

Title: 4-H at Home Grant related to Plant Biotechnology

Geographic Scope: National

Your Unit/Department/Group: 4-H Youth

Summary: Through the 4-H at Home grant project awarded by National 4-H Council, Georgia 4-H created and piloted lesson plans about plant biotechnology during 4-H Summer Camp. Funding provided materials and supplies at no cost to camp participants, and adult leaders provided valuable feedback to the lesson plan author.

Situation: Plants are the key to a healthy and sustainable food system. In addition to providing oxygen, plants supply 90% of human calorie intake and 80% of human protein intake. Animal products are the remainder of these intakes; it is important to note that animals must derive their nutrition from plants (Chawla, 2009). As the world population continues to expand, there is a critical need to address food supply concerns. Kalia (2018) explains that plant biotechnology “encompasses a multitude of scientific tools and techniques for screening and genetic manipulation of plants to develop beneficial or useful plant/plant products.” Plant breeding and biotechnology assist in the developing of new varieties and traits, leading to higher-yielding crops and food with improved nutrition, taste, and storage life.

Farmers and producers have been modifying plant genes for more than 10,000 years. Many “modern” or common vegetables and fruits were domesticated through plant breeding programs. Additionally, plant biotechnology also allows for the modification of plant traits such as insect resistance, disease resistance, and herbicide tolerance. In the United States, the majority of all corn, soybeans, and cotton are grown using biotechnology. While 4-H is certainly rooted in agriculture production, there are no curriculum sets offered by National 4-H Council related to plant breeding and biotechnology. Furthermore, while traditional in-school science education teaches biology and genetic content to youth, it is estimated very few formal science programs teach plant biotechnology to students before college.

Response: Through a partnership with National 4-H Council and funded by U.S. Department of Agriculture (USDA) Agriculture and Food Research Initiative (AFRI), Georgia 4-H was awarded the 4-H at Home Grant. The \$15,000 award supported the creation of lesson plans and materials for National 4-H Council to share via the 4-H at Home platform. Aligned with the first priority area for the USDA-AFRI, Georgia 4-H created six lesson modules related to plant biotechnology for middle (grades 6-8) school 4-H youth. According to USDA-AFRI, the Plant Health and Production and Plant Products (PHPPP) program area of the AFRI “was established to increase knowledge of plant systems and the various factors that affect agricultural plant productivity.” Additionally, this project aligned with the National 4-H Mission Mandate of science, technology, engineering, and mathematics (STEM).

The goal of the six-part series is for young people to gain a greater understanding and appreciation of plant/crop production and plant biotechnology, while exposing youth to potential career opportunities. The proposed lesson module topics include: (a) plant classification, (b) parts of a plant and plants we eat, (c) simple plant genetics, (d) wild mustard selective breeding, (e) engineering a greenhouse, and (f) apple taste-testing. Aligned with the experiential learning process (Kolb, 1984) and the framework provided by National 4-H Council, each learning experience included a description of the activity, supplies & materials, activity steps, formative assessment, reflection questions, and a connection to one or more agriculture-related workforce development opportunity.

To ensure high-quality, interactive, and fun lessons, Georgia 4-H piloted three of the activities during 4-H Summer Camp offered at Rock Eagle 4-H Center. Each cabin was provided a STEM kit with lesson plans and resources for youth to build designer plants, engineer a greenhouse, and play the mustard mania board game. Due to COVID-19 protocols, each cabin acted as a cohort during the week of camp, and there were times (inclement weather, etc.) when adults may have had to facilitate activities with campers. Not only was Georgia 4-H able to pilot the lessons and receive feedback, but adult leaders did not have to prepare or pack any materials or resources.

Results/Impact: Adult leaders (faculty, staff, and volunteers) participating in Summer Camp at Rock Eagle 4-H Center were able to access the STEM kit during their weekly camping session. State 4-H staff and counselors prepared and restocked the kits on a weekly basis, creating an easy-to-implement model for adult leaders. While adult leaders were not required to facilitate the activities or report their actions, it is easily estimated over 1,000 youth benefitted from the STEM kits.

“These are great lessons for any time, but it’s always a plus when an outstanding curriculum can meet a very practical need,” said Georgia 4-H camping specialist Charlie Wurst. “COVID restrictions made us restructure our plans for rainy day activities, and it was great to have top-notch programming available to our leaders in each of our 45 cabins in the event inclement weather disrupted the regular camp schedule.”

One 4-H leader commented before camp, “Thank you! I really appreciate this resource. These activities are much better than what I have in my bag right now for camp. I thought of a few things, but they are not as in-depth with learning objectives.” While another leader shared, “the STEM kits were great! At first, I was a little reluctant because I didn’t want them to feel like they were doing school work, but the activities were so much fun that the kids asked to do one every day! I look forward to using the resources with my county program.”

Lesson plans were submitted to National 4-H Council for formatting and publication on the 4-H at Home website.

Program Function(s): Extension



2021 Impact Statement

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Program Area(s): 4-H

Collaborators: Charlie Wurst