



EXTENSION
College of Agriculture,
Biotechnology & Natural Resources



4-H Youth
Development

University of Nevada, Reno Extension
Clark County, Las Vegas, Nevada
4-H Afterschool Safekey Robotics Program
Spring 2023 Report



4-H Afterschool Safekey Robotics Program



4-H Afterschool Safekey Robotics Instructor

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Introduction

During the spring 2023 school semester, UNR Extension Clark County 4-H partnered with Clark County Parks and Recreation to pilot a 4-H Afterschool Robotics program. We worked with six elementary schools at five afterschool Safekey sites, trained nine Safekey staff leaders, and taught one hundred seventy-one students from grades K-5 for a total of twenty-eight contact hours at each site. Safekey staff leaders attended three 4-H robotics training sessions for a total of six hours from January to April where they were introduced to 4-H and given an orientation on Positive Youth Development, the 4-H Thriving Model, and the 4-H Experiential Learning Model. They were also enrolled as 4-H volunteers. Each training session, 4-H professionals taught four to five lessons of the curriculum, and Safekey staff taught it weekly at their afterschool site. The curriculum involved: principles of engineering, mechanics, electrical circuitry, and robotics programming.

Program Overview

The 4-H Afterschool Safekey Robotics Program started the week of January 16, 2023 and ended the week of May 1, 2023. The program was piloted at the following schools: Liliam Lujan Hickey Elementary School, Helen Herr Elementary School, Zel & Mary Lowman Elementary School, J.E. Manch Elementary School, Martin Luther King Junior Elementary School, and Mountain View Elementary School. The students had robotics classes once a week for two to three hours, depending on when they were picked up by their parents. Every week, the students had a new model to build that added complexity and technique to the model of the previous week. We focused on experiential learning by giving the students a brief description of the engineering or robotics principle they needed to know to create their robot that day, and then supported them as they assembled the models by following schematic diagrams of the step-by-step process for construction. Students worked in pairs to create their robots, which introduced components of the 4-H Thriving Model and life skills, such as: goal setting, engagement, contribution, and openness to challenge and discovery.

Each Safekey site was given the required amount of robotics kits to supply every two students with enough materials to create over thirty different models. The kits came with digital diagrams of each model, which 4-H printed out and gave to each site to ensure every student had access to the model they wanted to create that week. The kit is named EQ-ROBO1. It came with a mock study plan that outlined the different subjects that each week should cover to ensure a successful build. The curriculum starts with topics such as "What is a robot?", "Simple Machine Foundations: Center of Gravity, Leverage Principles, Friction and Power Transmission", and "Elastic Power", wherein students built models of windmills, airplanes, seesaws, catapults, and rubber band powered cars. After learning the basic principles of simple machines and energy transmission, the curriculum adds electronic foundations by introducing battery-powered models that move using motors and infrared light sensors. Topics of this section include: "Machine Foundations: Gear, Motors, and Crank", "Electronic Foundations: Brain of a Robot", and "Electronic Foundations II:



Infrared Ray and Photo Sensor". The last section of classes focused on programming and allowed students to create models that they programmed to use with a remote control. These models encouraged competitions and challenges such as racing their remote-controlled car and battling with their soccer robot. The topics of this section include "Electronic Foundations III: Remote Controller", "Obstacle Avoiding Robot", and "Understanding Conductors, Insulators and Semiconductors".

4-H staff helped the Safekey staff in piloting this curriculum by attending classes monthly and having one-on-one time with the kids as they assembled their models. The program encouraged kids of all ages and technical skills to learn more about robotics, engineering, and building.

This program will continue at four new afterschool Safekey sites starting in the 2023 fall semester. These sites are Gwendolyn Woolley Elementary School, Clyde C Cox Elementary School, Jay W. Jeffers Elementary School, and Myrtle Tate Elementary School. The schools that participated in our pilot of the 4-H Safekey Afterschool Robotics program will continue with eight weeks of 4-H programming this fall as we introduce the 4-H Arts Kit Curriculum.

