TECH TALES

MAKE. LEARN. SHARE.

DAY 4: CONSTRUCTION
Design Process

This session engages families in design work, learning how programs can control how electronic devices behave, and the underlying science principles involved in this work. The design work is sometimes open ended play and tinkering and more "how to" tutorials. By the end of the session, families will have most of their sets designed and pieces constructed. Families are integrating lights, motors, and sensors into their designs.

badges

artist

researcher

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 4

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

2. STORYTELLING
Share a story, introduce theme

3. EXPLORING
Revisit projects and make a plan for the day
Design/Skill share
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.
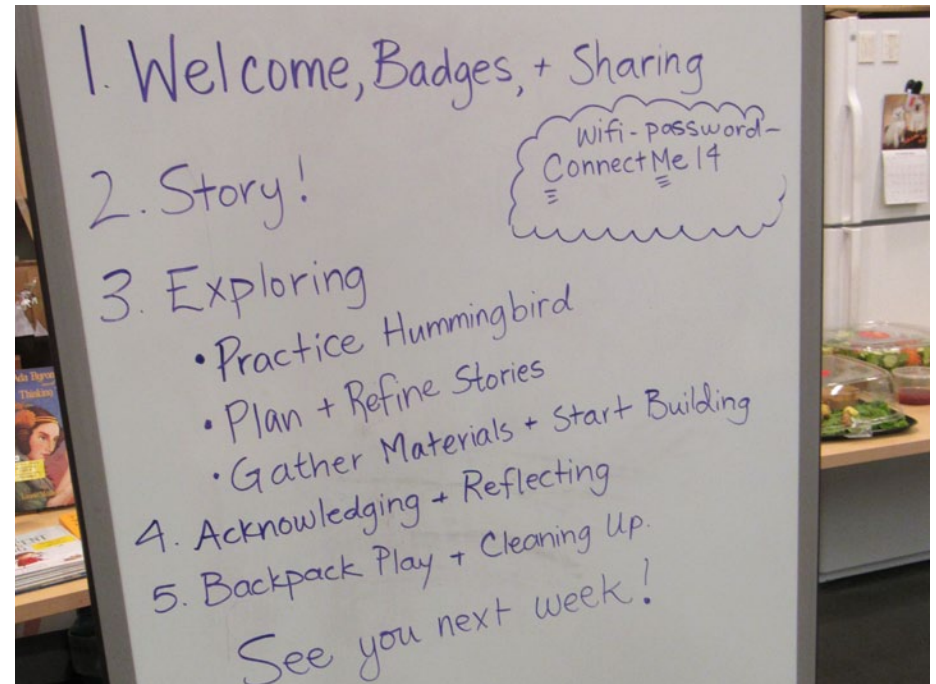
<<EXPAND THIS DEFINITION>>

materials

Light meal
disposable cutlery
drinks with lids

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.

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.

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**.

photo: taking pictures, photos from home

workshop day 4

STORYTELLING
15 minutes

Gather families together. Read a picture book or share a traditional cultural story. If you have the opportunity to invite a visiting storyteller, consider inviting an engineer or other scientist to tell a story from their life.
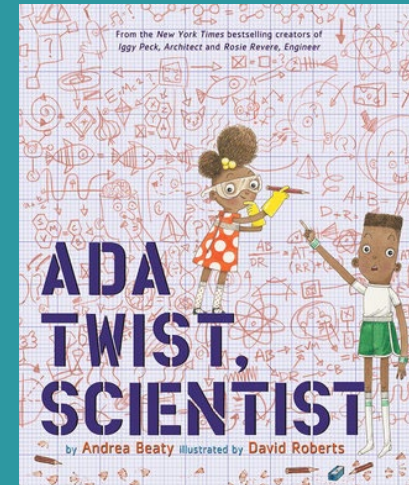
If you feel like the participants are comfortable sharing, offer the option for a participant to share a personal story or read a book.

