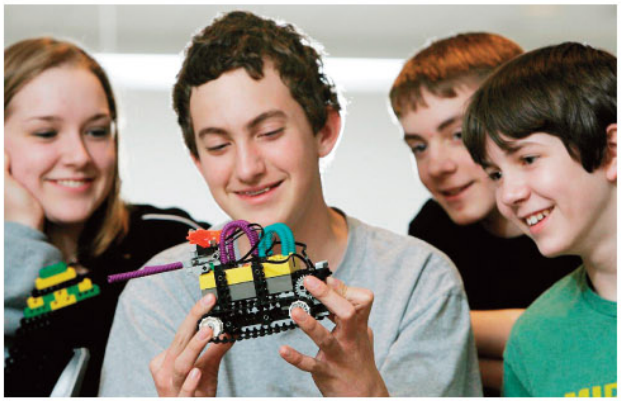
4-H ROBOTICS

Year-Round Training Guide

MODULE 8: Science Inquiry and Programming Robots

4-H Robotics: Engineering for Today and Tomorrow



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4-H Robotics Curriculum

4-H Robotics Introduces Youth to:

- Basic physical science concepts related to robotic systems
- The Scientific Inquiry Process
- The Engineering Design Process
- Technology tools for learning and communications
- An exploration of SET careers

4-H Robotics Curriculum

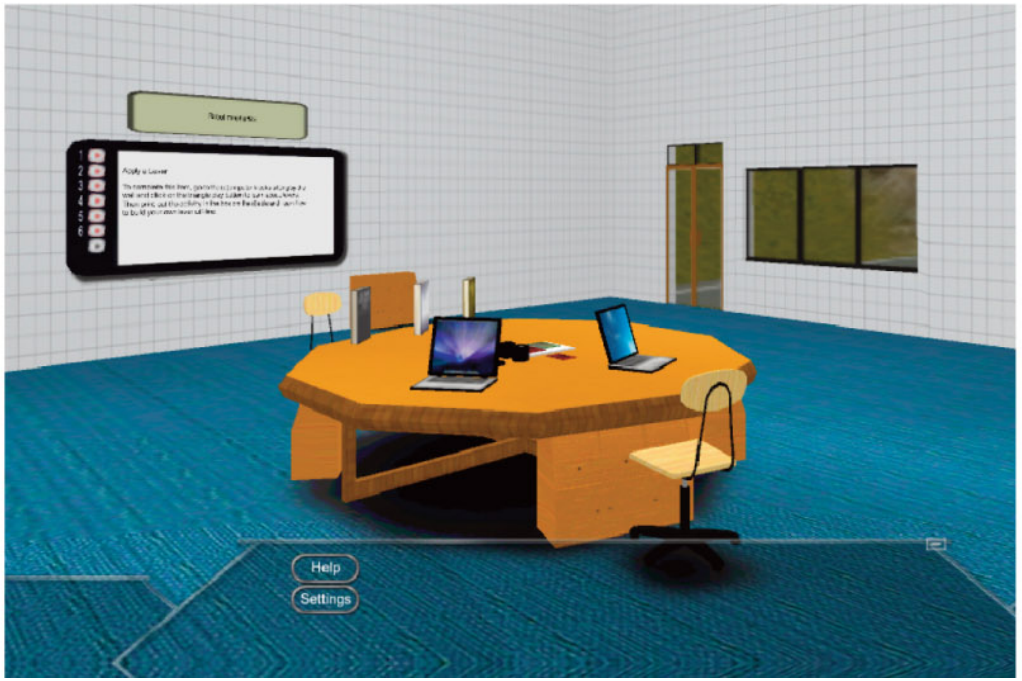
- ***Virtual Robotics:*** Youth utilize an interactive computer game environment to learn about the science and engineering of robots.
- ***Junk Drawer Robotics:*** Youth make use of everyday objects to design, build and learn about robots.
- ***Robotics Platforms:*** Youth employ robotics kits to understand robotics and programming and develop their own robot designs.

Track 1: Virtual Robotics

Youth build skills and knowledge about robotics as they play an interactive computer game.

The learning experience includes videos, simulations, and animations—all in an interactive virtual robotics lab.

Curriculum is delivered on a DVD.