Program Evaluation

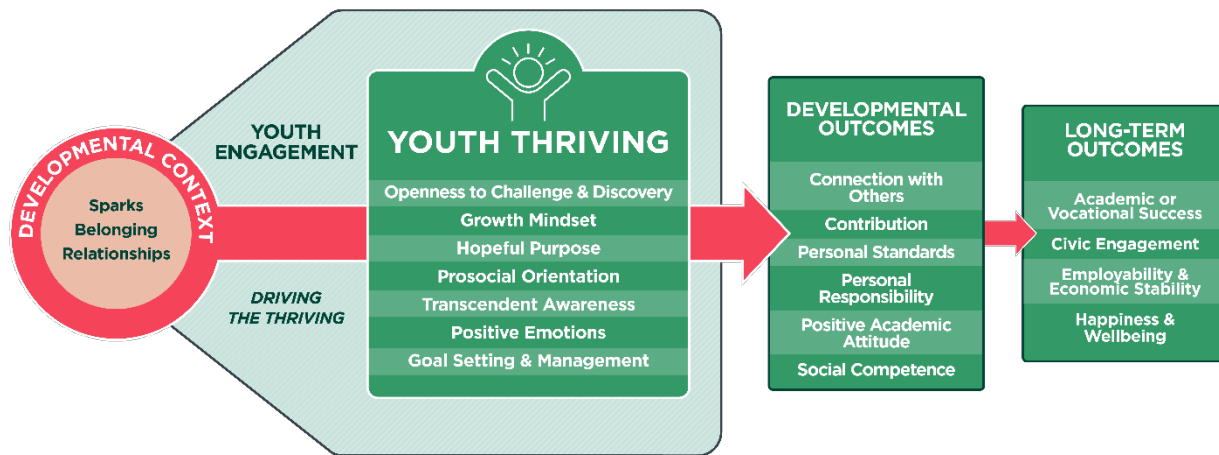
We used a paper sign-in sheet for attendance logs to track the number of participants. Demographic data, including ethnicity, age, gender, and zip code, were documented. We assessed social and emotional skills, using the 4-H Thriving Model (Arnold, 2018) as a framework (Graph 1). The 4-H Thriving Model demonstrates how the 4-H program achieves its developmental outcomes (Arnold & Gagnon, 2019). Based on impacting indicators of thriving, it is expected that youth will have the following outcomes: positive academic attitude, social competence, personal standards, connection with others, personal responsibility, and contribution. The indicators of thriving are as follows: 1) growth mindset, 2) openness to challenges and discovery, 3) hopeful purpose, 4) prosocial orientation, 5) transcendent awareness, 6) positive emotions, and 7) goal setting and management. The evaluation will answer whether these thriving indicators were impacted by the program.

The evaluation instrument is adapted from the Mediating Effects of Thriving on Youth Development studies (Arnold, & Gagnon, 2019). The 4-H Thriving Model uses surveys to assess outcomes. The survey instrument was administered to youth ages 7 and above before and after the program. The instrument measures seven indicators of thriving: (1) growth mindset; (2) openness to challenge and discovery; (3) hopeful purpose; (4) prosocial orientation; (5) transcendent awareness; (6) positive emotions; and (7) goal setting and management. The survey measured developmental context: youth sparks (passion), belonging, relationships (caring adults, challenging growth, youth-adult partnership), and engagement. The survey is intended to measure group trends to understand the quality and impact of the program. The results will be compiled, along with all other 4-H programs and will be documented in an annual 4-H report.



The results of the survey, attendance records, demographic data, and anecdotal stories from the instructors will be used to modify and improve the program. The outcomes will be reviewed annually to make necessary adjustments. In addition, the outcomes will be used to engage stakeholders, report results to program participants, describe the program, and share lessons learned. The evaluation process will also be reviewed annually in order to ensure the best instruments and the best processes are being utilized.

Graph 1: 4-H Thriving Model



Overview of Safekey Staff Leader Training

The 4-H STEM team hosted three training sessions for Safekey staff leaders to teach them how to implement the program’s curriculum. They were also introduced to 4-H and given an orientation on Positive Youth Development, the 4-H Thriving Model, and Experiential Learning. The training sessions resulted in a total of six hours and were held from January 2023 to April 2023. During each session, staff reviewed four to five lessons, to be taught weekly at each afterschool Safekey site. The curriculum involved: principles of engineering, mechanics, electrical circuitry, and robotics programming. Safekey staff leaders completed a pre-survey and a post-survey to record their experiences with 4-H curriculum.

Safekey Staff Surveys

Each instructor completed a survey that assessed the value of the 4-H experience. Responses are used to improve 4-H programs for participating youth and adult practitioners who work directly with youth. The pre-survey was given to Safekey staff leaders prior to receiving training on the 4-H curriculum. The post-survey was given to the staff leaders after they completed the training. They both include the same sixteen Likert-scale questions inquiring about confidence levels. The post-survey also includes three additional questions with open-ended responses.



