TECH TALES

MAKE. LEARN. SHARE.

DAY 1: INTRODUCTIONS
Algorithms

Today's session is about getting to know each other and getting oriented to the program. We will talk about what we think about robotics and how they work.

badges

materials

- Workshop helper
- Light meal
- Diorama examples
- Projector and slides
- Name tags, lanyards
- Backpack checkout forms
- Backpacks + Hummingbird kits
- Large paper/dry erase board
- Markers/Crayons
- "About Me, About Us" Cards
- Badges
- *Optional: Energy Stick, bowl of water, masking tape*
- Books

workshop day 1

1. WELCOME & SHARING

Welcome participating families and introduce everyone. Dinner and ice breakers. Introduce the program.

2. STORYTELLING

Share a book or traditional story. Facilitator tells a story from their life.

3. EXPLORING

Adult meeting
Children: Toothbrush Robot
Families: Grown-up Robot

4. ACKNOWLEDGING

Reflection on the day: How does what was done today relate to algorithms?
Check out backpacks.
Prepare for next week.

workshop day 1

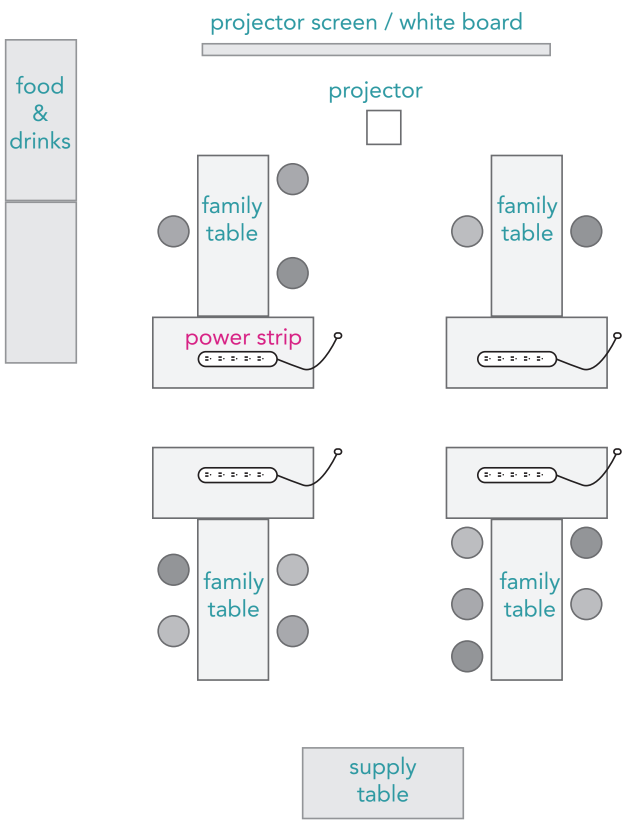
EATING & SET-UP

20 minutes

Welcome families as they arrive. They will pick up their name tags and take plates of food to their tables. As they eat and wait for everyone to arrive, they will fill out their "About Me" cards with words or pictures.

Post a schedule of the day prominently in the room, on a white board, paper, or projected on the wall.

Sample room set up



materials

Light meal, disposable cutlery, drinks with lids

Name tags, lanyards "About Us, About Me" cards

Markers/crayons

background info

Not all families may be able to arrive exactly on time. You may want to serve dinner early to start the workshops on time. Be sure to ask about dietary needs ahead of time.

set up

Set up food and paper goods on a table.
Lay out name tags and "About us, About me" cards on family tables with markers.
Arrange any books or supplemental items on a table.

badges

Badges can be awarded at the end of the activity or saved for the end of the workshop.

