



# Little Makers

@ Keene Public Library





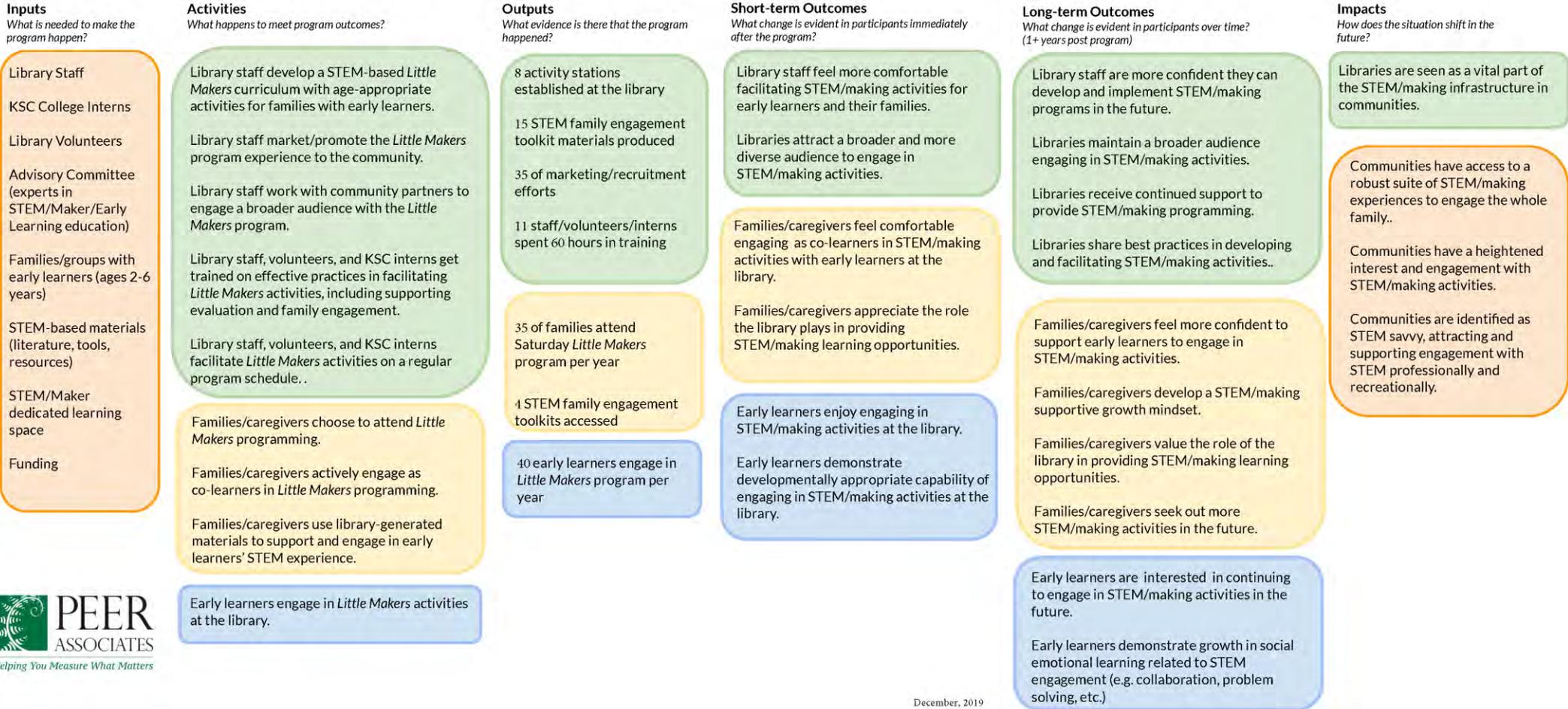
We received a three year IMLS grant to develop and evaluate Making, Tinkering, and STEM programs for children ages 2 through 6 and parents and caregivers.

Early on our advisory committee met to establish goals. The committee included representatives from Dr. Deborah Black (KSC), Dr. Lisa Brahms (Children's Museum of Pittsburgh/ Montshire Museum), Stephanie Chang (Maker Ed), Saroj Ghoting, Joy Kubarek (PEER Associates, Dr. Lisa Regalla (Bay Area Discovery Museum Center for Childhood Creativity, and Dr. AnnMarie Thomas (Univ. of St. Thomas)

# Our logic model established outputs, outcomes, and activities for three audiences: children, parents/caregivers, and librarians.