materials
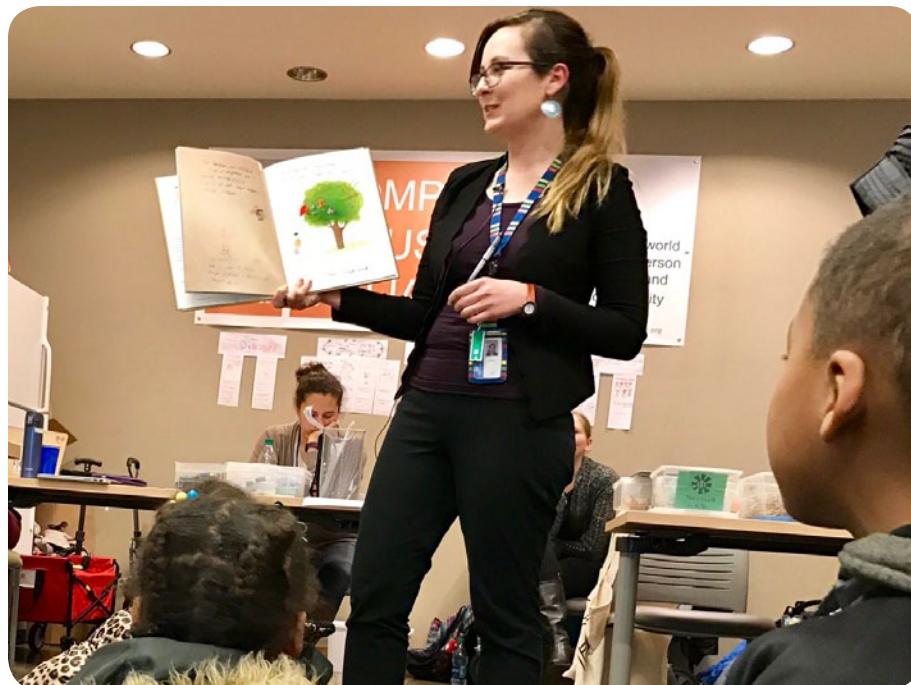
Book

Visiting storyteller.

Suggested books:
<<suggestions>>

background info

Books 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.

You may choose to have a family read a book to the group.

DAILY THEME

5 minutes

Have a quick discussion: What is Design?

The **Design Process** is an approach for breaking down a large project into manageable chunks.

Architects, engineers, scientists, and other thinkers use the design process to solve a variety of problems.

Think about how you can plan your design process as you build your diorama.
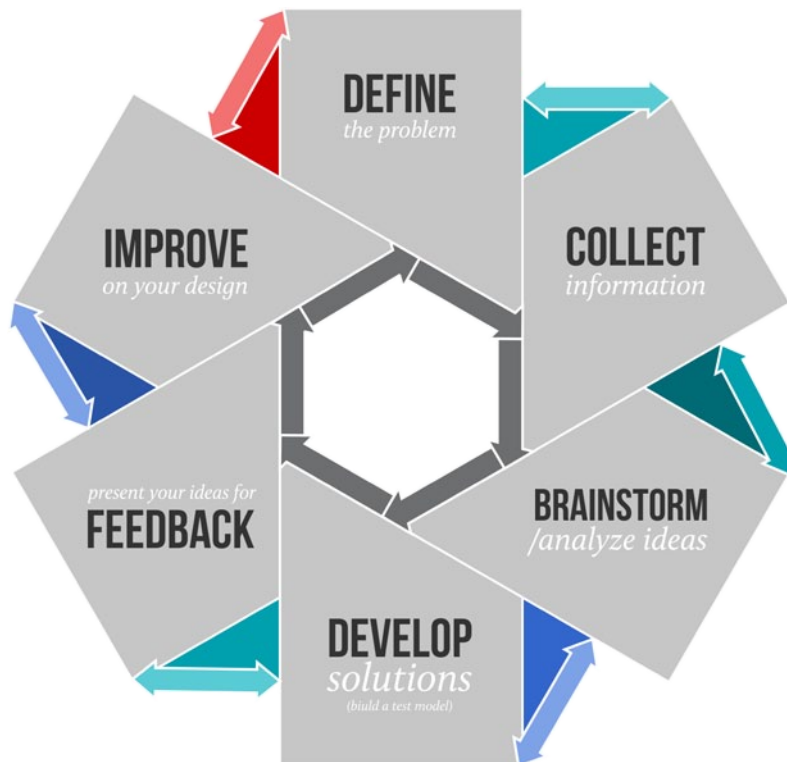
materials

Tech Tales Diorama Guidelines sheet

Explain Diorama Guidelines:
Your diorama should have at least:

Hummingbird
ONE INPUT component
(sensor or dial)
TWO OUTPUT components
(lights or motors)

Scratch
ONE EVENT block
(Example: when X clicked)
ONE CONTROL block
(Example: Repeat X times, Repeat forever, Wait X seconds)

Story
A short written paragraph
in your preferred language
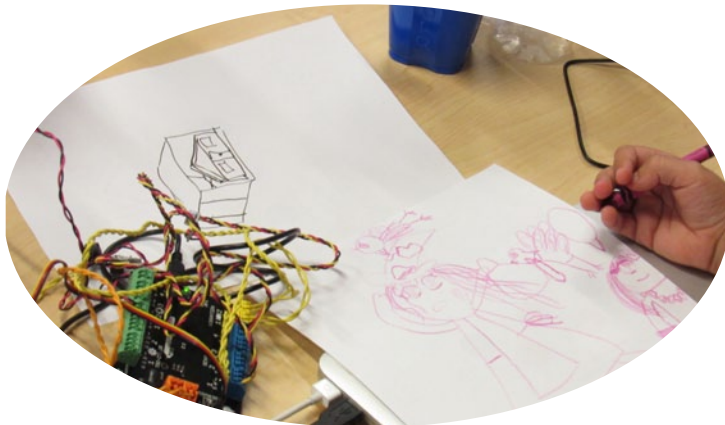
MAKE A PLAN

15 minutes

Have families take out their worksheets along with all materials they have built for their diorama so far.