INTRODUCTIONS

10 minutes

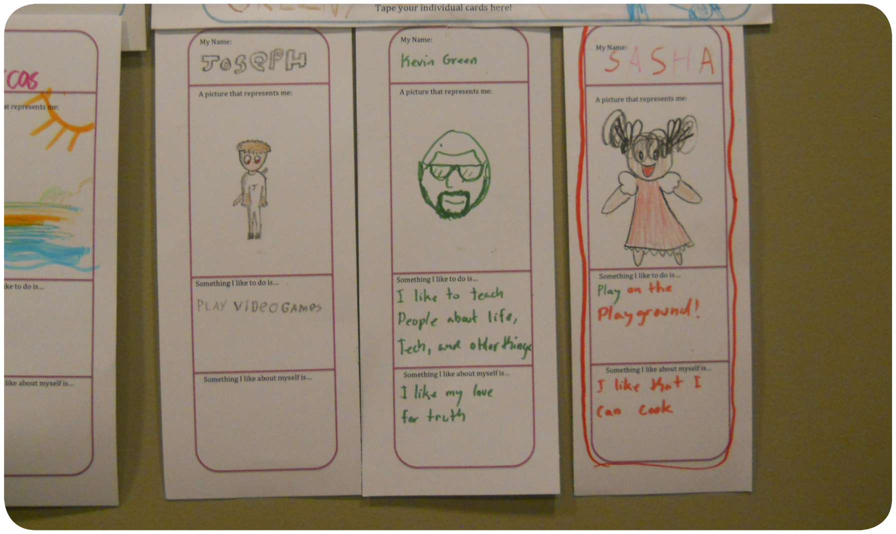
Welcome participating families and introduce everyone.
"Welcome! We are so excited that you have decided to join us! We have put together a workshop where our main goal is for you to have fun and learn about robotics as a family and as a group."

INTRODUCTIONS

Introduce yourself to the group, and feel free to use any ways you feel comfortable to open the session. We have included "About Us, About Me" cards to get the ball rolling.

Have family members trade their "About Us, About Me" cards with each other. They will introduce each other to the whole group. Include your own example of the card filled out so they can get to know you too. At the end, you can collect the cards and post them on the wall for the rest of the workshop sessions.

The facilitator's diorama, supplemental books and information



ASK

Who has worked with robotics? Programming? (Show pictures of each on a slide)
How do you think these might be important in your life?

EXPLAIN

Robotics (,or physical computing) is one way that you can make physical happen in the world using programming. Robotics uses electricity running through circuits, and programming to control actions and reactions. You can build things that move using motors, control with sensors, and blink and change colors using lights.

"All of the things we are learning and doing in this workshop are the foundations of what many engineers do, and how many of the things that we use in our everyday life are made.

For our workshop you should use your imagination and be creative. You can incorporate arts and building into your robotics projects. We are going to learn about all of these starting today!"

ICE BREAKER

4-8 minutes

HUMAN CIRCUIT

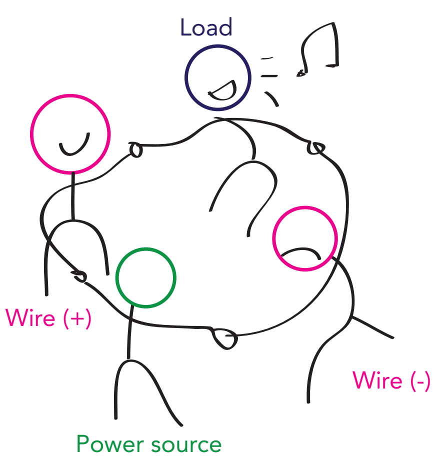
Explain that we will be participating in a quick activity that will help us get to know each other, also called a "mixer," or "icebreaker."

Ask for two volunteers:
One **source** (e.g., a battery, electrical outlet), and one **load** (e.g., light bulb, radio, anything that uses electricity).

Divide the rest of the group in half:
Two separate **conductors** (e.g., wires).
Ask the first wire to hold hands with the source;
then ask the **load** to hold hands with the first wire;
then ask the second wire to hold hands with both the load and the source, forming a circle.

Since **electricity** moves through a circuit from **positive** to **negative** poles of a power source, you can ask volunteers on the positive side to smile and volunteers on the negative side to frown just for fun.

Human Circuit



Once all the hands are held and the circuit is complete, ask the load to sing a note or do a little dance to show that he or she is powered.

materials

Your bodies
Optional Extension: Energy Stick
Bowl of water, or various materials

background info

In a **circuit**, **electricity** flows along one path–made of a material that conducts electricity (a **conductor**), like wire–from the power source, through whatever 'load' or component needs to be powered, and then back to the source.