## Little Makers Project Logic Model

**Situation:** There continues to be a need for high quality STEM programs accessible to a broad audience. In particular, early learners are not only receptive to STEM learning but greatly benefit from such experiences, including aiding in the development of their social emotional and executive functioning skills. Libraries are uniquely positioned as a trusted community resource capable of engaging a broad audience. Keene Public Library is responding to this need, leveraging their years of experience engaging youth and families to implement a robust STEM and maker program for early learners and their families. Formative and summative evaluation will assist in identifying effective practices within the Keene Public Library program that may serve as a model for other libraries across the nation.



# What were we trying to learn?

1. Can libraries effectively use making and tinkering activities to promote STEM thinking for early childhood learners? If so, what approaches, activities, and structures seem to be most potent?
2. What are children doing or saying that suggest the presence of the specified learning attitudes, skills, and knowledge?
3. In what ways do parents/ caretakers observe and/ or reinforce these dimensions of learning outside of the library?
4. What are the needs, successes, and challenges experienced by partner replicator libraries?
5. How can program implementation and/ or replication efforts be improved?

*PEER Associates helped us evaluate our programs through observations, surveys, and interviews*

# LEARNING DIMENSIONS of Making and Tinkering

Valuable learning experiences can be gained through making and tinkering.

Use this framework to notice, support, document, and reflect on how your tinkering environment, activities, and facilitation may have supported or impeded such outcomes.

## Initiative & Intentionality

- Actively participating
- Setting one's own goals
- Taking intellectual & creative risks
- Adjusting goals based on physical feedback and evidence
- Persisting through problems to achieve goals

## Problem Solving & Critical Thinking

- Troubleshooting through iterations
- Dissecting the problem components
- Seeking ideas, tools, and materials to solve the problem
- Developing work-arounds

## Development of Understanding

- Making observations and asking questions
- Testing tentative ideas
- Constructing explanations
- Applying solutions to new problems
- Striving to understand

## Creativity & Self-Expression

- Playfully exploring
- Responding aesthetically to materials and phenomena
- Connecting projects to personal interests and experiences
- Using materials in novel ways

## Social & Emotional Engagement

- Working in teams
- Helping one another
- Expressing pride and ownership
- Documenting / sharing ideas with others
- Physically connecting to other's work

Early on we choose the **LEARNING DIMENSIONS** of Making and Tinkering, developed by the Exploratorium's Tinkering Studio, as a Framework.

A framework is intended to guide planning and implementation.

We also used the framework for evaluation and self-reflection.

Many of the learning dimensions only become evident over time. Learning dimensions do not “just happen” without careful attention to the environment, facilitation, and pedagogy.

The Exploratorium continually researches and tweaks the LEARNING DIMENSIONS.  
Their Library of Exemplars will help you as you work with the LEARNING DIMENSIONS.



