



# Readiness through Integrative Science and Engineering

<http://rise.as.tufts.edu>



# Science

Knowledge of the natural and human-made world gained through observation and experimentation





# Technology

Modifications of the environment to meet human needs  
(for example, tools)



# Engineering

The design process:  
solving problems and  
meeting human needs





# SCIENCE, TECHNOLOGY, AND ENGINEERING ARE EVERYWHERE

In your home and in your community



# Structure and Function





# TECHNOLOGY IN EVERYDAY LIFE



# SHARE AT YOUR TABLE

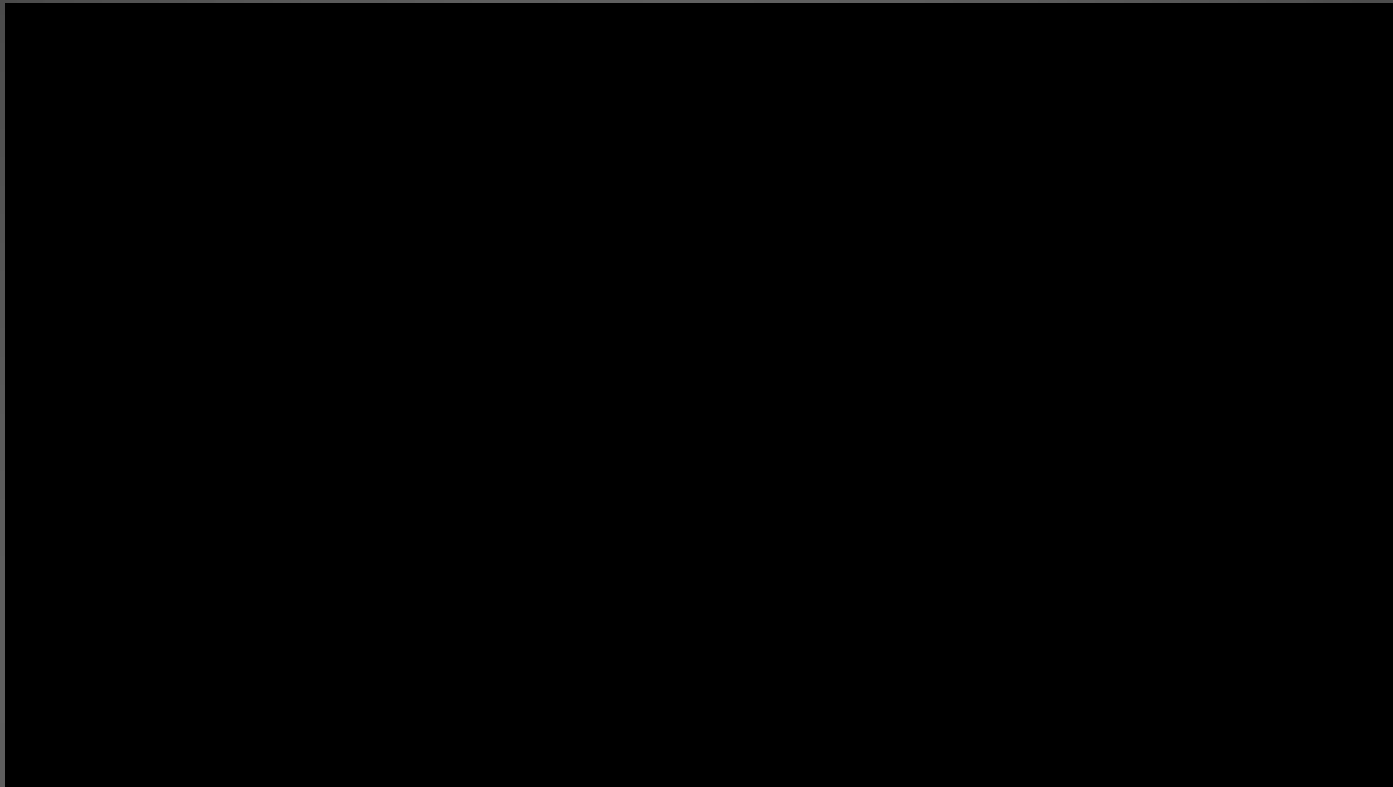
- ▶ Think about a “tool” you use in your daily life.
- ▶ What do you use it for?
- ▶ How is the tool designed (*its structure*) to make it work (*its function*)?
- ▶ How might you encourage families to explore tools in their home and community with their child?





# Home-School Collaboration in Project RISE

*(Readiness through Integrative Science & Engineering)*



# Engaging Families and Teachers in Curriculum Co-Construction for DLL Children

**Christine McWayne, PhD**

Eliot-Pearson Department of Child Study and Human Development  
Tufts University  
Medford, MA

*2017-18 Professional Development for All series*  
Buffett Early Childhood Institute  
Omaha, NE  
October 7, 2017





- ▶ Many educators can “harbor beliefs, attitudes, and fears about families that hinder their ability to cultivate partnerships” (Mapp & Hong, 2010, p. 346).
- ▶ “Sometimes [educators] will have to build bridges over valleys they did not create and mend wounds that they did not cause in order to reach families.” (Hill, 2010, p. 121)



# RISE HOME-SCHOOL COLLABORATION (HSC) MANTRAS

- ▶ Parents as Equal Partners
- ▶ Home-to-School
- ▶ Learning Builds on Familiar Knowledge
- ▶ Culture as Practice





# FAMILIES' FUNDS OF KNOWLEDGE

MOLL, L. C., AMANTI, C., NEFF, D., & GONZALEZ, N. (1992; 2005)

*Family's knowledge of the local environment and community and the funds of expertise they have developed to adapt to and function within their local context.*

This approach acknowledges that children's homes and communities "contain ample cultural and cognitive sources with great potential utility for classroom instruction."