Short circuit refers to a circuit that *does not* have a **load**. For example, a short occurs if the lamp is connected to the circuit, but a direct connection is present between the battery's negative (-) terminal and its positive (+) terminal.

badges

Participants will earn an Electrical Engineer badge, having experienced electricity in a new way. As an electrical engineer, you can think about what materials are conductive, and identify systems where energy flows.

What's Happening?
A load needs current, so a circuit has to be complete before it's powered. Electricity won't flow, so it can't move or generate current in a broken or incomplete circuit.

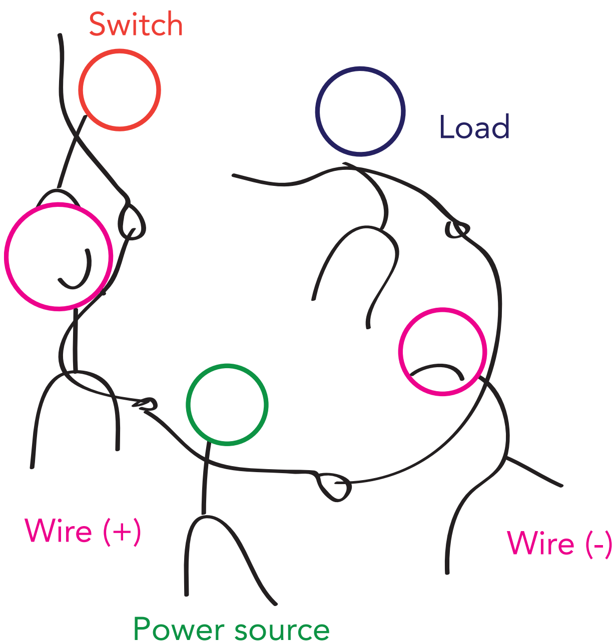
Next: Switches

Ask for a volunteer in either wire group to be a switch.

Let the switch hold hands with the load or let go and swing away from the load while still holding hands with the first wire.

When hands are held, the load should sing or dance. When not all hands are held (broken circuit), the load should fall silent or still.

Human Circuit with Open Switch



What's happening?

A switch is like a drawbridge that completes a circuit when it's down and interrupts or 'breaks' a circuit when it's up. This is what happens when you flip a light switch and the light goes off and on: when the electrical current is running through the light bulb, the light is on; when the circuit is broken, the light turns off.

EXTENSION: Energy sticks

Use the Energy Stick as a "load." Have one participant hold one electrode and the person next to him or her hold the other electrode. If everyone in the circle is holding hands, the Energy Stick will light up and make noise. But as soon as someone breaks the circle it will stop. Have the participants predict how many people the current can pass through and still light up the stick.

Lead them through a demo of how a basic switch works (two people break contact).

Test the conductivity of water by having two participants place their hands in a bowl of water or hold different materials to complete the circuit.

What's happening?

Materials that allow electricity to flow are called conductors. Some examples of conductive materials are metal and water. Human bodies are around 65% water, so they can conduct electricity.

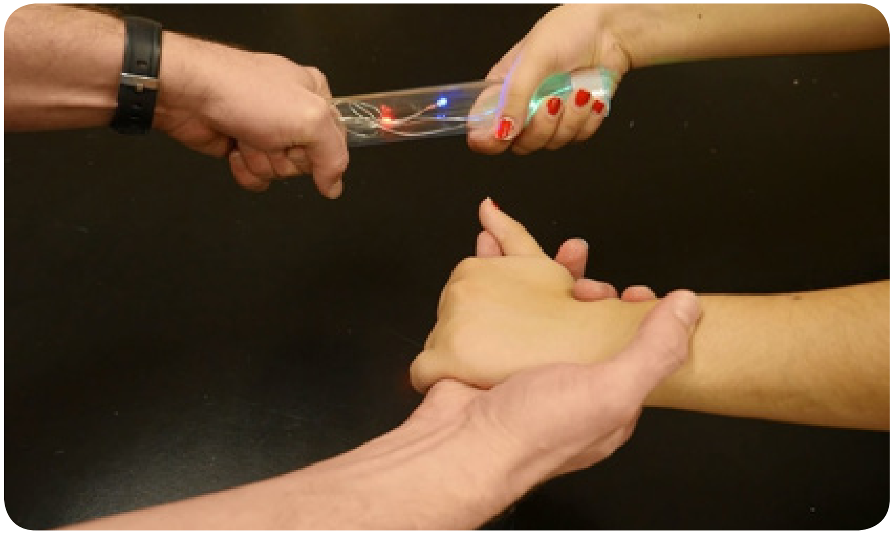


Photo from Arbor Scientific
http://www.arborsci.com/cool/fun-and-engaging-activities-using-the-energy-stick