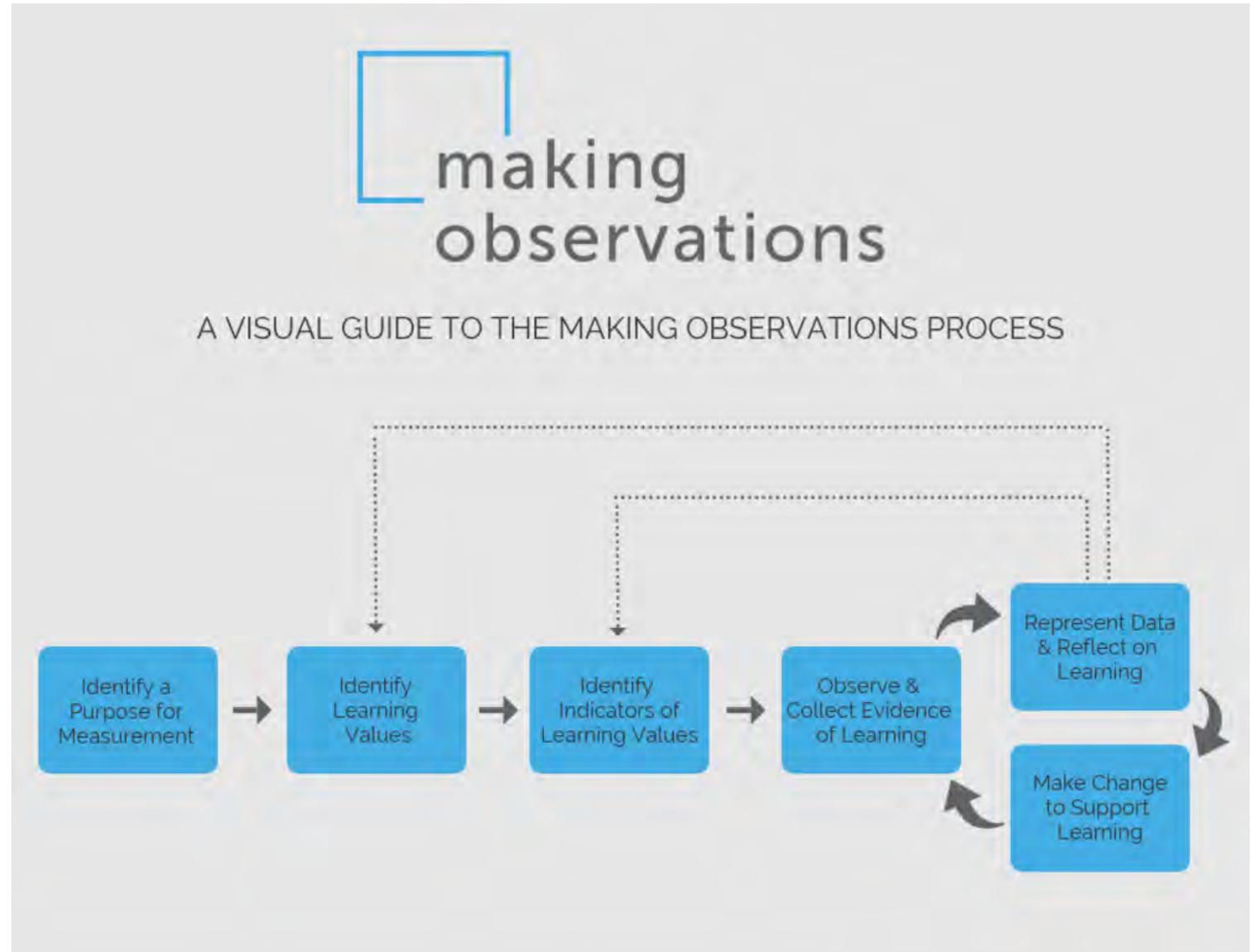
*Initiative and intentionality - Seeking and responding to feedback, from the Exploratorium's Tinkering Library of Exemplars*

Our project has also been influenced by Making Observations.

*Making Observations:*

*Evidencing Learning Through Making* is a project of Children's Museum of Pittsburgh that was made possible through the support of the Institute of Museum & Library Services.

*Making Observations* is in partnership with the Science Museum of Minnesota, Chicago Public Library, and the Montshire Museum of Science.



# Seven Pop Up Events



Small spaces can encourage collaboration. Tested and experimented with equipment and activities in different spaces our story room and in the library.

Practiced facilitation, asking open ended questions, and observation

# Exploratorium Learning Dimensions: Engagement

- **Spending time in Tinkering activities** : play, envision, make, explore materials, try something over and over, etc.



# Displaying motivation or investment through affect or behavior

- show emotions such as joy, pride, disappointment, frustration
- remain after they appear “finished,” and start something new



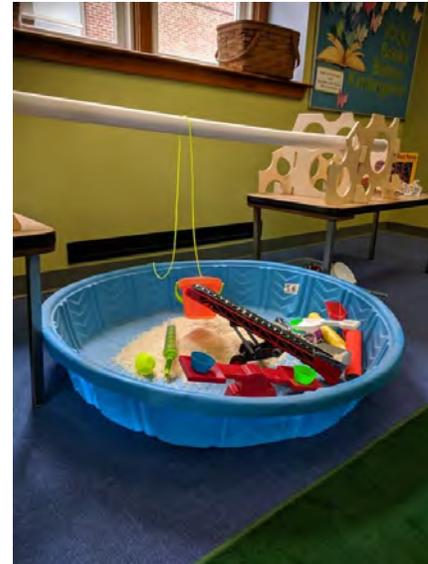
# Exploratorium Learning Dimension: Social Scaffolding

