TECH TALES

MAKE. LEARN. SHARE.

DAY 3: PUTTING IT TOGETHER
Engineering

Families use their new and previous knowledge to begin constructing their dioramas and bringing them to life. They will explore more programming concepts and refine their stories together.

badges

materials

- Light meal
- Projector and slides
- Badges
- Full hummingbird kit + computers
- Craft materials
- Paper
- Markers/pens
- Storyboarding worksheet

workshop day 3

1. WELCOME & SHARING
- Eating
- Community building

2. STORYTELLING
- Share a story
- Introduce the day's theme

3. EXPLORING
- Refine stories and choose a plan of action
- How to use Hummingbird sensors
- Diorama building

4. ACKNOWLEDGING
- Reflection on the day
- Award badges from the day
- Prepare for next week

EATING & SET-UP

20 minutes

Welcome families as they arrive. Provide food and drinks. An opening circle is nice way to keep families and staff connected throughout the series.

For example, in one of our communities we opened each session by gathering in a circle outdoors, intruducing ourselves in our own languages, sharing something we were thankful for or that we were happy about. Children were often excited to come up with a question that everyone answered, such as, "what do you want to be when you grow up?," or, "if you could be any animal, what would it be and why?"

Sharing what they are thankful for

materials

Light meal
Disposable cutlery
Drinks with lids

background info

Inviting scientists to the workshops gives families an opportunity to explore technology while also interacting with someone who uses it in their profession. As they interact with the families, they can help problem-solve projects and talk about how they use similar techniques in their career.

You can also invite the scientists to tell a story, transporting audiences into the life of the scientist.

During the workshops, scientists can share how they use science and technology in their careers and everyday life, while also fostering personal connections with the families.

set up

Set up food and paper goods on a table.
Arrange any books or supplemental items on a table.
Post a schedule of the day prominently in the room, on a white board, paper, or projected on the wall.

SHARE A STORY

15 minutes

Families gather together. Facilitator shares a book or traditional story.

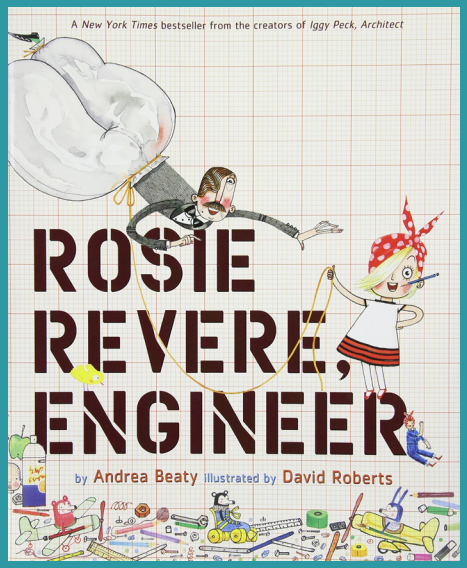
The facilitator can remind families that they did a lot of good work last week coming up with their stories and drawing a scene from that story. This week they will learn more about the Hummingbird kit so that they can start building!

Scientist Ivonne sharing a story

materials

Book, visiting storyteller.

Suggested book: *Rosie Revere, Engineer* by Andrea Beaty, David Roberts



background info

A story that highlights problem-solving or testing work and persistence through failure will support the idea of engineering practices.

If it is possible, ask a visiting scientist to share a story from their life.

DAILY THEME

5 minutes

SHORT DISCUSSION ON THE THEME OF THE DAY

Today's theme is **Engineering**. Engage in a casual conversation about ideas around engineering. This is not a quiz! We are not looking for correct answers, just ideas.

ASK

Have you heard the word "Engineer" before?
What kind of work do you think engineers do? Who do you think engineers are?
Possible answers include train engineer, software engineer, civil engineer, never heard.

EXPLAIN

Engineers work on all kinds of things from roads, buildings and bridges to computers and software. Even running shoes and roller coasters are designed by engineers.

Engineering is a **process** and **way of thinking**. Engineers like to solve problems and work to make things more efficient. Failure is normal for engineers and is an essential part of the process. It helps engineers learn and improve things!

background info

There is great value in recognizing and identifying the sophistication of thought inherent in occupations like cooking or construction—and makes connections to academic or professional definitions of those same practices. Framing seemingly disparate careers as related helps students see family experiences as learning resources.