SHARE A STORY

15 minutes

Gather families together. Read a picture book or share a traditional cultural story with the whole group. If you have the opportunity to invite a visiting storyteller, consider inviting a traditional storyteller from within the community, or an engineer or other scientist to tell a story from their life. Invite participants to share their ideas about what they think the story means to them.

If the participants are comfortable sharing in front of a group, you may offer the option for a participant to prepare a personal story or read a book in their preferred language.

materials

Picture book, visiting storyteller.

Read-aloud book options:
The Most Magnificent Thing, by Ashley Spires
Ada Twist, Scientist, by Andrea Beaty,
Illustrated by David Roberts

background info

Stories don't necessarily need to fit in with the day's theme, but can have themes of problem-solving, growth mindset, design thinking, or perseverance.

A story that relates to a program or series of instructions will relate to the theme of algorithms.

DAILY THEME

5 minutes

SHORT DISCUSSION ON THE THEME OF THE DAY

What does Algorithm mean?
An **algorithm** is a complete set of instructions we use to accomplish a task. A cookie recipe is an example of an algorithm. It includes all the ingredients, amounts, tools, and instructions that need to be completed in order to bake a certain kind of cookies.

Knitting patterns are also algorithms. They include the type of yarn you'll need, the size of needles to use, and the kinds of stitches, and the exact order and number of stitches to be made in order to complete the garment.

A programming algorithm is a computer **procedure** that is a lot like a recipe and tells your computer precisely what steps to take to solve a problem or reach a goal.

Human Circuit activity

background info

Ada Lovelace is often called the Mother of Computer Programming as she wrote her code for a theoretical computing machine in 1842. The official programming language of the United States military is named after her.

Check out the book ***Ada Byron Lovelace and the Thinking Machine*** by Laurie Wallmark & April Chu

ADULT MEETING
15 minutes

materials

Large paper
Markers

set up

Divide parents and children into separate rooms or areas of the room.

INTRODUCTIONS
Ask everyone to introduce themselves. Share why you are excited about this program.

EXPLAIN
Explain we are having a separate parent meeting:

- To help parents get to know each other
- To give us a chance to talk together about what roles we can take in the workshop

Explain to families that we'll be doing a lot of sharing stories, giving feedback and suggestions on each others' projects, acknowledging each others' learning, working with each other within our families and even across our families.

SHARE

- "What do we all hope to get out of this workshop? Why is it important for you to do this together?" Talk to the people around you and share your thoughts with each other.
- "What are our ideas about how we should all work together during this workshop?" Write this on a big piece of paper that is visible throughout the workshop.
- "How can we share an understanding of how we should treat each other in the next few weeks?" Come up with a Community Code and write this on the large paper. *Examples: Be open to lots of ideas, respect each other, be honest, learn through failure, try out lots of ideas for the same solution, etc.*

ASK
Any questions for us?

KIDS' ACTIVITY

15 minutes (simultaneous with adult meeting)

TOOTHBRUSH ROBOT

Children practice programming the facilitator (human robot) to brush their teeth.

EXPLAIN

"We are here to experiment and work together. If the thing you're working on doesn't look or work the way you think that it should, that's okay! Every time you come up against something difficult, it's a chance to learn. Perfection is not expected. We hope you try new things, and work together."