- Requesting or offering help in solving problems
- Inspiring new ideas or approaches
- Physically connecting to others' works



# What did we try

- Ramps
- Wind
- Circuits
- Simple Machines
- Woodworking with sandpaper and Montessori predrilled kits, hammering into clay
- Color and Light



# What happened next

- The new space was completed
- We hosted 15 little Makers Programs
- Each program had between 6-20 children between ages 2-6 and along with families and adult caregivers



# Multipurpose Room Considerations

- Furniture needed to be moveable and multipurpose
- Considered storage
- What could be left out in the space during different programs?
- How messy can we get?



# Setting up for activities

- Intentionally created different areas for activities that would require high facilitation, medium facilitation, and low facilitation
- **High facilitation** : kept out of high traffic area needed extra adult support and control for safety
- **Low facilitation** would still be staffed, but the staff could step away if necessary

# Adjust your activities based on how many staff you have



- Open space for moving and exploring: Medium Facilitation Area



- Projector and Light : Low Facilitation Area

# High Facilitation area : Woodworking



Keep tools in a safe but reachable space

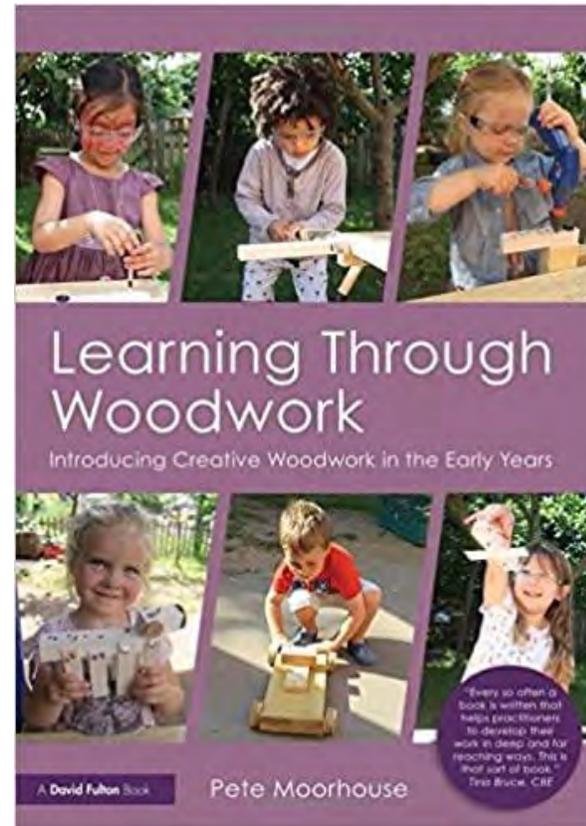
1:1 Child to Adult Ratio with safety glasses



Create boundaries with Moveable shelves, barriers or gates

# Tools : Advised by Peter Moorhouse

- Stubby Hammers
- Stubby screwdrivers
- Hand crank Drills
- Clamps
- Small Japanese Hand saw
- Rasps
- Sandpaper
- Woodworking bench at child height



# When there are not enough adults you can adjust



Developing tool skills



Woodworking Adapted – low risk tools when there aren't enough adults

# A Few Maker Activity Benefits

- Personal and Emotional Development
- Physical Development
- Communication
- Critical Thinking
- Understanding the World
- Expressive Art and Design
- Literacy