**We should build on what children are already learning within their families and draw on families' experiential knowledge in building curriculum.**



# Family Engagement (FE) among culturally and linguistically diverse families



- ▶ There is a substantial need to understand immigrant families' engagement with their young children's learning to inform best practices.
  - ▶ 1 in 4 children are foreign-born or first generation.
  - ▶ Head Start is an important point of entry into the formal education system in the U.S. for many children and their families (27% DLLs nationwide).
  - ▶ Traditional expectations for FE activities may be inappropriate for a variety of reasons.
  - ▶ Support parent-teacher reciprocal dialogue → integrate culture-specific, familiar knowledge into the classroom → higher congruence btw home and school → better child outcomes.

# Readiness Through Integrative Science and Engineering (RISE) project:

- 1) **Focus on dual language learners:** Curricular models rich with opportunities for science inquiry and engineering are particularly well-suited to engage DLL children through **hands-on, minds-on learning** that builds on children's natural curiosity and problem-solving abilities.
- 2) **S-T-E integration:** The purposeful engagement of preschool teachers and children in both the explanation-seeking behavior of science and the problem-solving behavior of engineering through connected sets of learning experiences.
- 3) **Home-school collaboration (HSC), beyond home extension activities:** The RISE project seeks to bring children's out-of-school contexts into classrooms by supporting non-hierarchical and reciprocal dialogues between parents and teachers - the home-to-school flow of information is just as important as the school-to-home flow of information.
- 4) **Co-construction** of curriculum among researchers, teachers, and families.





# Home-School Collaboration (HSC)

The RISE approach seeks to incorporate children's and families' lived experiences into the classroom curriculum through establishing **non-hierarchical partnerships and reciprocal dialogue** between Head Start teachers and parents.

## Parent Leader Meetings

Monthly in Y1-Y2

## Joint Activities

Twice in Y1-Y2

## Parent Teacher Dialogue (PTD) Groups

Monthly in Y2-Y3

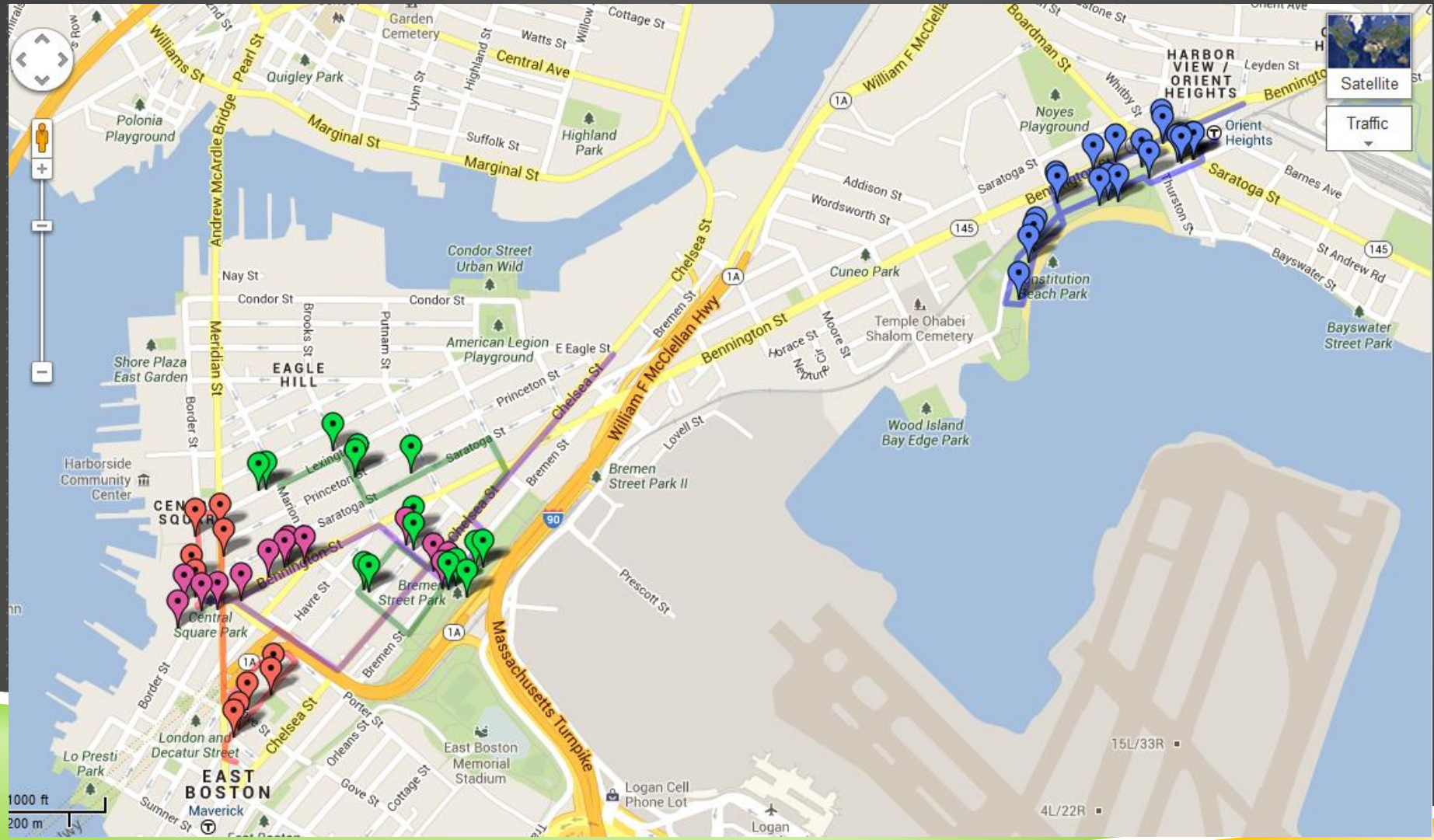
Purpose: To develop integrated HSC+STE curriculum