ACTIVITY

- Introduce human robot to the participants
- Ask children to describe what a couple of the steps of brushing your teeth are. Write down the steps as people call them out.
- Once you have a couple steps written on the whiteboard, pause and "**upload** the code to the robot." Explain that this is what they will be doing as they code their own robots: they will have a code that is a list of steps, or an **algorithm**, and then the robot will read that list of steps and do exactly what it is told to do. We will see what that means as our robot follows our steps!
- Read each line of code out and have the human robot complete the tasks exactly as they hear it in that order. Remind learners that the robot is doing exactly what it is told. What do we want to change about our algorithm?

materials

Volunteer helper
toothbrush & toothpaste
cup of water
cup to spit in
towel
white board/large paper
marker

background info

Debug: Tweaking the setup of a project (in this case the code) to fix errors (bugs) and work toward getting an expected outcome.

Fun fact: *Grace Hopper, a Computer Scientist and Navy Rear Admiral worked on the "Mark I Electromechanical Computing Machine" in 1943. When testing the machine, she found a moth stuck in a relay. By removing the moth, she was literally "debugging" the computer.*

Troubleshoot: Locating the cause of a problem and treating it.

Fun fact: *This word probably came from the late-19th/early-20th century name for people who worked on telegraph or phone lines.*

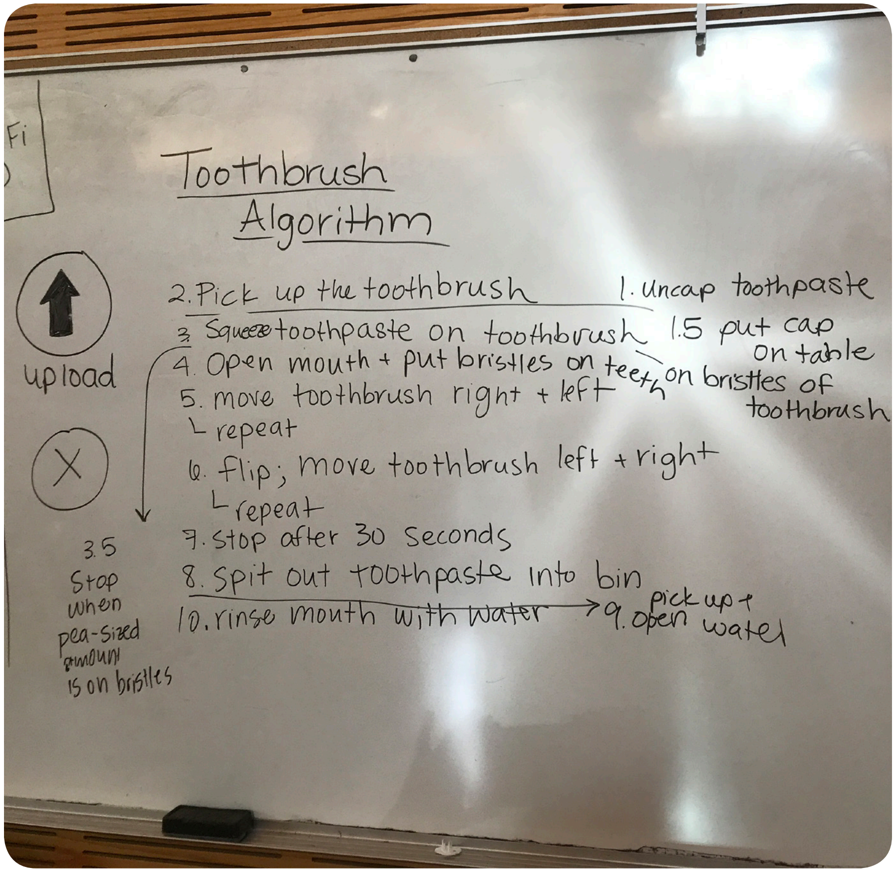
Upload: Sending data (in this case, your program) from one computer to another. The second computer is the robot.

set up

Set up your "robot zone" next to a large white board in full view of the children. Have children gather around so they can all see and be heard.

Toothbrush robot continued...

- **Troubleshoot** and **debug,** repeating the steps until you have a working script. Explain that this is all part of the process: you will have an algorithm that you think will do one thing and then something is not quite what you wanted. Then you go back and **debug** the algorithm (or fix the mistakes) until the computer does exactly what you imagined.
- This process of going back and forth between your code and the robot is a process that is used a lot by engineers as they are designing a solution to a problem. They rarely get it right the first time!
- Tell the group that they just made an algorithm for brushing your teeth.