What practices do families engage in that you can leverage as part of their communities or personal hobbies that involve iterative design or engineering processes?

There are many different types of engineers:

Environmental Engineers work to improve the environment, provide clean water, and reduce pollution.

Chemical Engineers develop new materials and processes

Aerospace Engineers design airplanes and space shuttles

Biomedical Engineers work in the medical field on artificial limbs and pharmaceutical drugs
...and many more!

http://stemteachingtools.org/brief/7

UNPLUGGED PROGRAMMING: LOOPS

(**Optional activity**) 15 minutes

Facilitator leads an embodied activity demonstrating loops and repetition using the Human Robot model.

- Reintroduce the Human Robot that we programmed to brush its teeth. Ask them to stand in front of a chair in front or center of room.
- Instruct your robot to walk around the table (or their chair, or a friend). *(Adapt this for mobility as necessary, e.g., command can be "nod your head once" or "clap your hands once")*
- When they finish, instruct them to do it again, using the exact same words you did before.
- When they finish, instruct again.
- Then again.
- If you think participants have understanding of the concept, add complexity to the looped instructions or be more detailed with your instructions (stand up, face left, take three steps, face left, take three steps, etc) and identify sub-loops (e.g., face left, take three steps).

SAY

"Robot, walk around the chair and stop
Robot, walk around the chair and stop
Robot, walk around the chair and stop"

materials

Helper, chair

Extension: stereo, music

background info

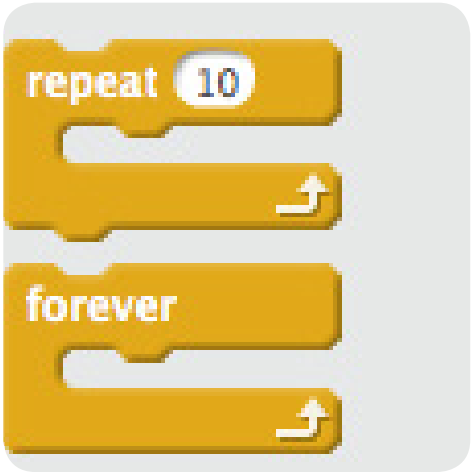
Each time a procedure is completed, it is called an **iteration**. This is also the word we use to describe design cycles.

How a loop works:
A "For Loop" is a *control flow statement*.
A counter variable (i) is set to track each time a code is iterated up to a set amount. The program increments through the loop until the condition is met.

In C, a code to repeat some_function 100 times looks like this:

```
for (i = 0; i < 100; i++)
    some_function(i);
```

This is all done behind the scenes in Scratch so all you see is the number of increments to loop.



EXPLORING

ASK

- Would it have been easier for me to just ask you to walk around the chair and stop 3 times? What about 10 times?

EXPLAIN

- When I know in advance that I want you to do something a certain number of times, it's easier for both of us if I just ask you to "Repeat it that many times."

SAY

"Robot, walk around the chair 3 times and stop"
(volunteer walks around the chair three times)

EXPLAIN

This is a loop that repeats 3 times. Because we told it to, the robot knows to start at 3, then count down every time it does a loop until there are no more.

WRAP UP

What did we learn?

- Do you think it is easier to add more instructions or change the number of times we loop? What if we added 5 more repeats? 100 more repeats?
- Could we use these same loops with different motions?
- What was your favorite part about that activity?

Mike S. leading the Loopy Dance

EXTENSION:

Code.org's Getting Loopy Dance lesson:

This lesson introduces the programming concept of loops (repeated instructions) through a dance activity. Students will learn simple choreography, then be instructed to repeat it.