# *PLACE-BASED* SCIENCE, TECHNOLOGY, AND ENGINEERING

How children's surrounding  
community influences their  
exploration and learning



# PROGRAM A ROUTES





# MARSH – PROGRAM A

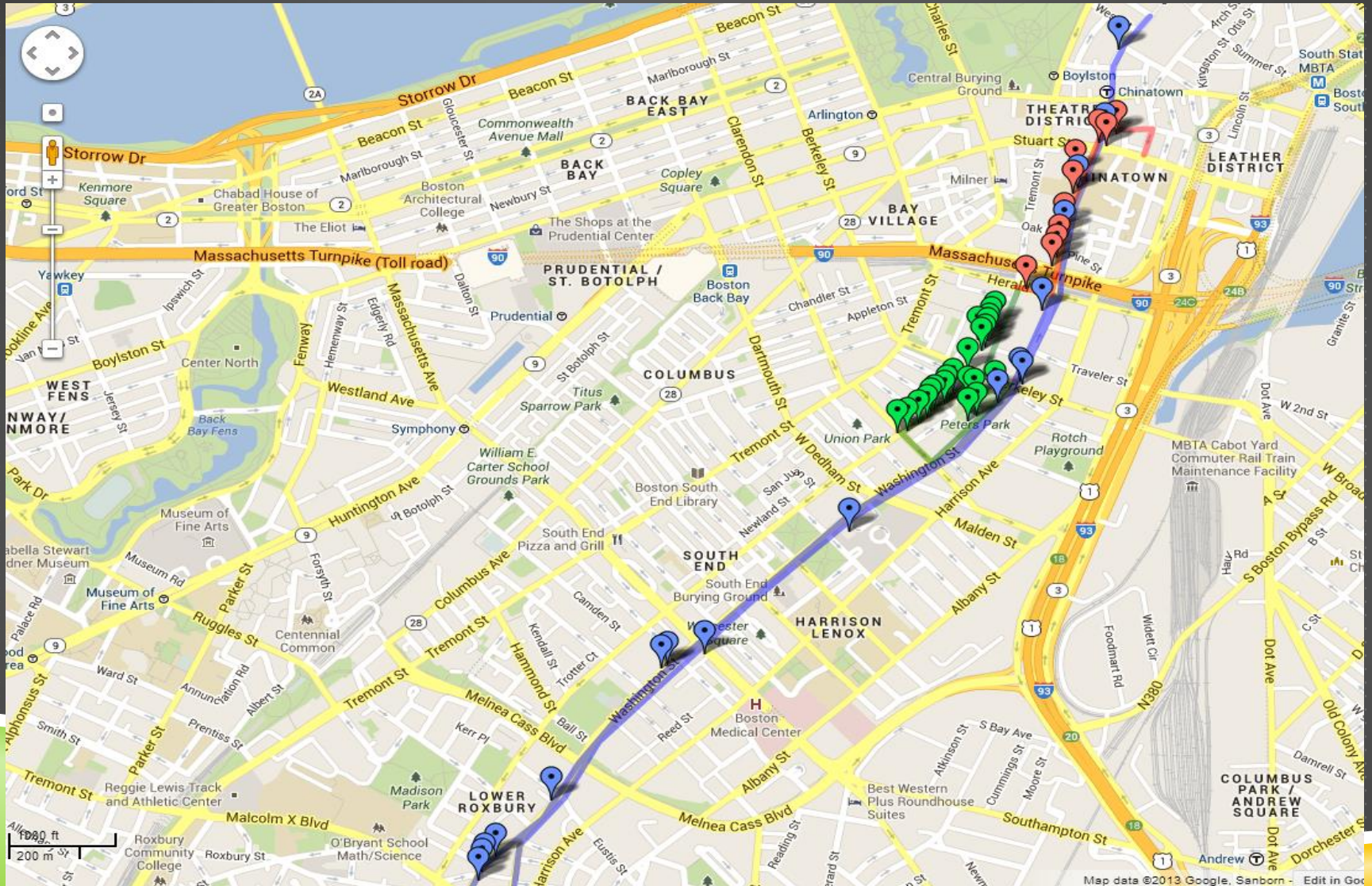


# BRIDGES – PROGRAM A



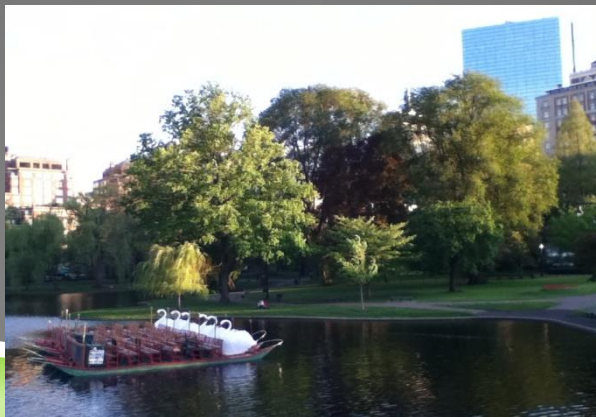


# PROGRAM B ROUTES





# SKYSCRAPERS – PROGRAM B



# CULTURAL SIGNS – PROGRAM B





# CULTURAL SIGNS – PROGRAM B





# PROGRAM B: TALL BUILDINGS



# PROGRAM B: TALL BUILDINGS





# PROGRAM A: BRIDGES



# Examples of other discoveries on neighborhood walks that were incorporated into the STE curriculum







**Living versus Non-living**





Living versus  
Non-living





Using tools to explore and extend our senses





# HOME OBSERVATIONS

## Home Visit Observation Guide for Research Assistants

Goal of home observations: To get a sense of the physical spaces and objects in children's home environments, specifically to note natural opportunities for STE learning.

