

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

- 56,000 participants, 3,200 teen and adult volunteers
- Final Production of STEM Pathways Challenge Instructional Videos
- Grants Supporting STEM - \$142,000
- Peer Review Scholarly Presentations Given and a Journal of Extension Article
- Collaborations and Partnerships OSU Cares Grant, and North Central Region Ag Innovators Challenge Lead State for 2014, 2015 and 2016

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.



150 Jr. Fair Board Members and Volunteers participate in STEM Pathway Challenges. 95% indicated interest in conducting one or more challenges at their 2015 Fairs.



STEM Pathways Signature Program In-service Feb. 6, 2015 Ohio 4-H Center



Sixty-Three Ohio Extension professionals experienced the STEM Pathways formula. Engagement + Problem Solving = Learning

Participant surveys revealed: 100% increased their STEM knowledge; 100% received useful resources to implement STEM in their 4-H programming efforts; 96% enhanced their STEM skills; 91% increased their comfort level to teach STEM to others; and 96% expanded their understanding of how to incorporate STEM in their county 4-H program. "I will use everything, I am excited to got home and starting planning STEM activities!"



More than 3,200 4-H teen and adult volunteers trained by Extension professionals extend the STEM Pathways outreach at camp, in 4-H clubs, school classrooms, after-school sites, and public events including county Fairs, community festivals, sporting events, Farm Science Review and the Ohio State Fair.



"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 completing STEM Pathways Challenge “You Tube” instructional video production. Team members were involved in authoring STEM Challenges, 4-H project books and journal articles as well as presenting at conferences to expand the STEM Pathways footprint.

STEM Pathways made its path westward through participants from ten mid-west and western states as well as Canada and Ireland at the Blackhills Recreational and Leadership Laboratory in South Dakota.

An August 2015 Journal of Extension Article, shared the youth development benefits of STEM design challenge experiences with professionals across the Extension system.

Team members have submitted proposals to both the NAE4-HA and National Science Teachers Association Conferences in 2016.

STEM Pathways Working Group Membership

Patty House, *Program Leader*

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

- | | |
|-------------------|-------------------|
| Kathy Blackford | Carolyn Belczyk |
| Beth Boomershine | Kim Catchpole |
| Larry Hall | Kevin Harris |
| Jackie Krieger | Debby Lewis |
| Elliott Lawrence | Mark Light |
| Sally McClaskey | Andrea Mead |
| Christy Millhouse | Janet Wasko Myers |
| Kelly Royalty | Kim Showalter |
| Tony Staubach | Michelle Stumbo |
| Rebecca Supinger | Cynthia Toler |
| Travis West | Tracy Winters |
| Demetria Woods | |



2015 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.

4-H members and youth from in-school and after-school STEM Pathways programs served as the youth talent for instructional challenge videos produced by the STEM Pathways Working Group.



STEM PATHWAYS

Programming Across Ohio:

Seventy-five OSU Extension professionals from fifty-two counties reported utilizing STEM Pathways curriculum in programming with some 56,000 Ohio youth through camps, clubs, in-school, after-school and large group events. 37% of the 427,452 4-H projects and programs participated in by Ohio's 4-H membership focused on STEM. Whether one-shot authentic STEM experiences, sequential STEM learning episodes, 4-H project-driven or classroom-centered instruction, STEM Pathways Signature programs resulted in heightened awareness of STEM careers, application of STEM skills and concepts through inquiry-based experiential learning and a reinforcement of the need for problem solvers and critical thinkers to address today and future world issues.

Youth participant data collection included both qualitative and quantitative results. Highlights include:

- 72% of the participants answered yes that after attending STEM camp they were now planning a career in a STEM related field.
- 66% of fourth graders stated that they would be interested in exploring STEM subjects after participation in a STEM in-school program.
- Pre-and post-evaluations showed improvements in areas of STEM concepts, ability to work with a partner, and knowledge of the 4-H youth program.

\$142,000 in grants from local, state and national funders assisted OSU Extension professionals in delivery of dynamic STEM focused efforts. Significant support came from the Ohio 4-H Foundation, National 4-H Council, commodity groups and local funders as well as targeted legislative funding for the Agri-Science in the City initiatives in Cleveland and Cincinnati.

4-H Extension professionals reported conducting more training to prepare both adult and teen volunteers to deliver STEM programming to both Cloverbuds and 4-H members. STEM focused day and overnight camps as well as an increase offering of STEM related workshops at 4-H camp were highlighted by Ohio's Extension professionals. The ultimate goal -- to expand young people's interest in STEM and enhance their STEM skills and capacities.