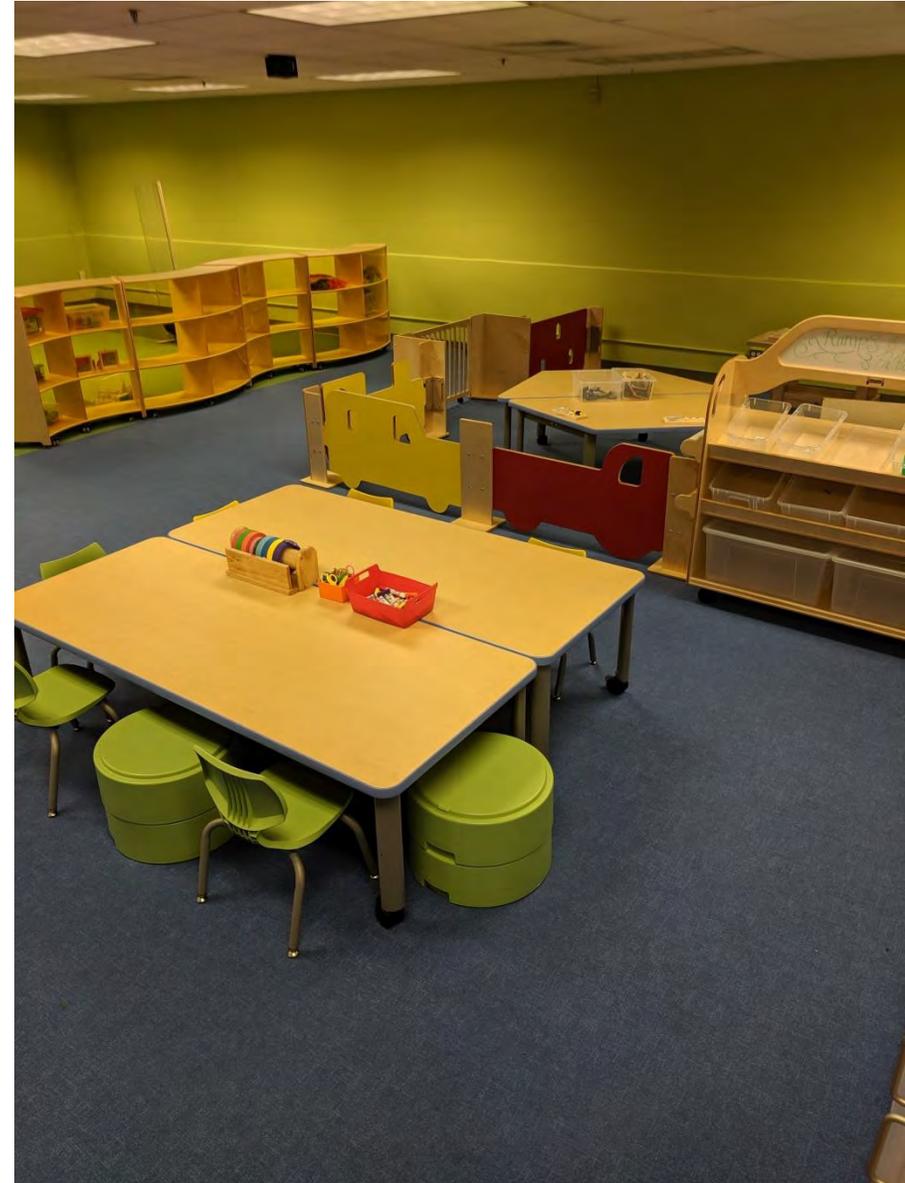
# Learning Dimensions Framework Initiative and Intentionality

- Setting one's own goals
- Seeking and responding to feedback
- Persisting to achieve goals in the problem space
- Taking intellectual risks and or showing intellectual courage : such as trying something that might not work, or offering/requesting feedback



# Maker Space

- Always included materials available for making
- Cart on wheels with bins, full of repurposed materials, paper, objects, tape, glue, etc.
- Very low temp glue guns in the back corner with woodworking tools
- Offered open ended prompts to spark ideas
- Sometimes suggested making objects to test on equipment in a different activity area :  
e.g. wind tunnel, ramps