Likert-Scale Questions:

1. 4-H provides a place where adults care about youth.
2. 4-H provides a place where youth feel like they belong.
3. 4-H provides a place where youth are accepted by others.
4. 4-H provides a place where youth feel safe.
5. 4-H provides a place where youth get to figure things out for themselves.
6. 4-H provides a place where it's okay to make mistakes.
7. 4-H provides a place where youth get to teach others what they've learned.
8. 4-H provides a place where youth can do activities that match their interests.
9. 4-H provides a place where youth are encouraged to plan for their future.
10. 4-H provides a place where youth have a chance to be a leader.
11. You can teach robotics lessons to elementary school students.
12. You can identify the 3 classes of levers in common items around school.
13. You can teach how to assemble robots using step-by-step diagrams.
14. You can explain the differences between an electrical conductor and a nonconductor.
15. You can help youth develop an understanding of careers in STEM.
16. You can help youth develop skills necessary to prepare them for their future.

Post-Survey Open-Ended Questions

17. What went well with the 4-H Robotics Safekey Program?
18. What can be improved with the 4-H Robotics Safekey Program?
19. What subject would you like 4-H to teach in Safekey next year?

Participant Demographics

Demographics of the Safekey staff leader participants were collected using an attendance sheet. The attendance and demographics collection sheet prompted participants to self-identify their gender, ethnicity, race, familial military status, as well as contact information via email or telephone number. For gender: seven out of nine participants self-identified as women, and two out of nine participants self-identified as men. Zero participants disclosed military status. For ethnicity: three out of nine participants self-identified as Hispanic or Latinx, and five out of nine participants self-identified as not Hispanic or Latinx. For race: five participants self-identified as Black, one participant self-identified as white, one participant self-identified as Native Hawaiian/other Pacific Islander, and two participants self-identified as Other/Not listed.