See instructions at https://code.org/curriculum/course1/12/Teacher

This activity is adapted from Code.org's "Getting Loopy" Unplugged activity

REFINE YOUR STORY TOGETHER

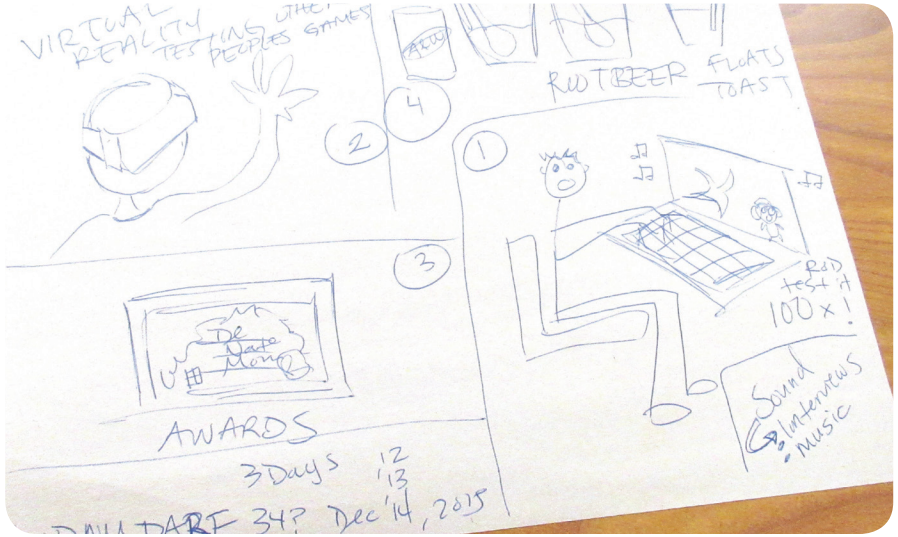
15 minutes

Diagram how the robotics will move in your scene.
Where will lights, sensors, etc. be used? Talk through how to use various components to express the idea.

ASK

As you notice families mapping out their stories, you can ask questions like, "What specific actions do you want this to be doing? Break down that action into small parts."
"What parts of this can you imagine moving? Lighting up? Turning around?"
"What robotics parts do you think you would need for that?"

Refer to the "Tech Tales Diagramming" page in the family guide. Give families time to fill out their diagram.



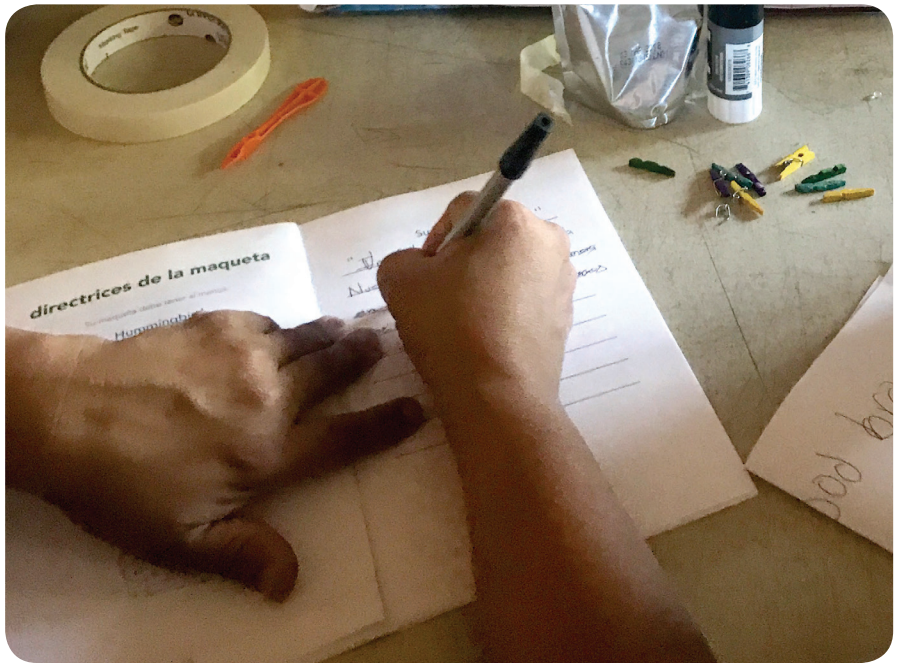
materials

Large paper
Storyboarding worksheet
Markers, pencils, pens
Tech Tales
Diagramming sheet

background info

Engineers and artists use design process in designing projects.

Families will be revising their original concept at least a couple of times through the workshop as they try new things and think through how to express their ideas with robotics and art.



INTRO TO SENSORS

20 minutes

Use a Distance Sensor to turn on an LED/vibration motor using Scratch with the Hummingbird

Talk about sensors in everyday life: automatic doors, faucets, hand dryers, locks. How can you tell when it's reacting to a sensor?