## A few tips for setting up

Toddlers like to stand and tinker



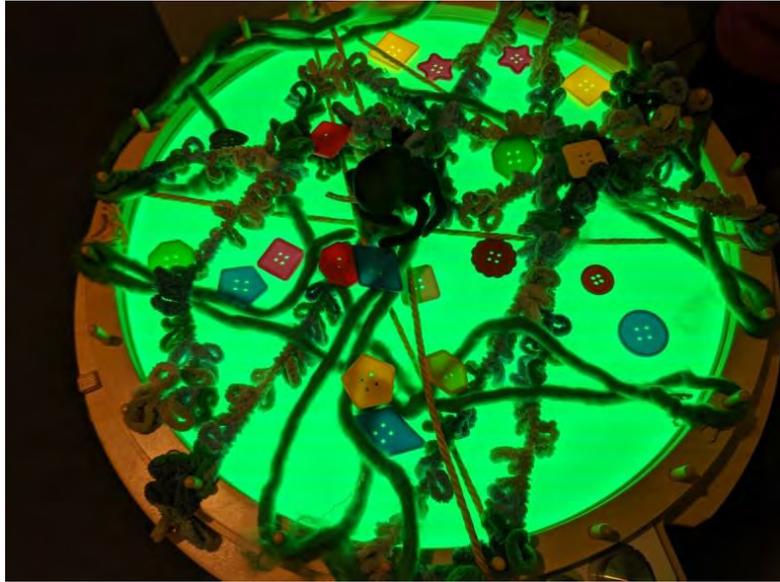
Keep Fine Motor Abilities in Mind



Books and Materials together



# Invest in Multipurpose Equipment



# In Person Challenges

- Setting the expectation for parents to actively participate as their child's learning partner
- Staffing
- Cleanup and breakdown time
- Adjusting for varying family size 1 adult arriving with more than 3 children



# AT HOME **STEM** FUN!

For Parents/Caretakers and Children Ages 2 - 6

An at HOME STEM LEARNING PROGRAM

# Same goals different approach

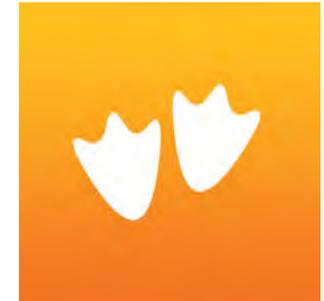
- Offer access to scaffolded STEM and making activities to caregivers and children ages 2 - 6.
- Model adult behaviors that encourage play and caregivers engagement as co learners.
- Demystify STEM learning embedded in play.

## Focus on developing a maker mindset

- Encourage children to be curious
- View challenges as opportunities
- Value the process over the product
- Understand that talent and competence are developed through action, effort and perseverance



# Program Delivery



**GooseChase  
Scavenger Hunt**



# Niche Academy



Little Makers at Home STEM Play for Parents & Children



+ Add new



Categories

**AT HOME STEM FUN!**  
For Parents/Caregivers and Children Ages 2 - 6

Tinkering with sound MAY 2021

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**AT HOME STEM FUN!**  
For Parents/Caregivers and Children Ages 2 - 6

Make it Move! Things that Roll, Slide and Tumble MAY 2021

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**AT HOME STEM FUN!**  
For Parents/Caregivers and Children Ages 2 - 6

Little Makers MAY 2021

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**AT HOME STEM FUN!**  
For Parents/Caregivers and Children Ages 2 - 6

Light and Shadow MAY 2021

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**AT HOME STEM FUN!**  
For Parents/Caregivers and Children Ages 2 - 6

Parent/Caregiver Introduction MAY 2021

# Welcome

## Welcome to a week of Sliding, Rolling, and Tumbling

Ramps and pathway activities are ideal for children of all ages. Playing with ramps will give children endless possibilities to think and create. We have found that children are motivated to engage in this process because they will encounter so many problems and possibilities. Let your child lead the play and help them build and test their systems, make adjustments, and try again until they are successful. Ask them what they think is happening. Challenge them by asking how they could make their ball go further or faster and why they think it goes further and faster. There are so many things children can send down a ramp and along a pathway. It might be the balls we provided, toy cars that roll, or other objects that might slide or tumble. Remember to let them make predictions, test, and figure out what is going on. As long as you keep safety in mind, let them go at it!



This project was made possible in part by a grant from the Institute of Museum and Library Services (LG-95-18-0191-18). Our planning teams include an active [advisory council](#) made up of experts from museums and libraries across the country. Additional support is given by the Friends of the Keene Public Library and the City of Keene, NH.

