
Title: Mission Make-It: The Georgia 4-H Engineering Challenge

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Summary: Mission Make-It: The Georgia 4-H Engineering Challenge provides middle school 4-H members the opportunity to work together to complete engineering tasks in a non-competitive setting.

Situation: Since 1990, employment in science, technology, engineering, and mathematics (STEM) occupations increased from 9.7 million to 17.3 million positions, experiencing a 79% growth rate, (American Affairs). The U.S. Department of Labor statistics indicate that STEM positions such as computing, engineering, and advanced manufacturing see larger projections of growth than non-STEM jobs in the next decade. François Bouchard, Engineering Outreach Manager at the University of Ottawa, shares that “engineering is a critical discipline in the development of new technologies that now saturates most disciplines today.” With STEM careers continuing to grow and expand, there is a need for young people to develop interest and skills in these areas. Still, many students do not have the opportunity to complete engineering-related classes until post-secondary schooling. An Emerson survey showed that 2 in 5 Americans believe the STEM worker shortage is at “crisis levels” with the National Association of Manufacturing and Deloitte predicting the U.S. will need to fill about 3.5 million jobs by 2025.

Response: Mission Make-It: The Georgia 4-H Engineering Challenge was created in 2016 to expose middle school students to the engineering design process through non-competitive means. During the event, small teams of 4-H’ers work together to brainstorm, design, build, test, and modify engineering creations related to real-world problems. In addition to building STEM knowledge, youth develop important life skills, such as communication, cooperation, problem-solving, team building, and critical thinking. The event also features guest speakers that are experts within their given field, providing career exploration opportunities to participants. High school youth serving as teen leaders facilitate the lessons alongside adult leaders, giving them the ability to develop leadership skills and mentor younger 4-H members.

The 2022 Mission Make-It event featured agriculture advancement challenges. By exposing youth to the history of agricultural advancements, such as the cast-iron plow, cotton gin, and cradle scythe, participants learned about how different tools and technologies have advanced farming and ranching operations throughout the centuries. Throughout the event, the 4-H’ers worked in small groups to use the five-phase engineering design process: ask, imagine, plan, create and improve. Following the agriculture theme, youth constructed windmills and wheelbarrows, two engineering advancements for farming operations. For the first time since the inception of the event, an art fair was held where youth were challenged to create seed art projects for display and judging.

All participants experienced an educational opening session about advanced agriculture technologies and flew miniature drones in small groups. Additionally, Jay Moon with the U.S. Department of Agriculture (USDA) Farm Service Agency, served as the closing speaker, sharing with youth how that can access USDA resources to begin 4-H livestock projects or even small-scale farming operations. Moon, a dairy farmer, also brought a dairy calf for the students to see.

Results/Impact: Two-hundred eleven youth, teen leaders, and adults participated in 2022 the Mission Make-It event. Evaluation data collected from youth participants (n=121) suggested students developed engineering skills during the program. Nearly 94% of respondents said they can use the engineering design process to identify a solution to a challenge. Over 96% of respondents indicated they can test their solution to see if their idea worked, and nearly 95% shared they know how to communicate a design solution to their peers.

When asked what the best part of the event, one 4-H'er replied, "I loved that there was agriculture and that farms that can use technology to produce better products," while another youth shared they enjoyed "being creative and sharing my artistic style."

One adult leader commented, "I think this [Mission Make-It] is a great initiative that invites kids into a safe social and learning environment," and another adult shared "this is a great experience that not only allows to build 4-H project work but also to learn something new."