EXPLAIN

We are about halfway done with our workshops. Now is the time to reflect on what you've done and see if there is anything that you want to change about your designs?

Their job for the next few minutes is to answer the following questions (have these either projected or on a big poster in the room):

1. Do you want to change something about your design?
2. What do you want to have done by the end of today? (negotiate different/competing ideas/expectations)
3. What do you need to accomplish that? (materials, skills, time)
4. Do you need help figuring something specific out? (building, programming, communicating)
5. Who wants to do which parts? Family members can decide on roles, such as Coder, Connector, Problem Solver, Project Manager.

materials

Storyboarding worksheet	Markers, pencils, pens

background info

Instruct families to think about their role for the day, that is, what they want to be in charge of, what materials they'll need, what they want their robotics to do. Make a plan for what they want to finish by the end of the day.

Remind families: Projects should be nearing completion by the end of today

FAMILY BUILDING
60 minutes

At this point, families should be building and rehearsing how the various parts of their projects interact with each other. Facilitators assist as needed, helping with planning, technical help, facilitating conversations. Most work is directed and completed by families.

They should also be writing their paragraph around their story and rehearsing how they want to present their stories.

materials

computers
full hummingbird kit

craft materials

background info

Identity Connection: Exploring how technology can support expressions of families' identities and stories.

Potential questions and probes to prompt families:
- Consider the learning goals with respect to design, force, and energy. Ask families how these target goals are reflected in their project. For example: How is energy moving in their projects?
- What kinds of forces are present? How do the components impact force and motion?

Facilitators can rotate around the room. Questions you can ask during this time:
- Are there any problems that you have encountered with your design/programming? How have you tried to solve them?
- What are you most proud of so far in your project?
- Is there some part of robotics/programming that you haven't tried yet but want to try? How can you incorporate that into your project?
- What has been really challenging for you so far? What has been the most fun?
- Why is this story important to your family?

DESIGN PAIR SHARE
20 minutes

Families will pair up and talk about their stories and how they designed their projects to bring their stories to life. Share challenges, how families overcame them and get feedback, suggestions for design solutions.

Group families in either pairs or a group of three (this works best in smaller groups of families, especially if you have larger families). Explain that as engineers design solutions, they share their designs in teams, get feedback, and improve their designs. The purpose of this "design charette" is for everyone to share their current progress on how they are bringing their stories to life, share their challenges/solutions, and get feedback to improve their designs. The structure of the task will be as follows:

The first family shares their story, the scene that they are building, and the parts of their diorama that they have built/want to build.

Some specific things to share:
- challenges they have encountered (mechanical challenges, challenges in how to translate their story into the robotics parts, assembly challenges, programming challenges, etc)
- strategies for overcoming those challenges
- what they're particularly proud of
- what they still want to do

The second family can ask questions or give feedback, such as: why is this story important to your family? What do you still want to try? What do you like best about your project and why?

The second family shares their story and the group repeats first and second steps.

materials

Dioramas in progress	Storyboarding and story diagramming worksheets

background info

Family members will have the opportunity share stories and project ideas with another family as well as give and receive feedback.

Family members will learn that iteration, challenges, and finding solutions to challenges are part of the engineering process.

Family members will deconstruct engineering problems and brainstorm solutions to those problems with other families in order to improve on their designs.

Plan on about 10 minutes per family.

Family members identify what they want help with: Programming a behavior, using a new component, building a certain type of structure, using a certain tool.

Example: if one family wants to use a gear motor but doesn't know how to program it, have a volunteer from another family join them and show them how to do it.

If it turns out a task is too complex, suggest breaking it down into smaller parts and tackling one small part at a time. If no one know the skill requested, facilitator can demonstrate to the whole group or work directly with the family to figure it out

REFLECTION

5 minutes

DISCUSSION

- Debrief the activities that were practiced through the day and relate them to the day's theme. Some discussion points: How did today's activities relate to design?

- Engineers, computer scientists, designers, artists use the design process to revise their concept. They test their design, then revise it when they learn new information or techniques. This makes the final product more efficient and robust, or helps them think about how to communicate effectively.

AT-HOME PLAY

5 minutes

- **Design and Test Drive a New Component**
  or
  Revise and master a currently challenging component
  If families have unexplored components in the Hummingbird kit, design and test this new component as part of their project. If families have a component that is challenging them, have them focus on and refine its function in the project.

- **Complete any backpack play activities from previous weeks**

materials

Discussion slides: optional	(1/2 page)
Projector	Books, website, cameras
Badge visual: slide or poster	Backpack play page in family guide
Badges	
Family badge worksheet	

BADGES

5 minutes

Issue badges for activities completed during workshop. Explain in today's workshop they used skills from all the roles, electrical engineer, computer scientist, storyteller, and roboticist. However, today they had to bring it all together to make it all work in one final piece. That takes a lot of creativity and problem solving.

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.