Sensors in your body: Eyes, skin, nose, tongue, ears take in information about the world. **WHEN** it senses that input, your **brain** processes that information, then tells your **body** how to **react** (move away from heat, blink, understand language, etc)

The Hummingbird LEDs and motors are **output devices**. Scripts in Scratch send commands to these devices to make something happen. The Hummingbird **sensors**, on the other hand, are **input devices**. They send information to the Scratch program. The Scratch program can use this information to make a decision with an **if then else** block.

Each family will take their own computer out and follow along, and the facilitator will demonstrate on a projected screen.

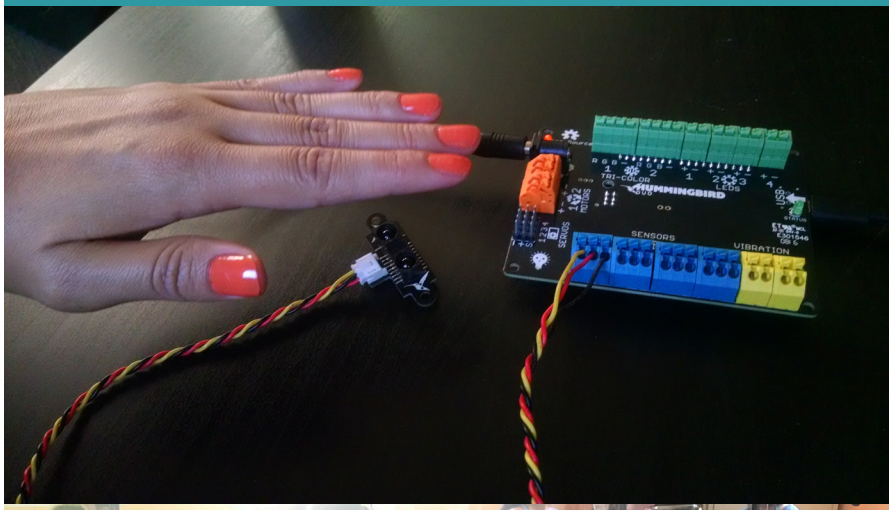
materials

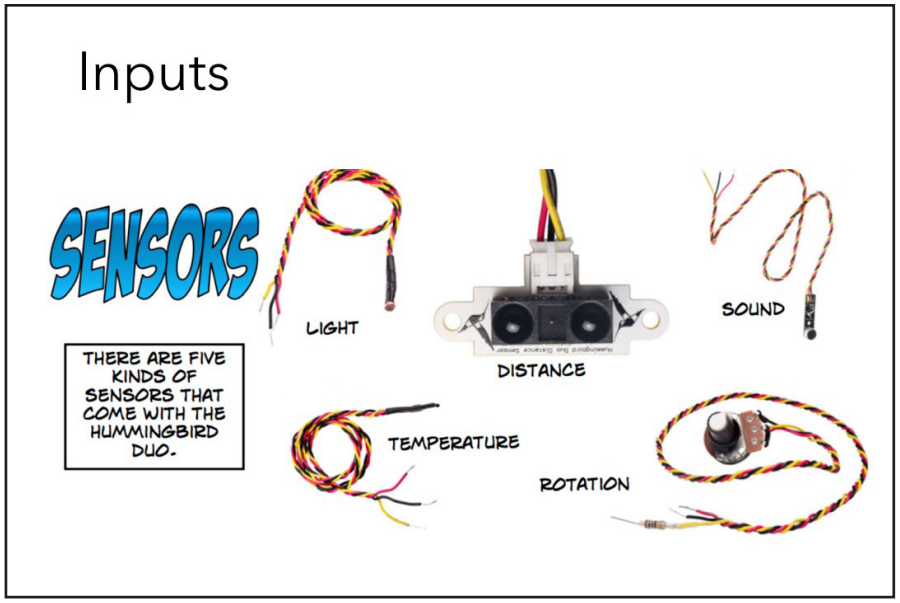
Computers with Birdbrain Robot Server and Scratch 2.0 installed

Hummingbird boards, USB cords, single-color LEDs , distance sensors

Slides and/or projected Scratch screen

Troubleshooting Guide





Day 3 slides

background info

Behind the scenes:
When an If...Then...Else statement is encountered, a condition is tested.