MODULE 8: **Science Inquiry and Programming Robots**

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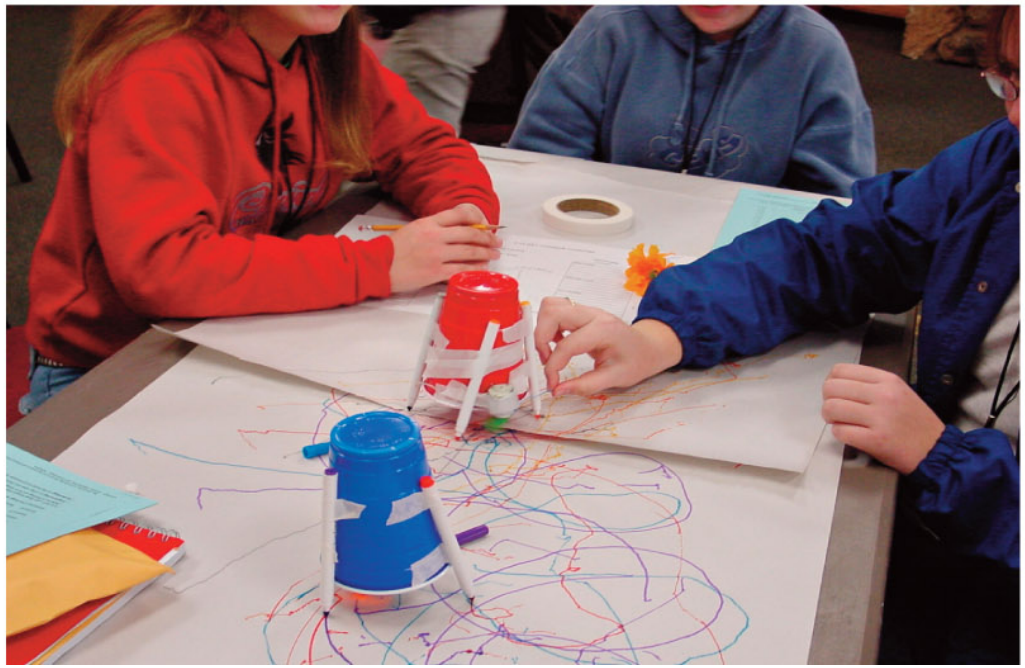
Track 2: Junk Drawer Robotics

Youth design, construct and test robots that lift, move or float.

Each level focuses on one aspect of robotics and the science, engineering and technology behind it.

Designed to be a teen-led program.

Curriculum includes three printed presenter's guides and a youth Robotics Notebook.



MODULE 8: **Science Inquiry and Programming Robots**

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Track 3: Robotics Platforms

Youth apply the engineering processes of designing, building and programming robots.

Youth build skills and knowledge and apply what they have learned to a challenge activity.

Curriculum is delivered on a DVD.

Makes use of a commercial robotic kit such as LEGO® MINDSTORMS®, VEX®, TETRIX® or CEENBoT™.