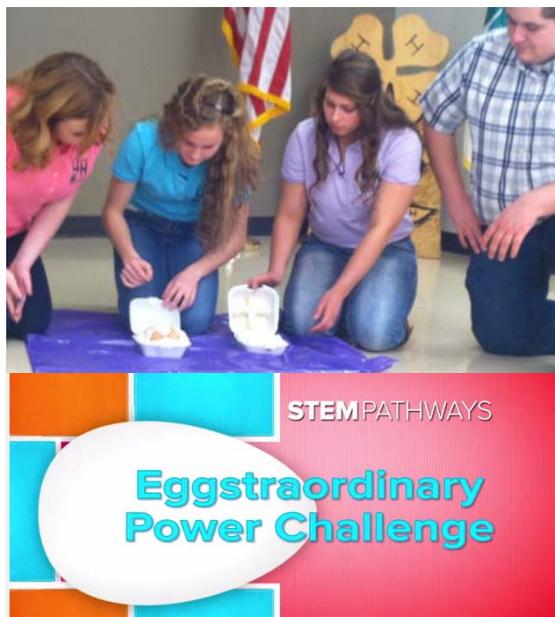


STEM Pathways Challenge Videos Completed

An Ohio 4-H Foundation grant provided the needed resources to produce a STEM Pathways instructional video for each of the design 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.



Campers work in a team to design a water windmill derrick system that will hold 24 pounds of tethered water weight. Campers learn teambuilding, communication and problem solving skills as they work their way through the engineering design process.

Ohio's Water Windmill Challenge... Awarded National 4-H Ag Innovators Experience

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

Awarded on a competitive review, the Water Windmill Challenge was taught by 281 trained teen facilitators to 10,561 youth in Illinois, Indiana, Kansas, Michigan, Nebraska, Ohio, Wisconsin and Colorado.

Three-quarters of the participants agreed that teamwork and communication, two essential elements of engineering projects and real-life problem solving, were important to accomplish this challenge. Teen leaders reported positive impacts including more than 60% agreed they are more interested in pursuing a career in agriculture; nearly 80% are more interested in learning about food production; 85% are more interested in advocating for agriculture issues that impact the world and nearly all felt they gained skills that will help them in the future.

Outreach and Engagement

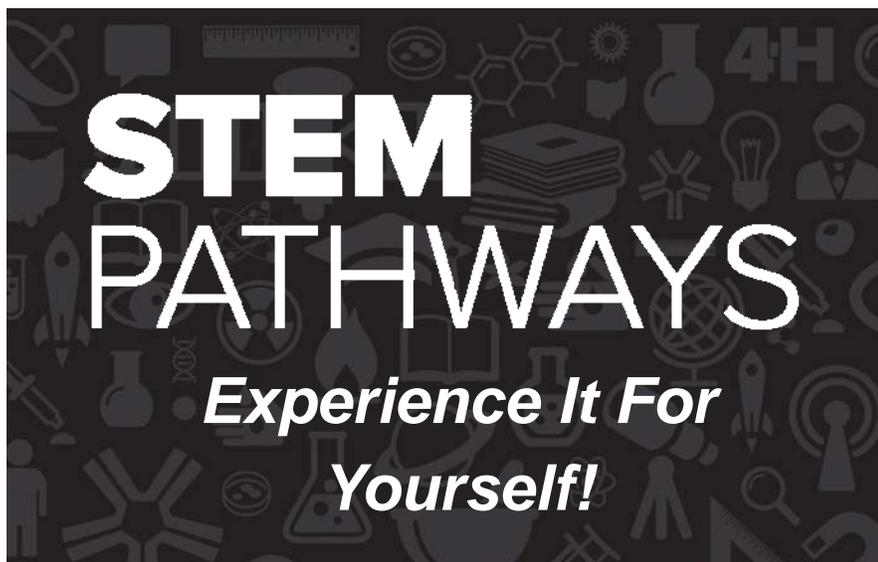
Ohio 4-H STEM Specialist, Dr. Bob Horton and Patty House, STEM Pathways Program Leader spearheaded yet another submission to the Monsanto and National 4-H Council, Challenging Youth to be the Solution, 4-H Ag Innovators Experience. Denise Ellsworth, OSU Extension's Honey Bee and Pollinator Program Director as well as Denise Johnson with Ohio's Master Gardener Program collaborated to develop this challenge.

The Honey Bee Challenge focuses on one of the importance of bees in pollinating one of every three bites we eat. Eight states will be involved in this Ohio created challenge in 2016. Youth will explore scientific modeling as a means to exploring bee's behavior and constructing foraging routes for the bees to collect pollen from three types of agricultural crops. To learn more about this effort, view the video vignette produced by Ohio

at <http://www.4-h.org/about/partners/monsanto/>. Ohio received \$25,000 as the lead state and another \$20,000 as one of the pilot states. Nineteen Ohio counties will be participating in this STEM Pathways programming effort with a target of 1800 youth reached.



Ohio's Teen Leadership Team traveled to Washington D.C. to help Honey Bee Challenge Developer's train other pilot states teens and Extension Professionals. The program will kick-off in Ohio on April 19 at the Ohio 4-H Center.



Science



Technology



Engineering



Math