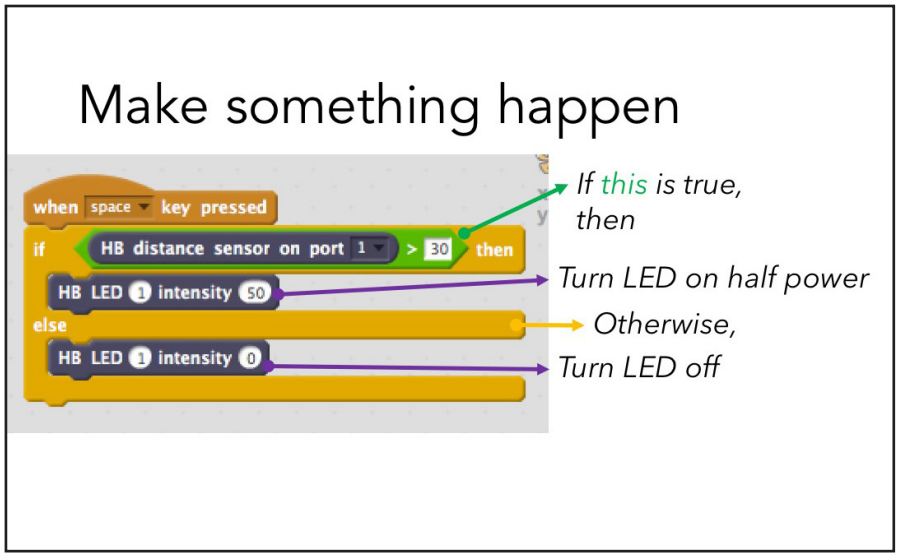
If condition is **True**, the statements following Then are executed.

If condition is **False**, each Else statement (if there are any) is evaluated in order.

INSTRUCTIONS

Follow step by step instructions on the TechTales slides, or refer to the Hummingbird Robotics website:

http://www.hummingbirdkit.com/teaching/using-sensors-hummingbird-scratch



REFLECTION

5 minutes

DISCUSSION

How did today's activities relate to engineering?

- How did you figure things out?
- How did you work together to accomplish something?
- Were you ever frustrated?

How is this like something you have seen somewhere else?

- Have you ever worked on a project that has lots of steps?
- Have you been creative in solving problems before?
- When are you most creative?
- Have you seen any of these electrical components elsewhere?

Engineering is a kind of career, and there are many branches of engineering

- What are examples of careers that people have?
- The skills we are using in these workshops are used in many different careers, and in many different ways. We set goals, identify problems, come up with plans, edit our plans when we learn more, think creatively, build structures, and work together.
- Do you know what it takes to be an engineer? Would you want to be one? Are you one now?

PREPARE FOR NEXT WEEK

- Ask families if there are any materials they want to build their dioramas in the next session. Encourage saving recylclable materials like yogurt containers and lids, cardboard boxes, and sourcing natural materials from the earth.

BADGES

5 minutes/family or 10 minutes all together

What was most challenging for you? How did you overcome that challenge? Did you try something you've never tried before?

background info

Engineering is a process and way of thinking. Engineers like to solve problems and work to make things more efficient. Failure is normal for engineers and in reality is an essential part of the process. It helps engineers learn and improve things!

Prompting participants to reflect on what they are learning may influence how they participate in the remainder of the program. This can help solidfy the connection between learning about yourself and your family through robotics.

BADGES

facilitator background

TRYING NEW THINGS

- The purpose of badges in week 3 is to talk with participants about new activities and tasks they've tried.
- During this workshop participants explore new materials as well as starting to develop details of their storyline (and perhaps how their story will manifest itself through robotics). There is opportunity for moms to try programming or kids to take the lead in design. Most importantly, it is an opportunity for families to remember together different times together and how those times made them feel.
- As the families learn to work together and learn new material ask them questions that prompt them to reflect on their own learning.

MORE RESOURCES

Hummingbird kit sensors tutorials
http://www.hummingbirdkit.com/learning/introduction-hummingbird-scratch#distance

Birdbrain Technologies Coding Tutorials playlist on YouTube
https://youtu.be/gTZ_lvTKtkA