LEGO® Robotics Kits

NXT Robots

RCX (1998) Brick

NXT (2006) Kit

EV3 (2013) Kit

Robotics Platforms

Robotics Platforms

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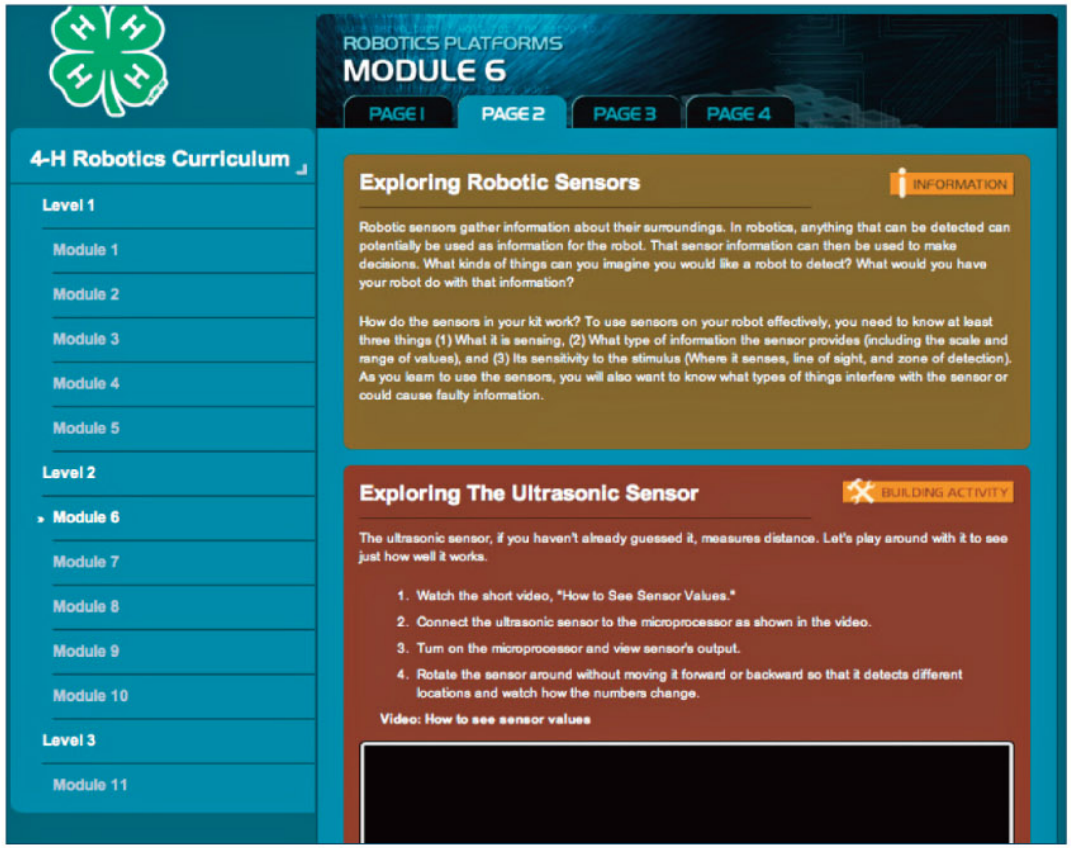

Robotics Platforms

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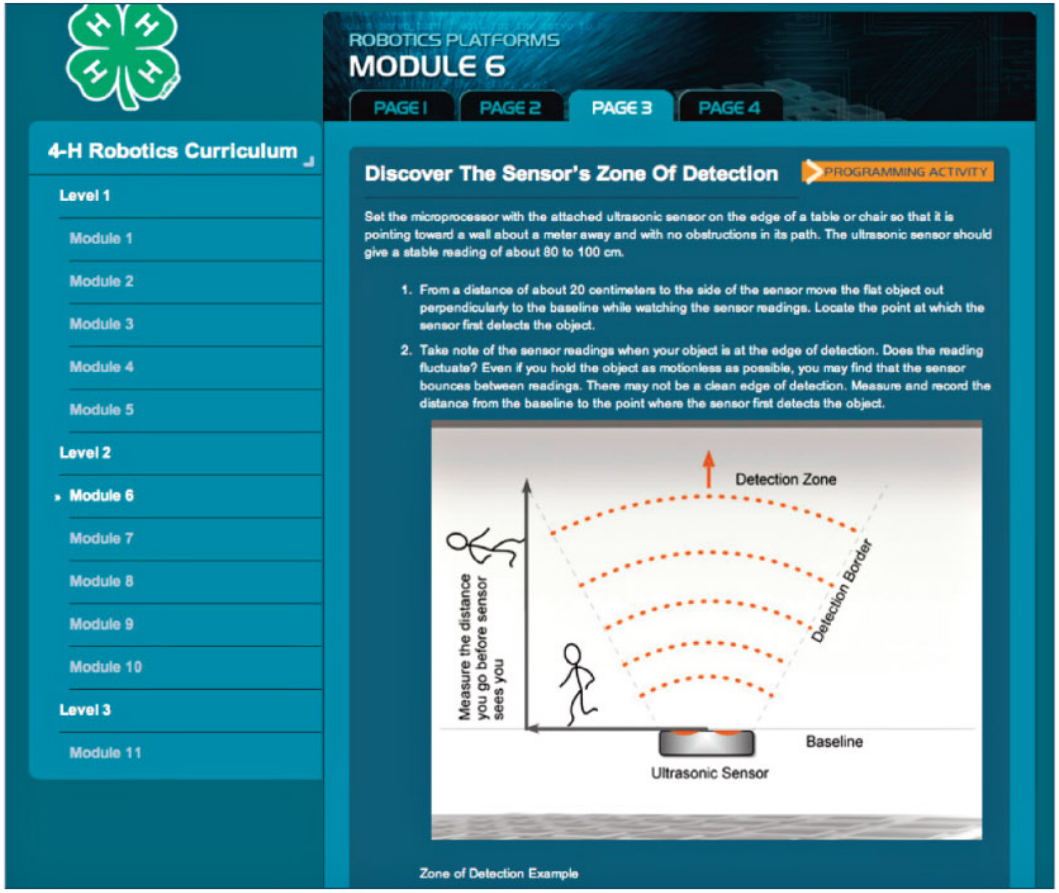