During your visit, take note of the following:

- **PHYSICAL ENVIRONMENT-** How are spaces organized? Prominent (important) places for child or family? Main objects? Accessibility to child?
- **SOCIAL SETTING:** Who is present? Where do adult-child interactions occur? Around what?
- **PRESENCE OF STE:** What in the environment (physical and social) appears to be a rich source of STE learning? Activities/ Routines/ Objects/ People?

With parent permission, this could be where you introduce using the camera with the child to capture important places, objects, people, routines, activities.





# USES OF FOIL IN KITCHENS (TOOLS)



# FOOD PRESENTATION & DISHES



# CULTURAL ARTIFACTS





# CULTURAL ARTIFACTS



# EXCERPTS FROM PARTICIPANT OBSERVATIONS

**On it the most prominent objects  
were a decorated Bible with a  
rosary and many pictures of the  
family.**

# JOINT ACTIVITY: “OUR CHILDREN’S WORLDS”

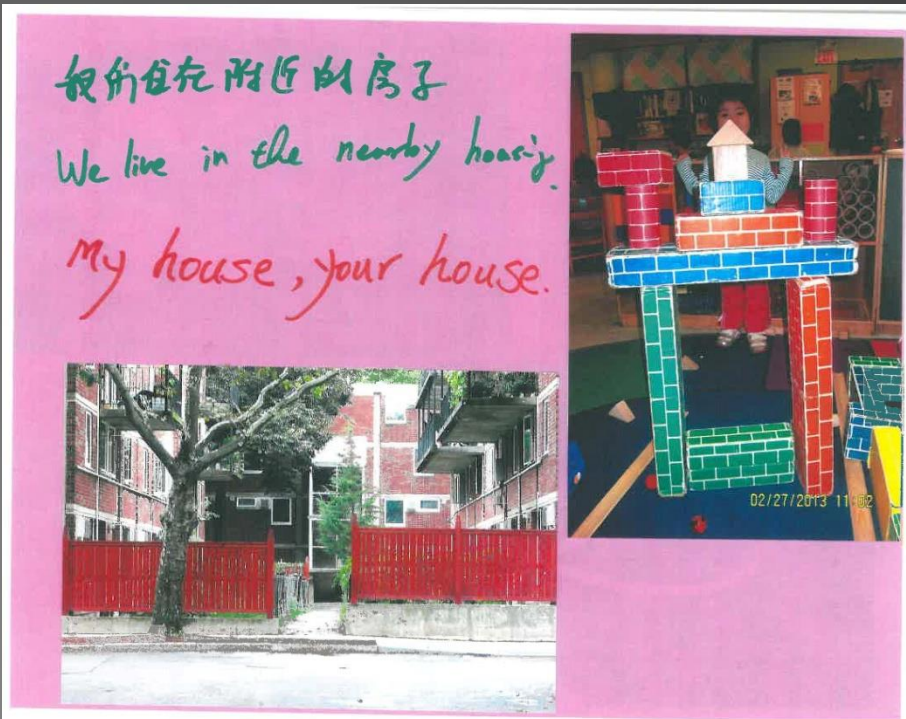




# “OUR CHILDREN’S WORLDS”



# “OUR CHILDREN’S WORLDS”



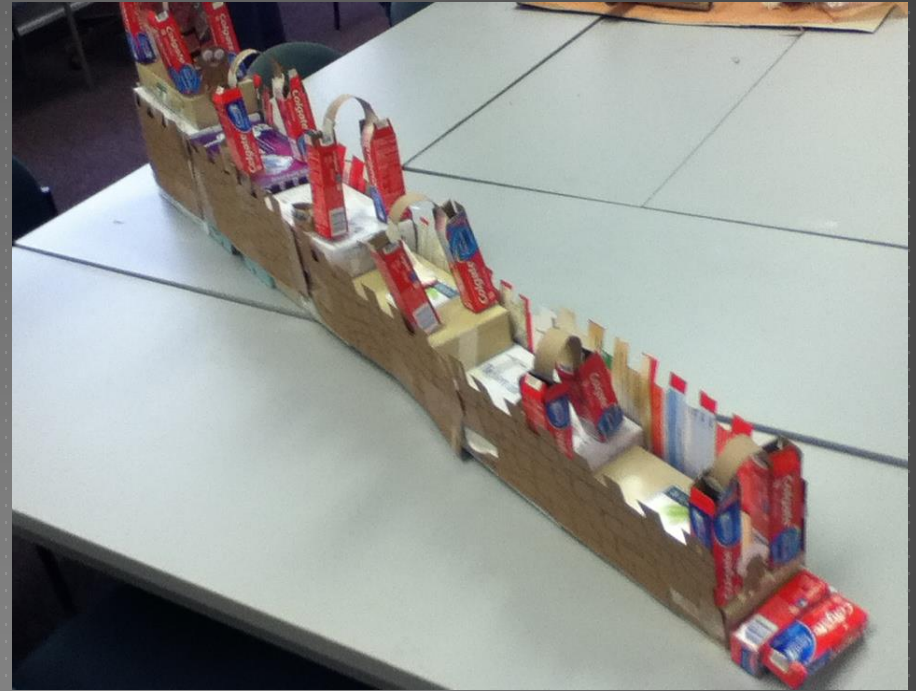


# “OUR CHILDREN’S WORLDS”





# JOINT ACTIVITY: BUILDING STRUCTURES TOGETHER



# BUILDING STRUCTURES TOGETHER





# PARENT-TEACHER DISCUSSION GROUPS

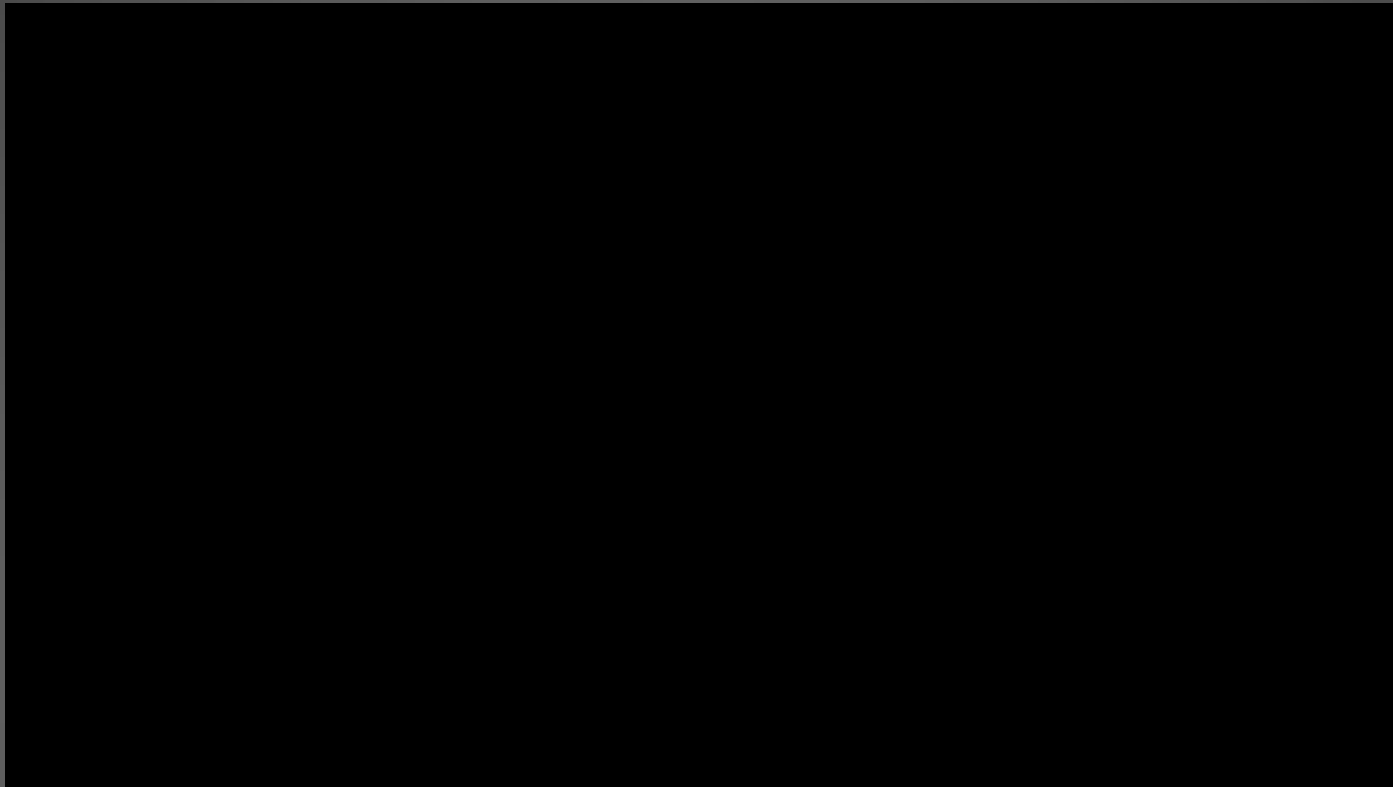




# DIFFERENT ROOF STYLES AND REMINISCING HOME



# STARTING A FIRE AND CULTURAL TOOL





# DESIGNING A REPLICA OF LIVING BAMBOO







04/25/2014 10:20





My Favorite Color Is

Blue	Blue
Red	Red
Purple	Purple
Green	Green

MANIPULATIVES  
捏泥角

04/29/2014 09:08





04/29/2014 09:57





Roundtop: Flying from the sky  
From the sky, from the sky  
Roundtop: Flying from the sky  
in my community

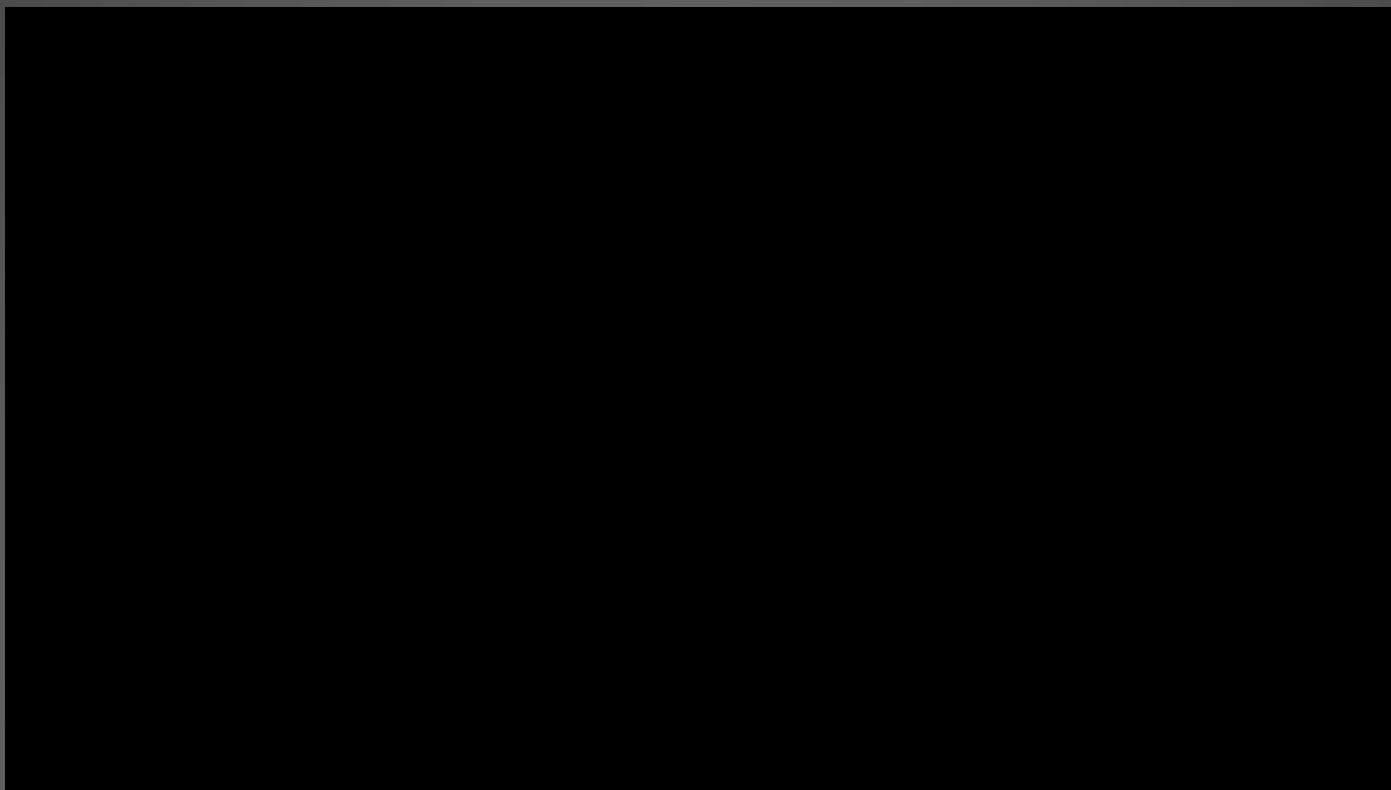
Spring  
Thunderstorm  
Partly cloudy  
Rain  
Sunny  
Fog  
Cloudy  
Snow

