned and use in club, camp & afterschool sites."



More than 700 4-H teen and adult volunteers trained by Extension professionals extend the STEM Pathways outreach at public events held at COSI, Baseball with the Buckeyes and Dayton Dragons, county Fairs, community festivals, 4-H kick-off and Extension centennial events.



**"Tell me and I'll forget, Show me and I may remember, Involve me and I'll remember."**

### Summary of STEM Pathways Working Group Accomplishments:

Team efforts were targeted at grant dollar acquisition, train-the-trainer programs and STEM Pathways Challenge “You Tube” instructional video production. Team members were involved in authoring new STEM Challenges, 4-H project books and journal articles as well as presenting at state and national conferences to expand the STEM Pathways programming footprint.

Minnesota’s Agri-Science Specialist shared as a result of his participation in the STEM Pathways session at the NAE4-HA Conference: “ I have personally used the Ag Bot video and curricula to highlight how to effectively use the steps in the engineering design process with inquiry learning with 4-H volunteers in Minnesota via training webinars. I have recently applied for a NIFA Youth Educator Grant to create AgBot Challenge Kits (both animal and crops science pathway kits) that will be used in Minnesota county fairs and with the Minnesota 4-H State Fair building.”

### STEM Pathways Working Group Membership

*Patty House, Program Leader*

*Dr. Bob Horton, Ohio 4-H STEM Specialist*

Kathy Blackford  
Beth Boomershine  
Andrea Davis  
Kevin Harris  
Debby Lewis  
Sally McClaskey  
Janet Wasko Myers  
Kelly Sedlak  
Tony Staubach  
Rebecca Supinger  
Travis West  
Demetria Woods

Carolyn Belczyk  
Kim Catchpole  
Larry Hall  
Jackie Krieger  
Mark Light  
Christy Millhouse  
Kelly Royalty  
Kim Showalter  
Michelle Stumbo  
Cynthia Toler  
Tracy Winters



### 2014 Events and Programs

STEM Pathways Challenges were utilized to engage more than 2000 youth and adults visiting the Ohio State Fair and Farm Science Review.

Ohio 4-H Ambassadors, OSU Extension Professionals and 4-H volunteers served as STEM Pathways Challenge facilitators at these state events. Excitement and interest were generated at all levels for the engineering and science challenges showcasing STEM Pathways formula for learning and engagement.

OSU President Drake and his wife experience first-hand STEM Pathways Challenges at the Ohio State Fair during a VIP tour coordinated by Bruce McPheron, Dean of the College of Food, Agricultural and Environmental Sciences and Jack Fisher, Executive Vice President for Ohio Farm Bureau.

Jack Fisher was excited to see the engagement of youth and adults with STEM Pathways challenges. “This is exactly what we have envisioned for the Ohio Farm Bureau Ag & Hort Building experience, he shared.” STEM Pathways Challenges can serve as a model for engaged learning. “It is exciting to see how youth and adults are experiencing the connection between STEM and agriculture.”



## STEM Programming Across Ohio

Twenty-nine (one-third) of OSU Extension, 4-H Youth Development Programs utilized STEM Pathways curriculum in events and activities celebrating 100 Years of Extension. Nearly 5500 youth and adults participated in an authentic STEM experience as a result of their involvement in one of these programs. These events were conducted at county Fairs, community festivals, Extension open houses, 4-H Kick-off events, day camps, after-school sites and community partner events. Increased teamwork, science is cool and fun, ah ah moments as well as heightened awareness of STEM careers were common themes reported as a result of youth and adult's participation in these programs.

In analyzing data submitted by Extension Professionals in the 2014 RIV and an end-of-the year survey, several key findings surfaced:

- Continued inconsistent reporting techniques makes summarizing STEM Pathways Signature Program participation difficult at best; if not impossible from an accuracy standpoint;
- Most Extension Professionals do not separate STEM programming efforts from other broader reporting categories (i.e. - 4-H Camp, School Enrichment, After-School, Teen, Counselor and <http://cfaes.osu.edu/> Volunteer Development & Training) even when STEM may be the focus.
- With no STEM keyword available for linking reports due to the discontinuation of RIV as the reporting system; the STEM Pathways Program leader requested RIV data be compiled using after-school, school enrichment, camping and technology as keywords identified in the field most used by Extension professionals reporting STEM programming efforts.

