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
- Hummingbird how-to sheets or components cards
- Paper
- Markers/pens
- Storyboarding worksheet

workshop day 3

1. WELCOME & SHARING
Eating, sharing any backpack play from last week

2. STORYTELLING
Share a story, introduce theme

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

4. ACKNOWLEDGING
Reflection on activities + badges
Introduce backpack play

EATING & SET-UP

20 minutes

Welcome families as they arrive. Provide food and drinks.

Today's theme is **Engineering**.

ASK

What is engineering? Have you heard that word before? Possible answers include train engineer, software 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.

<<EXPAND THIS DEFINITION>>

materials

Light meal, disposable cutlery, drinks with lids

critical questions

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.

HOME PLAY REVIEW

5 minutes

Pair families up to share photos.
Remind families that one option for backpack play this week was to do a self-documentation of "programmed objects" in their lives, or things that they use in their lives that need a computer program in order to work.

badges

ASK

Who made progress on their stories? Did they work as a family? Did they work individually?
Award the **Storyteller Badge** to those who did this part of the Home Play.

ASK

Who in each family did some form of self-documentation (like taking pictures, making a video)?

EXPLAIN

Explain doing activities like describing your hobbies and recording it is a form of research. If you were to record your hobbies and interests over time (even like writing it down in a journal) then you would have a history of hobbies that you could analyze. So for those who participated in this part of the Home Play you have earned your first **Researcher Badges**.

background info

Facilitators can listen for overlap between the objects they shared, everyday practices that might overlap with robotics /programming (like playing video games, using a sewing machine, etc) and point out that understanding computer programming gives us a way to understand (and even create) those objects.

photo: taking pictures, photos from home

SHARE A STORY

15 minutes

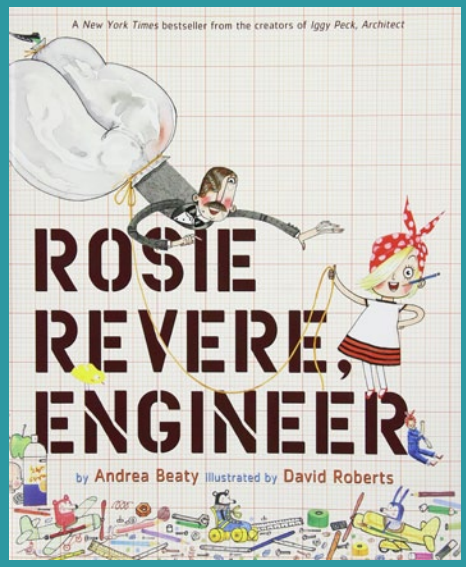
Families gather together. Facilitator shares a book or traditional story.

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 parts so that they can start building!

materials

Book, visiting storyteller.

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



background info

You may choose to have a family read a book to or tell a story to the group

DAILY THEME

5 minutes

SHORT DISCUSSION ON THE THEME OF THE DAY

Have a quick discussion: What is Engineering? What do you think of when you hear that word?

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!

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.

background info

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!

picture: ???

UNPLUGGED PROGRAMMING: LOOPS

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 the robot 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, repeat instructions 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).

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.

SAY

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

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?

critical questions

Interpret "loop dance" in a variety of ways. e.g., pow wow dance step, pop song, etc

Photo: Mike S. leading repeat 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

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.

INSTRUCTIONS

Follow step by step instructions on Tech Tales or Hummingbird Robotics website

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

materials

Computers with Birdbrain Robot Server and Scratch 2.0 installed

Hummingbird boards, USB cords, and single-color LEDs

Slides and/or projected Scratch screen

Troubleshooting Guide

critical questions

<<Highlight Other ways of knowing, observational and experiencial learning>>

background info

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

REFINE YOUR STORY TOGETHER

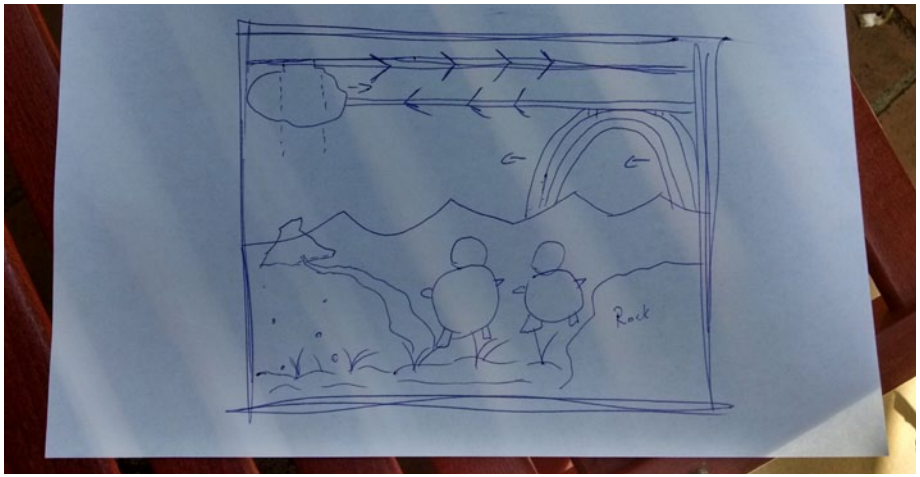
15 minutes

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?"

Use the handout "Tech Tales Diagramming." 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.

set up

Families may prefer to label the actions of each element directly on their drawings, or use stickers to mark which component they are using.

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 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?

materials

Slides (optional)

critical questions

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!

set up

BADGES

5 minutes

For the badges awarded today, you thought about how to use some of these materials in a new way – to represent and tell a story.

Like **electrical engineers** you are thinking about how to connect things to make them go.

Like a **roboticist** you've begun to look at how those materials can move.

Each member of the family writes down their name and what they are most proud of that they accomplished during the workshop. When they turn in the sheet the family gets a **family badge.**

AT-HOME PLAY

5 minutes

- Self-doc: What programmed devices do you use in everyday life?
- Component remix: Program 1 component to do 3 different things
- Check out Engineering resources: books, online videos

materials

- Badge visual: slide or work book page
- Badges
- Projector
- Family badge worksheet (1/2 page)
- Books, website, cameras
- Backpack play page in workbook

background info

Individuals and families will be able to track their progress and areas of specialization with badges. Badges are awarded for individual work and collaborative family work. The primary learning goal of the badge systems is to make visible to participants potential learning opportunities. In addition, badges allow participants to see each others' developing areas of expertise and may foster collaboration across skill sets.

badges

Complete any part of the Scratch Code Remix at home to earn the Computer Science badge.