Click on the BEGIN in the bottom right corner and start your first week of Little Makers STEM fun and learning!

### Make it Move! Things that Roll, Slide and Tumble MAY 2021

3 of 16 Complete

This week we will build ramps and pathways for our objects to roll, slide and tumble along!

 Welcome to a week of playing with things that roll, slide and tumble.

-  Safety
-  Tips on Facilitating STEM Play
-  Reflection and Documentation
-  Science Talk
-  Weekly Scavenger Hunt
-  Books To Read and Share This Week
-  Storytime
-  Additional Resources for Parents and Caregivers

#### This weeks activities

-  Tinkering with Ramps and Balls and things that Roll, Slide and Tumble
-  Sorting and Classifying Objects
-  Lets Play with Ramps
-  Ramp Challenges for Older Children
-  Marble Runs
-  Ball play outdoors
-  Make Your Own Car
-  Painting with Balls

# Safety

## Tips on Facilitation

- Engage as a facilitator and as a co-learner
- Follow the child
- Go slow
- Be a good listener
- Use rich, descriptive, age appropriate language
- Ask how and why questions
- Model behaviors, wonder and think out loud, help your child persevere and learn from failures

# Importance of Reflection and Documentation

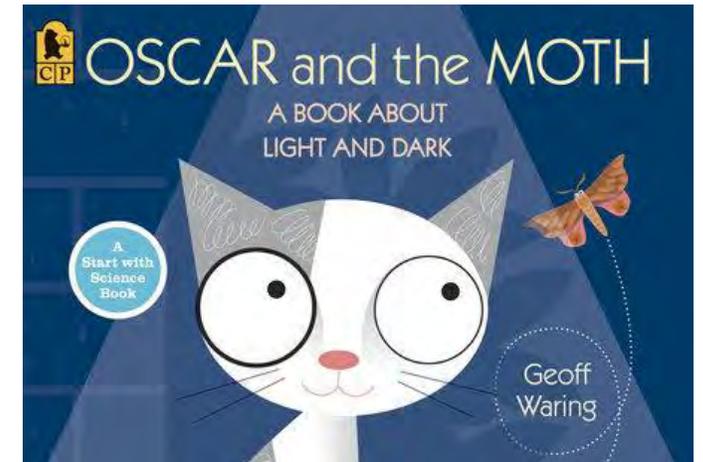
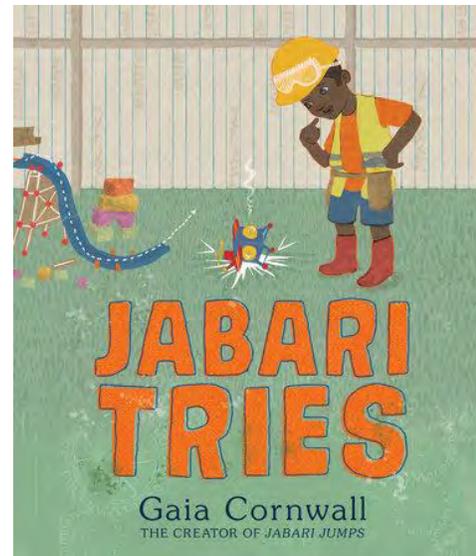
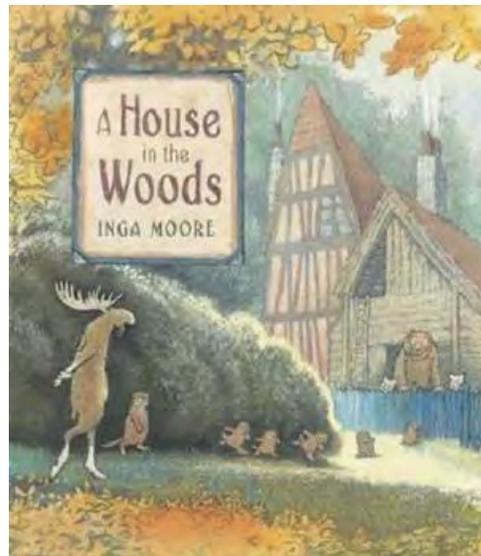
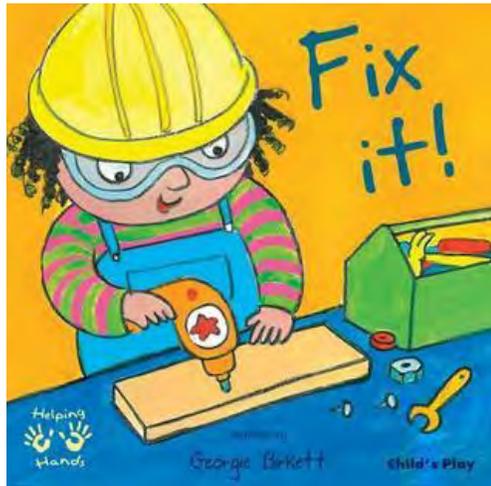
Reflecting is an integral part of STEM learning. Reflecting helps us process information. This is especially important and empowering for children since much of what they do is new to them. Reflecting involves remembering what things looked like, how they changed, felt, tasted, and more. Taking time to talk about what was fun, why it was fun, what happened, and why it happened helps your child make meaning out of what they do. They will make connections or associations between what they are doing or have done and the world around them.