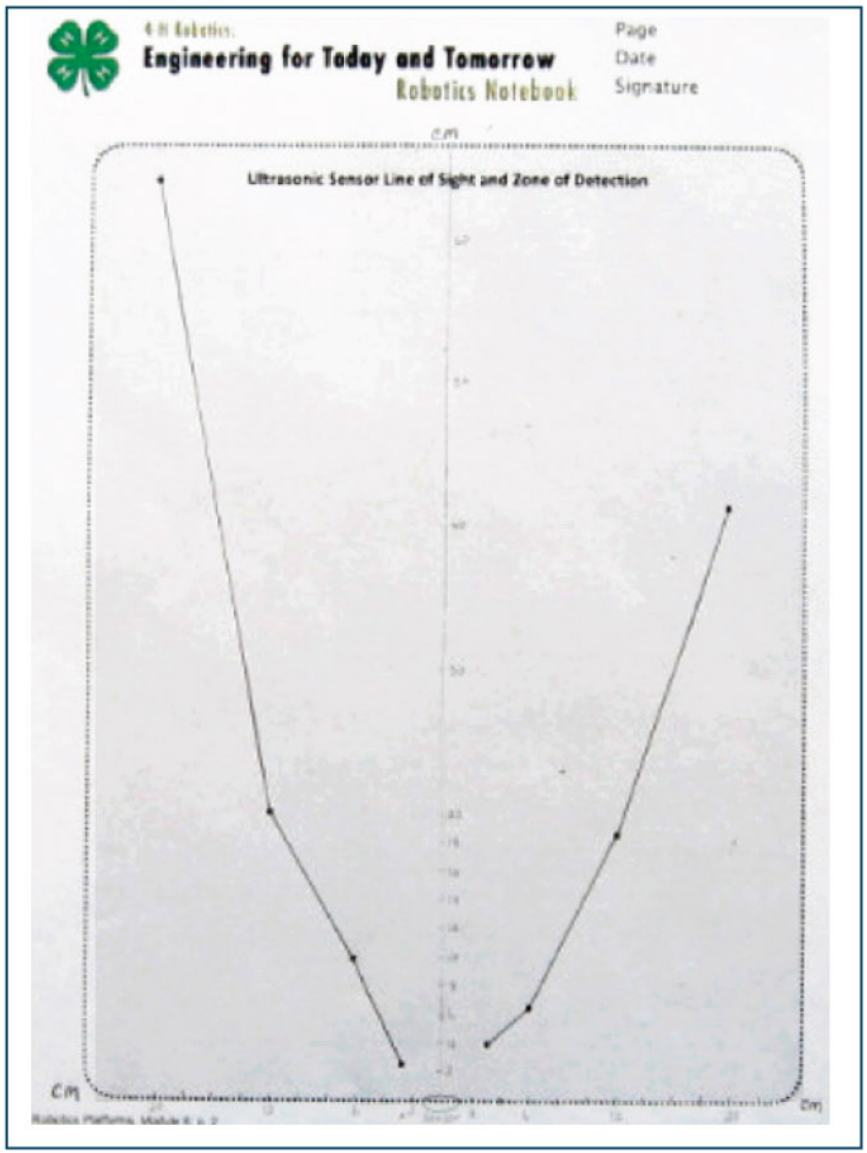

Zone of Detection

Sample Sketch

Robotics Platforms

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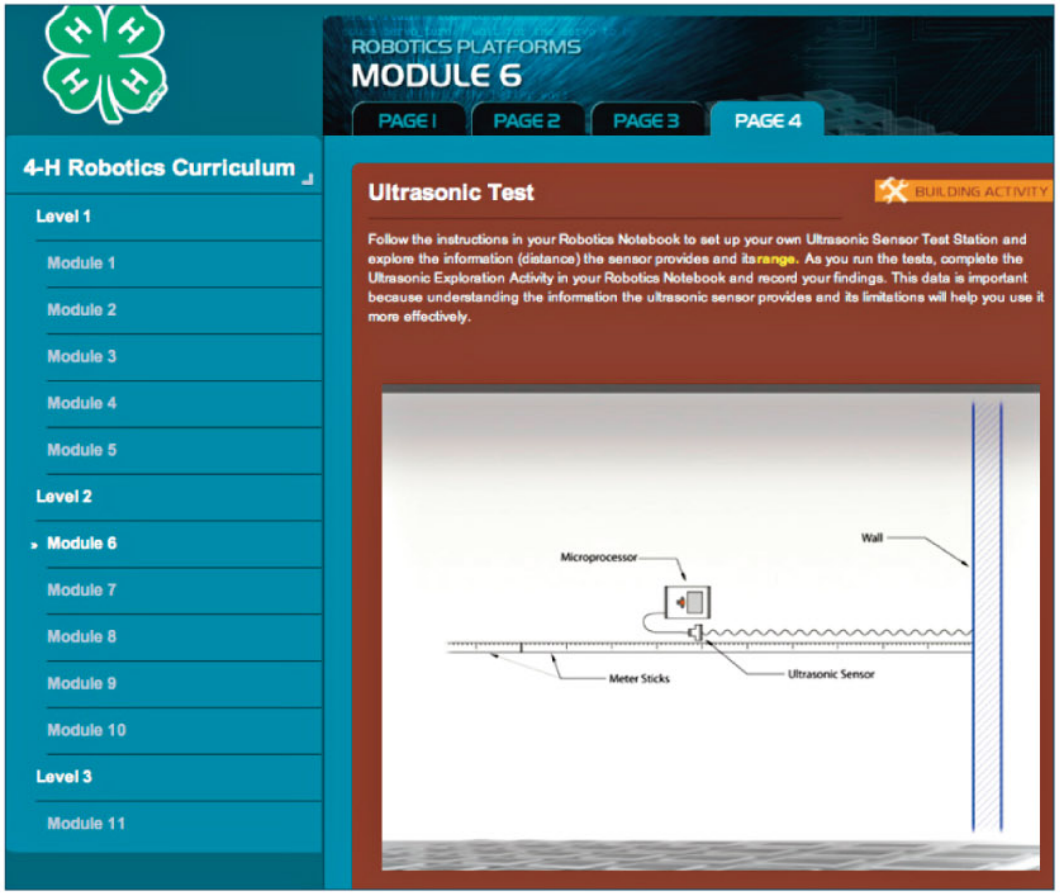


Inquiry Is

- Asking my own questions and finding answers
- Designing and doing my own investigation
- Using my data to answer my questions
- Sharing my answers with others

Inquiry Does

- Develop self-directed learners
- Support and develop curiosity about the world
- Lead youth to deeper understanding of the world by following their own path

Approaches to Inquiry

Structured Inquiry

- Youth use set procedures to investigate the hands-on problem they are given.
- Youth discover relationships between variables and generalize from the data they collect.
- Youth have the opportunity to share their conclusions and apply what they have learned.

Approaches to Inquiry

Guided Inquiry

- Youth determine their own procedures to investigate the hands-on problem they are given.