GROWN-UP ROBOT

20 minutes

When adults return, children will program their adult as a robot to do a task like they did with the toothbrush robot. Children and adults debug the program together.

EXPLAIN TO FAMILIES

We shared about stories and how we can use the Hummingbird to create an interactive diorama. In order for these things to happen, you will have to build them using your Hummingbird kits and program them on the computer. The program that you will use is called an "algorithm". We are going to practice writing and running algorithms now so that we can practice how to write our computer programs.

"Now we will have an opportunity for you to try bring human robots. How would you tell a robot how to accomplish something?"

- Break it down into steps
- Be as literal as possible

Now we will have an opportunity to try to code human robots! Choose a grown-up from your family to be a robot, and the rest of you will code your robot to complete a task exactly as they hear it.

ACTIVITY

- Option: create a non-linear path using the tape. It is fun to put obstacles in the way.
- Divide participants into groups (can be family or fewer people, but minimum 2)
- Have each group choose someone to be a human robot (usually the grown-up)

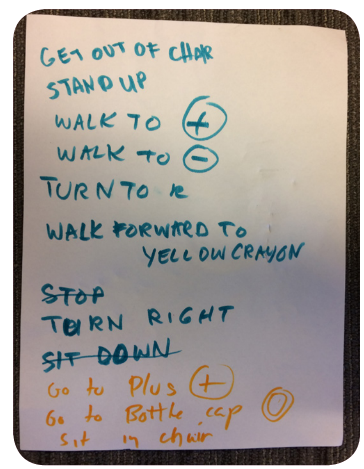
materials

Paper, pencils
Masking tape (that can be put on the floor)
Obstacles around the room (tables, chairs, etc)

badges

Programmers have to pay attention to details and sequencing just as you did.
All programmers also have to debug their programs to make sure they got all the details. Having to keep testing doesn't mean you aren't getting it right: it means you're a thorough programmer!

- Have participants create a code for their robot that the robot will follow to complete the path of tape, or complete the task exactly as programmed.
- Depending on the amount of time or space available, you may choose to simplify the activity to a straightforward task like walking around a table.
- Encourage participants to **debug** their code until it works.



REFLECTION

5 minutes

DISCUSSION

What did you learn about algorithms?
What did you think about programming a human robot or being programmed?
Do you think you're ready to start programming a robot?

BADGES

5 minutes/family, or 10 minutes all together

BADGES:

Explain to participants that badges are awarded by facilitator, or by members of your family. To receive a badge you must show that you've completed the criteria to either a peer or facilitator. 45 minutes before the end of the session, talk with everyone in each family (depending on seating configuration and size of family).

For example, in a child-adult pair, you can talk with them both together, or with multiple children you can talk with them all at the same time and then speak to their adults separately. (Families in our workshops have tended to sit close together so it has been easy to speak to the family all at once.)

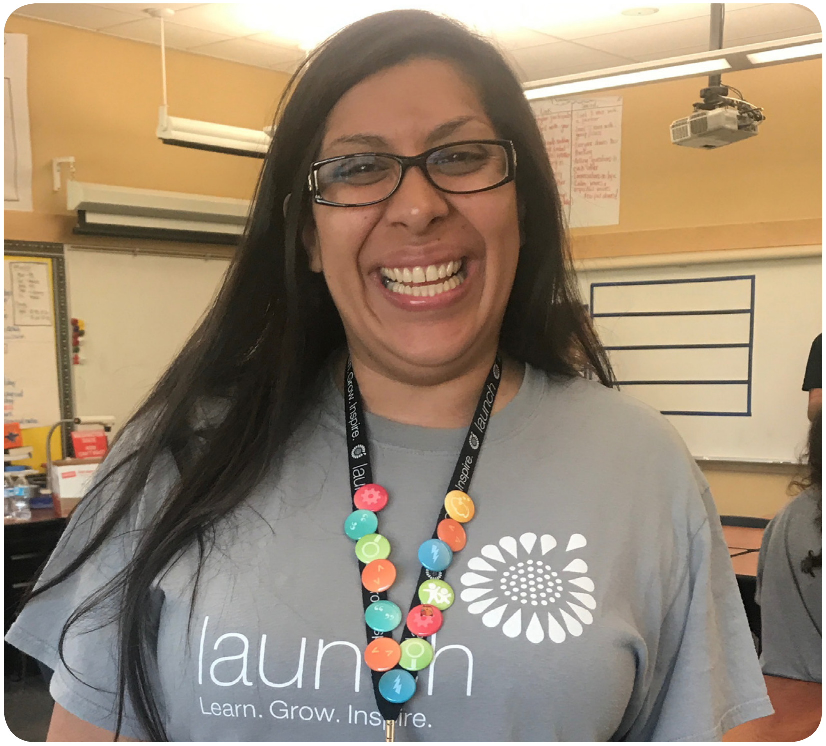
Recall activities that individuals completed or you saw them doing (like concentrating with the computer) to build connections between the activities they did in the workshop and the activities and characteristics typical of each of the roles.