# Science Talk

High Support  
Texture Light Source Slow  
Vibration OPPOSITE  
TRANSPARENT Loud Compare  
Fast Observe Friction Base  
Shadow Quiet Measure Speed Reflect  
Before Energy Force Echo After  
Pattern LOW Opaque Weight



## Books we included in the Kits



# Activities

## STEM Play with Blocking Light and Making Shadows



### Where does that shadow come from?

Light and shadows are ubiquitous. We are usually more aware of light and darkness but might not notice shadows. Many children will not connect shadows with a light source. Other children will consider a shadow as being pushed out by the light. Some children are puzzled by a paradox of light, making a dark shadow, and some children think that the size of a shadow is based on the size of the object. It takes a while before children have the conceptual development to understand the relationship between a light source, an object, and a shadow cast by the object.

### Make a Skyscraper



Playing with light and objects can challenge a child's everyday conception about shadows, which provides a powerful early STEM experience. This is a simple activity to get your child thinking about shadows and what causes them. Using a small number of blocks and a flashlight, you can work with your child to build a skyscraper whose shadow can reach up to your ceiling.

#### Materials:

- Blocks or something to use to build vertically
- A flashlight
- A wall to project a shadow

It might take some time for your child to discover that the challenge is not to make the tower taller but to make the shadow taller.

### Questions to Ask:

Explore what happens if you move the flashlight closer to the blocks? Why?

What about farther away?

If you can move your blocks farther away from the wall, notice what happens. Why?

What happens when you change the angle of the flashlight?

Can you estimate the height of the shadow? Use the measuring tape and see how accurate you were.

Please take a photo and share it with us below.



ENTER TEXT

Character2 / 0

Submit

### Light and Shadow MAY 2021

6 of 21 Complete

This week you will explore light sources and shadows

- Welcome to a week of playing with light and shadow
- Safety
- Tips on Facilitating STEM Play
- Reflection and Documentation
- Science Talk
- Weekly Scavenger Hunt
- Books To Read and Share This Week
- Storytime
- Additional Resources for Parents and Caregivers

This Week's Activities

- STEM Play with Flashlights
- STEM Play with Blocking Light and Shadows
- Hunting for Shadows
- STEM Play with Bouncing Light (Reflection)
- Exploring Opaque, Translucent and Transparent Materials
- Making Shadow Pictures
- STEM Play with Bending Light (Refraction)
- Making Rainbows
- Hunting for Rainbows
- Making Shadow Puppets
- Making Hand Shadow Puppets
- Making Sun Prints
- Making Sundials



Children and their caregivers really enjoyed the scavenger hunts



# Evaluation

- Peer Associates
- Phone Interviews
- Project Outcome survey
- Direct feedback from parents
- Scavenger Hunt

# Next steps

- In person summer programs
- Scavenger Hunts
- In person programs that include at home tinkering and making activities, and caregiver support through Niche Academy
- Professional development for public librarians
- Piloting the program in other public libraries



## Niche Academy

<https://my.nicheacademy.com/LittleMakersAtHomeStemPlay/course/25692/activity/6049>

## Keene Public Library

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