Open Inquiry

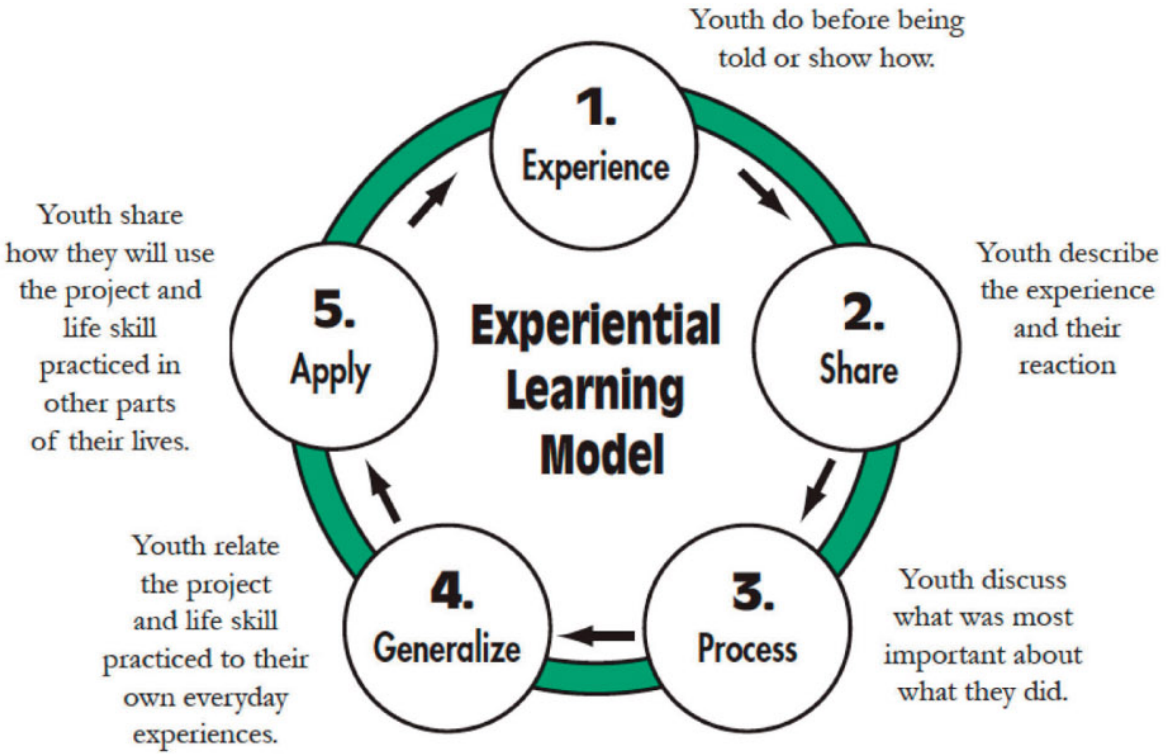
- Youth ask their own question and determine the problem and procedures for their investigation.

Program a Robot

Your challenge is

to use the ultrasonic sensor and program your robot to move up to an object and stop as close as you can without knocking it over or running into it.

Experiential Learning Model



Pfeiffer, J. W., & Jones, J. E., *Reference Guide to Handbooks and Annuals* 1983, John Wiley & Sons, Inc. Reprinted with permission from John Wiley and Sons, Inc.

Asking Good Questions

- Select six good questions.
- Identify where each question fits in the Experiential Learning Model.
- Decide if you need additional questions to cover all components of the model.
- Write additional questions if needed.

Progressive Challenges

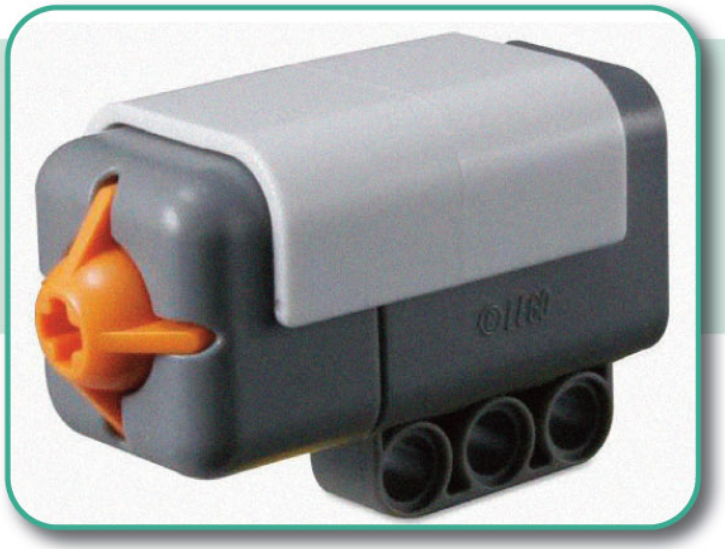
Progressive Challenges are a tool you can use as a leader to keep a diverse group engaged.