Fish  
Whale  
Turtle  
Octopus  
Dolphin  
Crab  
Starfish  
Shark

WATER TABLE  
水拓

04/29/2014 10:15

# COOKING WITH DIFFERENT CULTURAL INGREDIENTS

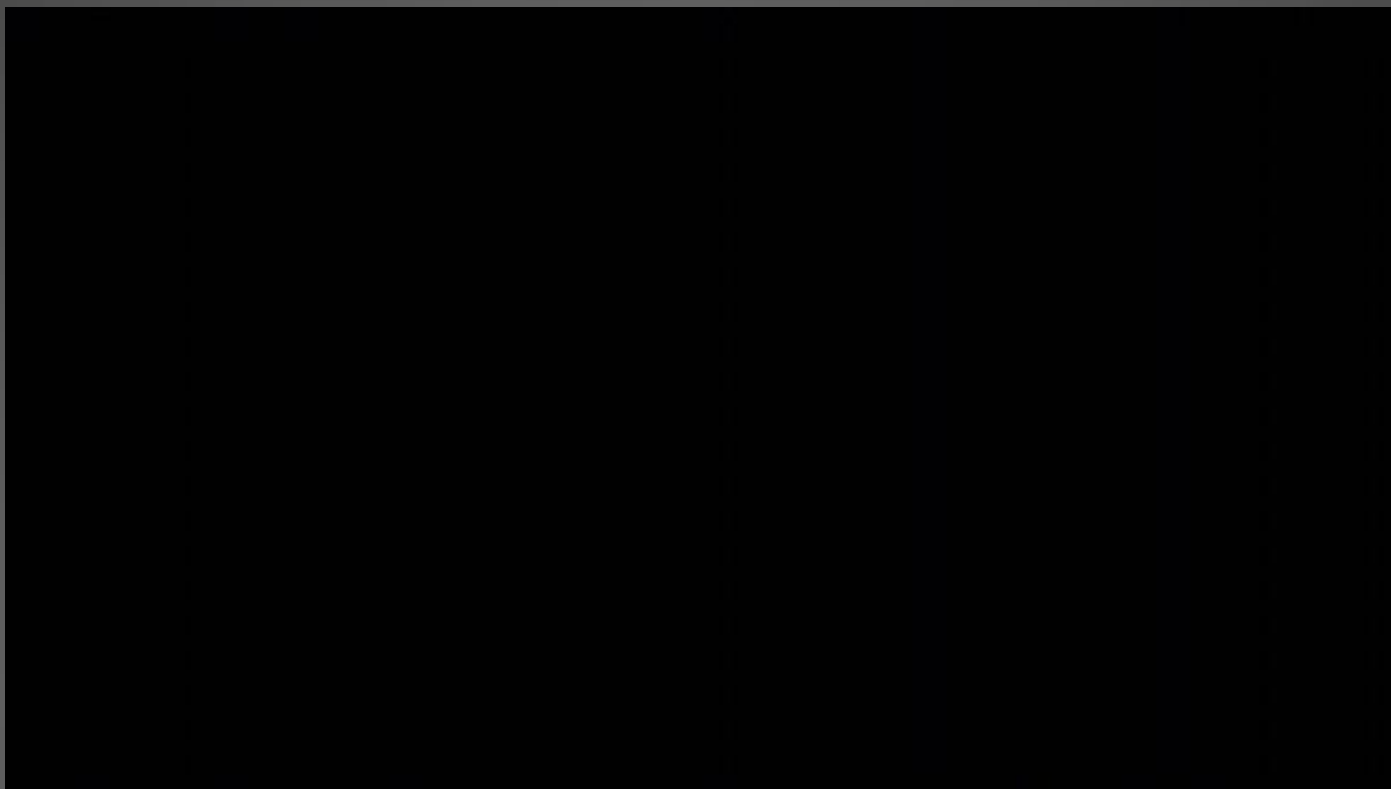




# COOKING CAN BE A FUN SCIENCE ACTIVITY WITH YOUR CHILDREN



# DISCUSSIONS AROUND PARENT INVOLVEMENT





# HUGS AND KISSES



Joint activities



Non-hierarchical and reciprocal dialogue



Home-to-school flow of information



Co-constructed curriculum relevant to the lives  
of DLL Head Start children



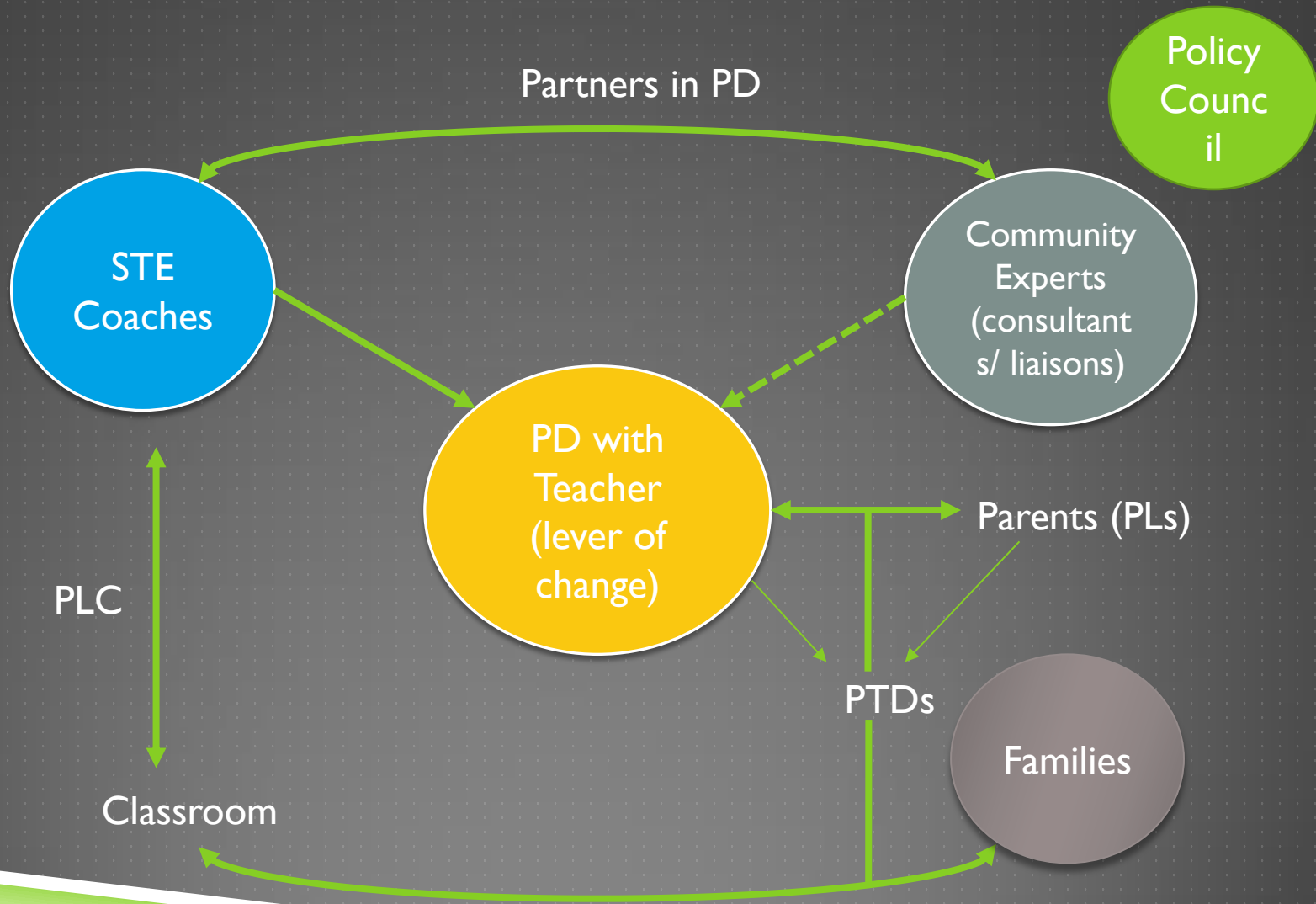


# EMERGING HSC ACTIVITIES IN RISE

- ▶ Induction of Community Experts
- ▶ Design of Culturally-rooted Stories
- ▶ Development of a Home Visiting STE Addendum



# MODEL OF STRUCTURAL RELATIONSHIPS





# SAMPLES FROM STORIES



Laundry Day!  
¡Día de Lavandería!

By Massiel Pena

# LAUNDRY DAY

Vamos a la lavandería para lavar nuestra ropa.  
Nosotras le decimos "laundromat."

We are going to  
the laundromat to  
wash our clothes.





# LAUNDRY DAY

Ahora que la ropa ya está seca, la doblamos,  
y regresamos a casa.

Now that the clothes are dry, we fold them and go back home.



# TEACHER'S GUIDE

## Sample Connected and Extended Learning Experiences

### Matter and Interaction

Massiel and her daughter go to the laundromat every Monday. This routine is an important aspect of their family life.