Trends that surfaced in review of the 2014 RIV data included use of Chick Quest, Rockets Away, Weather Together and Go Plants with some 15,000 youth in school classrooms and after-school sites. These foundation curricula for the STEM Pathways Signature Program are content driven to help support students success with Ohio's New Learning Standards for Science.

In addition, 4-H Extension professionals reported conducting STEM focused day and overnight camps or offering STEM related workshops at 4-H camp. The goal to expand young people's interest in STEM and enhance their STEM skills and capacities.



The 4-H Tech Wizards reported increased interest in STEM focused careers, science, technology, and engineering and report improved grades. One youth wrote, "It helped me with my classes and grades." The majority liked working with the mentors, finding them to be "very helpful."

Knowing that 60% of Ohio's 4-H projects and programs engage youth in STEM learning, the STEM Pathways Signature Program will provide both a means and a way to capture the impact this experience is having on young people and the adults working with them.

## STEM Pathways Challenge Videos

A \$29,000 Ohio 4-H Foundation grant provided the needed resources to produce a STEM Pathways instructional video for each of the challenges. The multifaceted video provides

- an overview of the real-world problem;
- highlights STEM careers addressing the issue;
- visual teaching instructions for the challenge with a facilitator and youth participants for easy replication by the viewer.



Videos are hosted on the OSU Extension STEM Pathways

Signature Program website <http://www.ohio4h.org/STEM-Pathways>. Viewers can access the accompanying printed challenge curriculum with each video. Another Ohio 4-H Foundation Grant has been submitted to fund production of additional videos in 2015. If funded, a total of twenty videos and challenges will be in the STEM Pathways Challenge Digital Curriculum.



**Campers work in a team to design a solution for a feeder to feed their farm raised fish. Campers learn teambuilding, communication and problem solving skills as they work their way through the engineering design process.**

## Ohio's Fish Farm Challenge... Awarded National 4-H Ag Innovators Experience

STEM Pathways challenge format served as the foundation for creation of the first annual National 4-H and Monsanto Ag Innovators Experience. Authors, Dr. Robert Horton, State 4-H STEM Specialist and Patty House, STEM Pathways Program Leader and 4-H Extension Educator in Clark County harnessed the STEM challenge momentum to create the Fish Farm Challenge in response to a North Central Region Request for Proposals.

Awarded on a competitive review, the Fish Farm Challenge was taught by 155 trained teen facilitators to 8,323 youth in Illinois, Indiana, Kansas, Michigan, Missouri, Nebraska, Ohio and Wisconsin. 1605 youth participated in the twelve Ohio 4-H camping programs awarded the request for funding opportunity.

76% of the participants indicated that it was important to work in a group and 74% to use communication skills to successfully complete the Fish Farm Challenge. 69% of the teen facilitators indicated that as a result of this program that they were confidently able to lead an educational activity.

## STEM @ Camp

Ohio's 4-H Extension Professionals are not only offering STEM specific camps, but making strides to incorporate more STEM into traditional camps. A focus on STEM allows professionals and volunteers to hone youth's teamwork, communication and problem solving skills while exploring career possibilities.

- 94% of Clark County campers indicated that the program allowed them to learn about science and engineering in a fun way and 96% shared it develop their creativity.
- 85% of Canter's Cave STEM Camp participants report that completing engineering challenges and other STEM Camp activities helped them develop or strengthen their abilities to work with others on a team. 88% reported that creating a STEM presentation for their parents and guests helped them develop or strengthen their communication skills to "some" or to a "great" extent.