Progressive Challenges

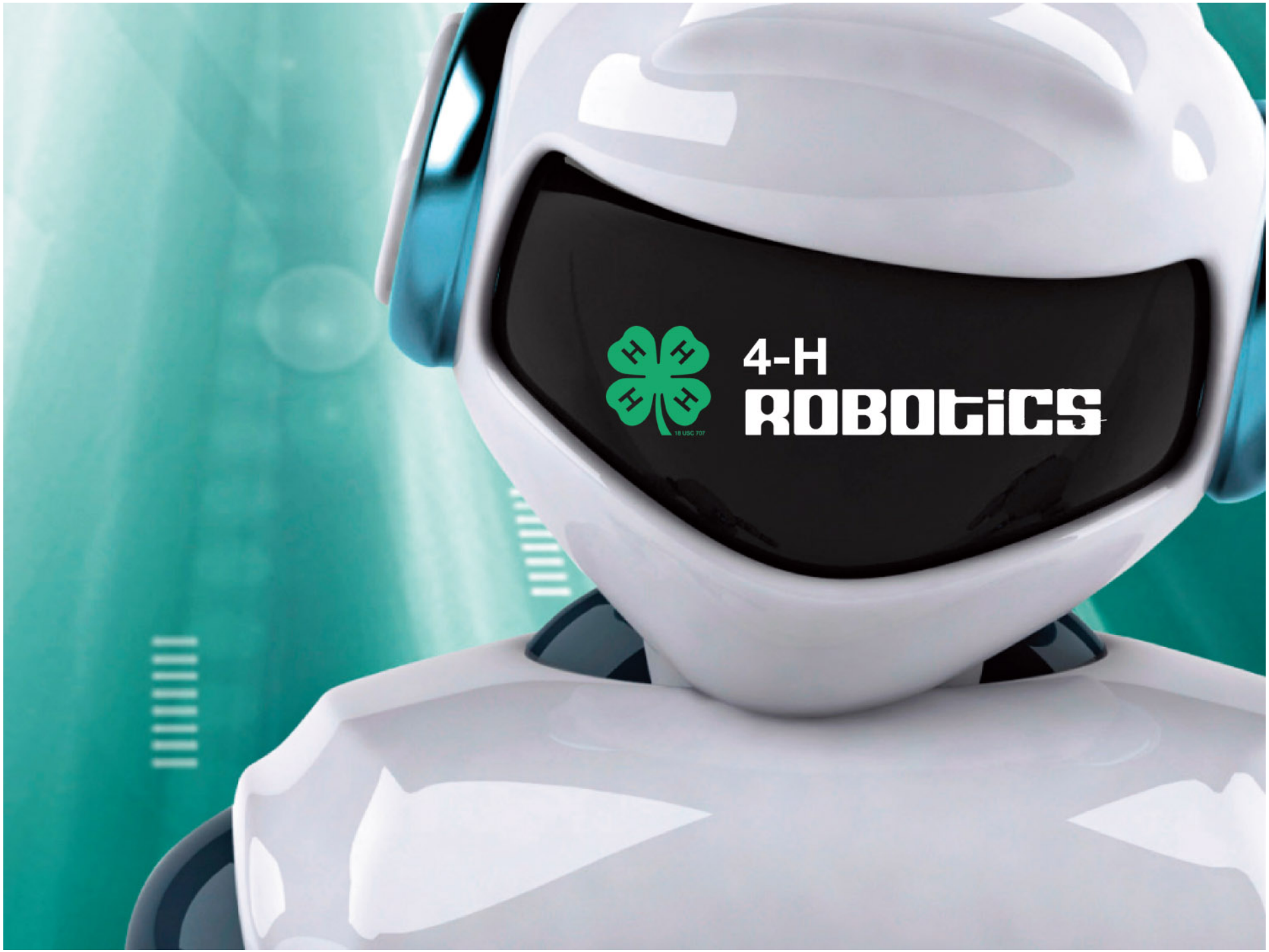
- Decide how much time to allocate.
- Create a list of challenges that build on one another.
- As a group completes a challenge, give them another challenge.
- The goal is to keep everyone engaged for the time allocated. At the end of the time each group should feel successful.

Closing and Questions

- Developed personal knowledge to draw upon when leading *Robotics Platforms*
- Utilized the sensors in the LEGO® MINDSTORMS® Kit to build and program a robot



- Developed and evaluated questions that enhance positive youth development using the Experiential Learning Model and Science Inquiry


4-H
ROBOTICS