materials

Badge visual: slide or workbook page
Badges or badge worksheet
Projector

set up

Be prepared to share some personal responses or prompts to encourage discussion



BACKPACK CHECKOUT & TECH TALES WEBSITE

15 minutes

BACKPACK CHECKOUT

- Each family gets a backpack with a camera, computer, Hummingbird board, USB cord, and LEDs. Throughout the workshop, participants will be adding more robotic components to their kits in the coming sessions.
- Share computer login information and any other technical details about connecting to the internet, etc. *See page 6 in the family guide*
- Have an adult from each family sign a check out form with the number on the equipment. Collect these forms to keep track of the materials.

materials

Backpacks & equipment	Projector
Backpack checkout form	Internet access

WEBSITE:

Walk through each section of the website *www.techtales.online* using the projector.

The website can be used for technical help, ideas, and contact information. Indicate where helpful videos are located.

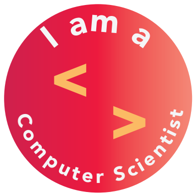
workshop day 1

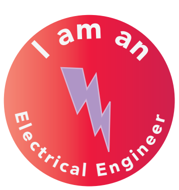
BADGES
facilitator background

Roboticists are....	Computer Scientists are....	Artists are....	Researchers are....	Storytellers are....	Electrical Engineers are...
Creative Builders	Creative Problem-Solvers	Observant	Question-askers	Historians	Curious
Persistent	Coders	Creative	Curious	Interviewers	Problem-solvers
Playful	Persistent	Storytellers	Photographers	Teachers	Diagrammers
Systems Thinkers	Logical	Expressive	Thorough	Sharers	Careful
Good at Repairs		Makers			Technicians

...What else?

page 17 in family booklet





MAKING ROLES VISIBLE

The purpose of the badges in Session One is to outline the different types of skills participants bring, skills they will develop and/or be exposed to through the course of the workshops and how those skills align with practices of six different roles:

- Badges demonstrate how interchangeable many of these skills are across roles.
  For example, both artists and roboticists are *visionaries*—projecting what they believe are possibilities through the tinkering of materials. Storytellers and Computer Scientists are precise in their intention. What participants begin to take away is that these skills are highly *contextual* and *flexible*. Computer scientists can also benefit from exploring and trying new things (that's how new languages develop!).
- Near the end of the session you can speak to how they stood around in a circle, holding hands, experimenting with conductivity. That's what electrical engineers do! They test materials to see which materials conduct energy in a specific way. They were also researchers, observing and keeping track of what worked and why. They are also researchers for asking questions as to why something **did** or **did not** work.

MORE RESOURCES

What is an Algorithm in Programming? - Definition, Examples & Analysis
http://study.com/academy/lesson/what-is-an-algorithm-in-programming-definition-examples-analysis.html

Troubleshooter Etymology
https://www.etymonline.com/word/troubleshooter

Google Honors Grace Hopper...and a "bug"
https://www.wired.com/2013/12/googles-doodle-honors-grace-hopper-and-entomology/

Energy Sticks
https://www.stevespanglerscience.com/store/energy-stick.html

Fun and Engaging Activities using the Energy Stick
http://www.arborsci.com/cool/fun-and-engaging-activities-using-the-energy-stick