## Grants

Two grants totaling \$40,000 were funded by the Ohio 4-H Foundation to support STEM Pathways Signature Program implementation statewide in 2014. Dollars enabled the STEM Pathways working group to assist Extension professionals in program implementation as well as enhance current curriculum with media rich teaching You Tube vignettes.

In collaboration with the College of Engineering, College of Human Ecology and Education, TEK8 (Teaching Engineering to Kindergarten through Eighth Grade) received an OSU CARES grant. Engineering challenges were created by Ohio State students enrolled in the Spring and Fall semesters. This partnership will result in additional engineering challenges for use by youth and adults connecting to Ohio University Extension's STEM Pathways Signature Program and cross promotion of both.

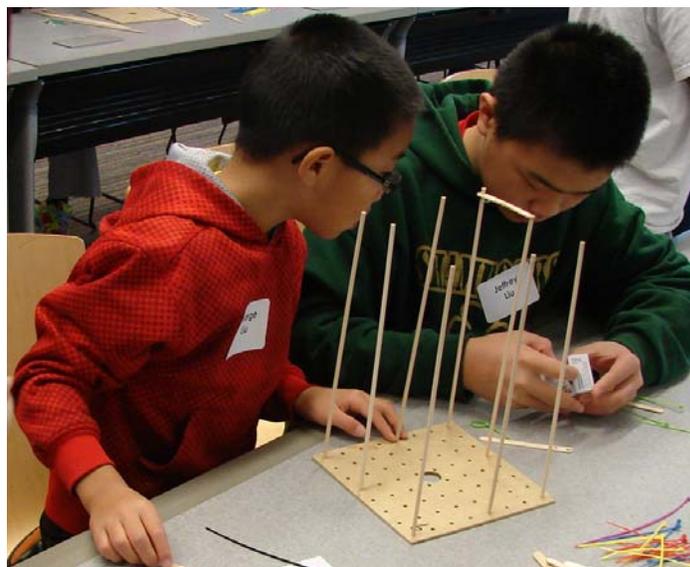
## Spreading the STEM Pathways Message

An educational seminar was presented at the 2014 National Association of Extension Professionals Association Conference in Minneapolis, Minnesota. Thirty-five Extension professionals from across the U.S. were engaged. In addition, Extension professionals from other states not able to attend the presentation have made inquiries to obtain curriculum.



## Outreach and Engagement

Ohio 4-H STEM Specialist, Dr. Bob Horton and Patty House, STEM Pathways Program Leader spearheaded yet another submission to the Monsanto and National 4-H Council, Challenging Youth to be the Solution, 4-H Ag Innovators Experience. The Water Wind Mill challenge focuses on one of our most precious resources - water. Eight states, seven in the North Central Region and Colorado will be involved in this Ohio created challenge in 2015. Finding a solution to address a shortage of water by engineering a water derrick will increase youth's awareness of and interest in STEM innovation, agriculture and careers in those areas. To learn more about this effort, view the video vignette produced by Ohio at <http://www.4-h.org/about/partners/monsanto/>. Ohio received \$20,000 as the lead state and another \$20,000 as one of the pilot states. Fifteen Ohio counties will be participating in this STEM Pathways programming effort with a target of 1800 youth reached.



Science Saturday participants pilot test the Water Wind Mill Challenge prior to submission by Ohio to National 4-H Council and Monsanto for review and selection as the 2nd 4-H Ag Innovators Experience.



## Global Impact STEM Academy Partnership

One hundred and fifty Global Impact STEM Academy 9th and 10th grade students in Springfield, Ohio assist in facilitating STEM Pathways challenges during the Clark County Fair and Farm Science Review. In addition, students set up tilapia aquaculture systems after participation in the Fish Farm Challenge. Eight students and one science instructor performed in two of the STEM Pathways Challenge videos showcasing the students STEM leadership. This partnership has led to the development of a 4-H club within the academy and can serve as a catalyst to future in-school 4-H clubs.

Global Impact student shares information about water and oil properties during his facilitation of the "Oil Blob" STEM Pathways Challenge.

# ***STEM Pathways ... Experience It For Yourself!***