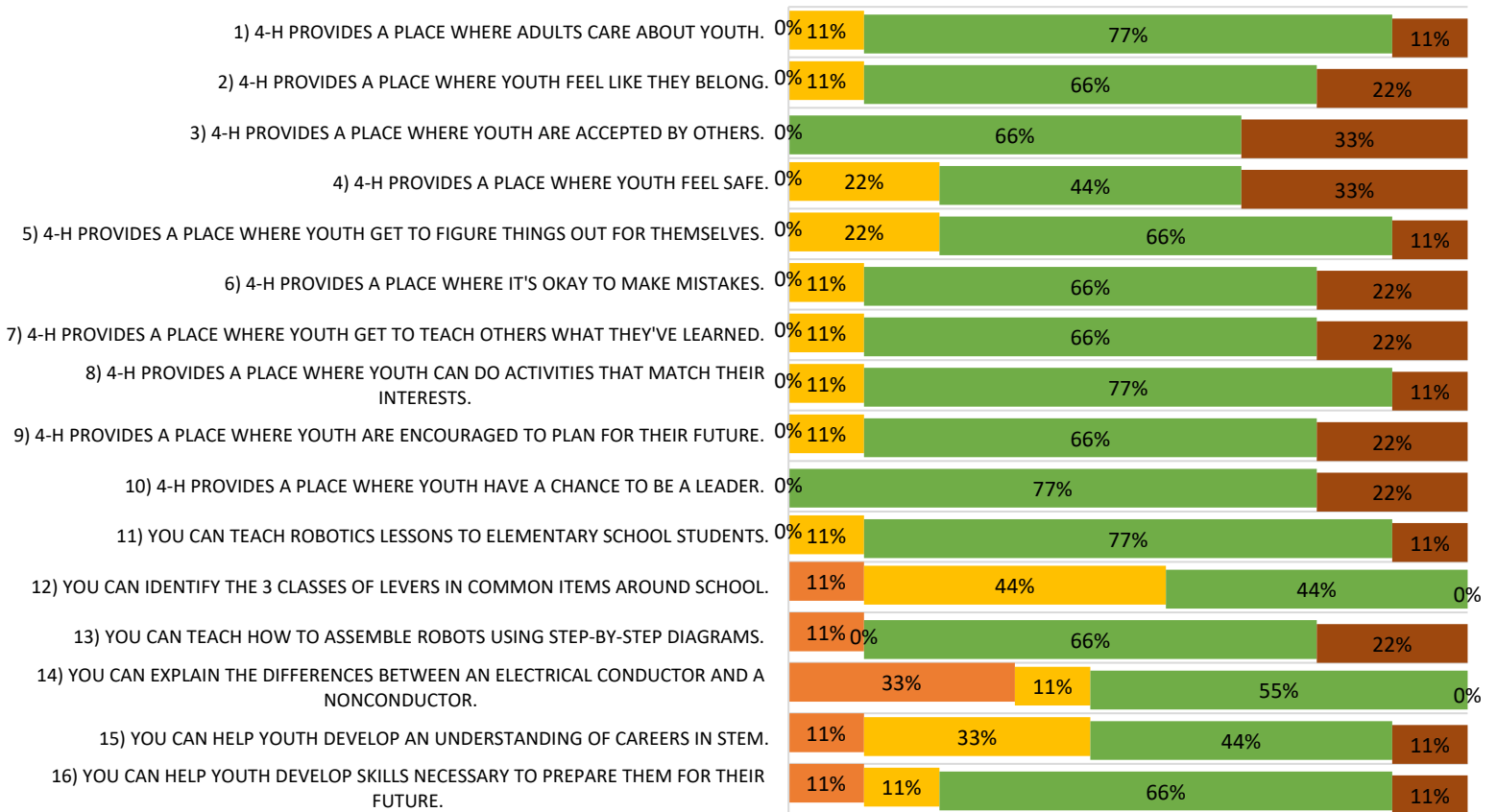


Results

Nine participants took the pre-survey. The results from the graph below reflect their responses:

PRE-SURVEY RESULTS

■ Not Confident
 ■ Somewhat Confident
 ■ Confident
 ■ Very Confident



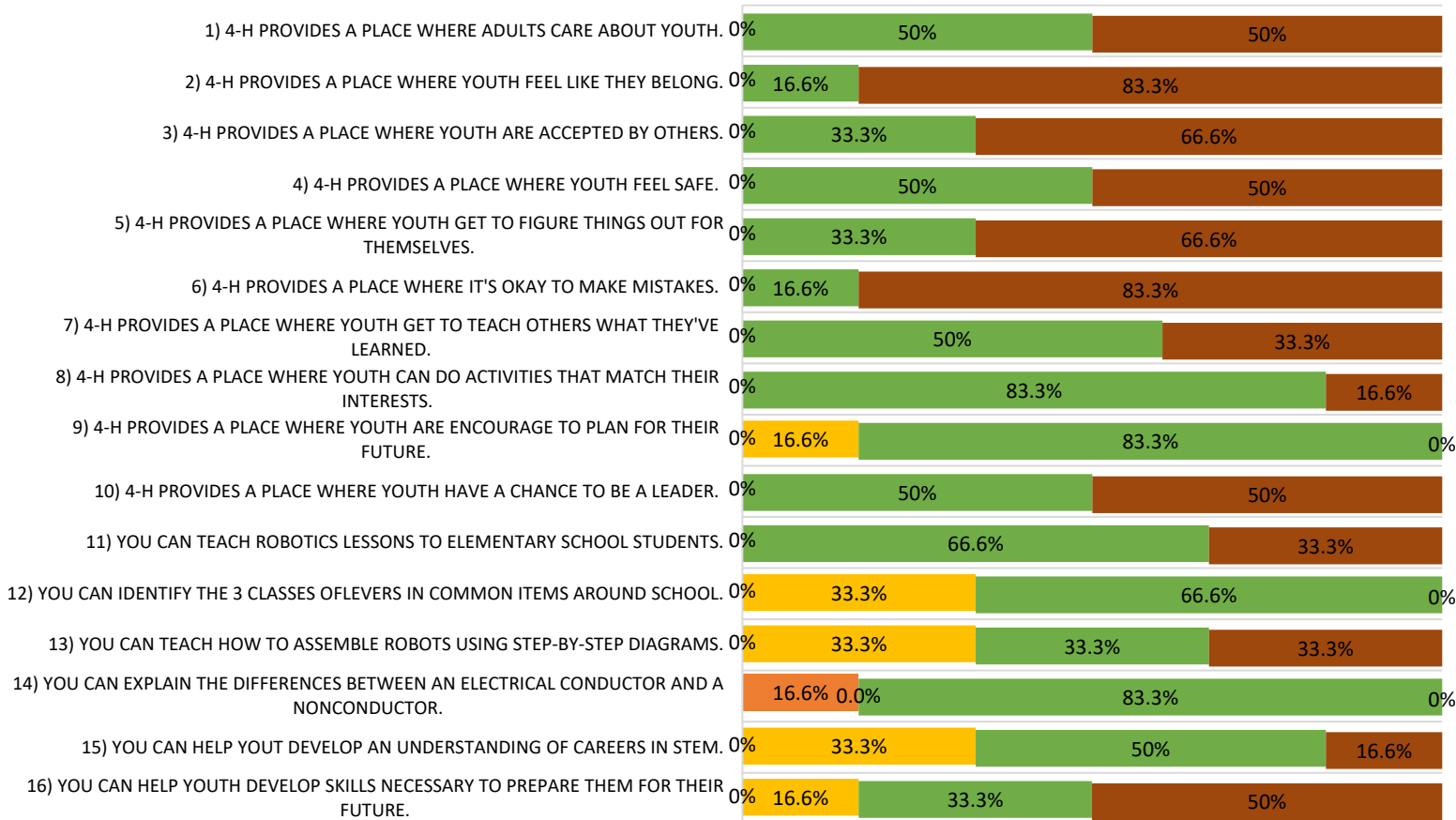


Six participants took the post-survey. The results from the graph below reflect their responses:

POST-SURVEY RESULTS

■ Not Confident
 ■ Somewhat Confident
 ■ Confident
 ■ Very Confident

AXIS TITLE



The survey included three questions with open-ended responses. Below are the responses to each question:

17.) What went well with the 4-H Robotics Safekey Program?

- "Student participation"
- "Watching the kids enjoy playing with them"
- "That most sites enjoy our day a week of Robotics. The children working as a team to complete their Robotic and gaining team building skills they are gaining."



- “Kids enjoy Robotic class and they understand that if they do a mistake, they can try again or we can help them. They understand that they have our help in case they need it.”
- “The level of understanding from participants, steps being followed were easy”
- “The way the students were able to problem solve among themselves”

18.) What can be improved with the 4-H Robotics Safekey Program?

- “Offer to other sites”
- “Having smaller things for my small children”
- “More instructions in your picture diagrams.”
- “Extra pieces when they need to complete their robots.”
- “The instruction with the image they provide us.”
- “Our staff being more enthusiastic or finding more ways to get our kids involved”
- “The translation from Chinese-Japanese”

19.) What subject would you like 4-H to teach in Safekey next year?

- “Not sure”
- “Anything regarding sports”
- “Space, plant, technology”
- “Art and craft, plant”
- “If we have anything musical.”
- “Up for anything!”

Analysis

The results from the post survey compared to the pre survey show an improvement in every question. This indicates that instructors felt more confident after the training sessions, and they increased their content knowledge of robotics and 4-H. For example, before the training, 22% of participants felt that 4-H was a place where youth feel like they belong, and after the program, it increased to 83%. Before the program, 11% of participants felt that 4-H Robotics was a place where youth get to figure things out for themselves, and after the program it was 66%. Before the program, 22% of respondents said 4-H provides a place where it's ok to make mistakes, and after the program it was 83%. This is important because the instructor's perceptions and beliefs can help promote a growth mindset and allows youth to develop skills, instead of having adults provide all the answers. The pre survey shows that 11% of the respondents felt they could help youth develop skills necessary to prepare them for the future, and the post surveys show that 50% felt this way.



One area that had the least amount of improvement was, “you can help youth develop an understanding of careers in STEM,” this shows an area of growth for the 4-H team when working with the Safekey site personnel, we may need to add a segment about careers in STEM so they may increase their knowledge in this area. Another area that had a low rating and a low improvement was, “4-H Robotics provides a place where youth can do activities to that match their interest.” Further exploration is needed, this may indicate that the Safekey staff do not feel that most kids are interested in the robotics topic or activities.

Closing

The program was a success in offering robotics and engineering to schools that have limited resources and engaging students in K-5 in experiential learning during afterschool hours. There was an increase in interest within Safekey staff, Safekey students, and parents for 4-H programming and an overall positive attitude towards implementing 4-H curriculum at Safekey afterschool sites. The program helped engage students in robotics and helped them be able to see themselves as engineers and scientists when they might have otherwise not felt comfortable learning “hard” science concepts. The program would benefit from more in-depth staff training on classroom management, 4-H volunteer training, and the 4-H Thriving Model. We also received varying degrees of completed attendance sheets, demographic records, and pre-post surveys which resulted in missing data. Next cycle, we will empathize the importance of capturing attendance and records. In addition, we will request that parents complete photo/video releases so that we may share the experiences of the students in the program. The photos and videos will also help us assess the engagement with the curriculum. Having a better trained staff and more qualitative and quantitative data from surveys will help expand the 4-H Safekey Afterschool Robotics program to more sites and help us make improvements in order to have greater impact.