- Connect children's experiences to the one in the book. How does your family do laundry? How do you help your mom?
- Offer children different types of fabrics (or other materials) to check if they absorb water and how fast.
- Drying laundry in a dryer is quick and convenient. What are some other ways to dry your clothes? **Document** ideas. **How long** does it take the **same sized** piece of material to dry under these different conditions such as on a clothes line with a fan blowing and without? **Is** there a difference if we dry something in the sun versus inside? What other things affect the drying process? Ask children to observe how fabrics dry (some are wrinkled and some are not).
- Fighting stains can be challenging. How can we get out different types of stains? Provide children with different fabric pieces and invite them to create stains with items such as grass, dirt, juice, markers. **Investigate** which different cleaners (i.e. dish soap, club soda, vinegar, hydrogen peroxide, milk, baking soda, lemons, salt) affect stains and materials differently? Do some work better on certain types of stains like grass stains? Can different tools (i.e. toothbrush, sponge) or actions (i.e. friction) help to get a better result? Why?
- Soap has the ability to interact with other liquids differently. Fill a clear container with a cover with oil and water. Cover and shake. **What happens to the oil and water?** Next, add detergent and some food coloring. Cover and shake again. What **happens now to the mixture?**

#### Legend:

- Disciplinary Core Ideas
- Crosscutting Concepts
- Scientific & Engineering

### I Took a Bath in a Washing Machine

By Jim Gill  
[www.jimgill.com](http://www.jimgill.com)

I took a bath, in a washing machine,  
I took a bath, in a washing machine,  
So I could get myself, really clean.  
The washing machine, is washing me clean.  
The washing machine, is washing me clean.  
I put in soap, up came the suds.  
I put in soap, up came the suds.  
They washed out dirt, they washed out mud.  
The washing machine, is washing me clean.  
The washing machine, is washing me clean.  
It was just then, that it started to spin.  
It was just then, that it started to spin.  
Then I knew, the trouble I was in.  
The washing machine, is washing me clean.  
The washing machine, is washing me clean.  
The washing machine, is washing me clean.

\*Don't try this at home!\*

### Forces and Interaction

There is a great deal of **motion and agitation** that occurs during the wash cycle. What would happen if the washing machine broke? How could we wash our clothes? What happens in a washing machine? How can we imitate those actions another way?

### Engineering Design

- Sing and dance along to "I Took a Bath in a Washing Machine" by Jim Gill. Encourage children to imagine and act out the movements of the washing machine and the process from start to finish. What else might be happening during a wash **cycle** that is not identified in the song? **Document** each step within the cycle.
- Take a walk to a nearby laundromat. What do you need to complete a load of laundry in the washers and dryers (i.e. money, soap, fabric softener, etc.)? What do the children observe happening within the different machines?



# A COLORFUL DAY

公园里有很多花，树木，  
和色彩缤纷的野菰。  
我看见一块很像鱼儿的石头。



The park has flowers, trees, and  
colorful wild mushrooms.  
There is also a rock with the  
shape of a fish.

# TEACHER'S GUIDE

## My Colorful Day

My Colorful Day shares a story of a young girl who enjoyed her day outside with friends. Their explorations and creative imaginations provide learning opportunities in numerous STE areas.

### Vocabulary

Bored

Wild

Mushrooms

### Connections to the frameworks

#### Life Sciences:

From Molecules to Organisms: Plants and animals grow and change over time.

Ecosystems: Some things are living and some are non-living.

#### Earth and Space Sciences:

Earth's Systems: We can observe characteristics of weather.

### Crosscutting Concepts

Structure and Function

Stability and Change

### Scientific & Engineering Practices

Asking questions and defining problems

Planning and carrying out investigations

Obtaining, evaluating and communicating information





# TEACHER'S GUIDE

## Sample Extended Learning Experiences

### Stability and Change

In her book, *Dezi* tells us what she sees in the park that she goes to everyday. She observes flowers, trees, colorful wild mushrooms, and a rock with the shape of a fish. Neighborhood walks are cultural experiences connected to children's daily lives. You can make connections during your daily neighborhood walk with your children in your classroom.

**Legend:**

- Disciplinary Core Ideas
- Crosscutting Concepts
- Scientific & Engineering Practices

- Go out for a walk and encourage children to observe and note what they see on this walk that represents the current season.
- Encourage conversations about what children do in their neighborhood and how activities might change through the season.
- Choose a few areas outside with the children's help to take a photo. Print photos and find a place to hang in your classroom. Every 2 months, take another photo of the exact same spot. Print and post photos alongside one another. **Compare and contrast** changes that have occurred over time and across **seasons**.
- Ask children to notice how trees look during each season. Consider reading *Sky Tree* by Thomas Locker.
- Take a walk in your school's neighborhood. Provide children with **binoculars, magnifying glasses** to make **observation** and bags to collect items. Place items in the science area with observation tools for exploration. **Compare and contrast** the items collected. Sort them into **living and non-living** groups. Invite children to share an item they found from home outside and add it to the collection.
- Offer paper, clipboards and crayons/markers for children to create observational drawings outside while on the playground or on a walk. What did children observe and document?

## Potential Extended Learning Experiences

### Earth Sciences

*Dezi* describes how children lie down on the grass and look up to the sky. This poetic image allows us to enter *Dezi*'s childhood memories growing up in China.

- Ask children if they have ever looked up to the sky to see how clouds move and change.
- Invite children to do just like *Dezi*! Let children sit or lie outside and **observe** the sky (be sure to bring protective eye wear!). What do they notice about the sky today? Are there any clouds today? What do they notice about the clouds today? What shapes and colors do they see? Do any of the shapes look like something else we know? Do you see any animals as *Dezi* described in her book? Encourage children to describe their observations and ask questions. You make provoke them with questions: How do clouds move? What makes them move? How do they change colors and shapes?
- Read *It Looked Like Spilt Milk* by Charles Shaw to extend discussions with children.
- Begin a weather chart. Using pictures of the various weather features that may be observed, ask children to post the features they notice each day out of the window on the chart. Allow children to post more than one feature as they may see the sun and clouds at the same time. You could even represent white clouds and gray clouds to encourage more detailed observations and connections among weather. **How many** sunny days did you have this month? How many rainy days? Which type of weather did you experience **more** often?

**Legend:**

- Disciplinary Core Ideas
- Crosscutting Concepts
- Scientific & Engineering Practices



# HOME VISITING PROTOCOL ADDEDNDUM

1 - 1.15 hrs max

**Goal of PL Meeting: Get PL feedback on instructions to students.**

Instructions to Students:

- Goal of home observations: To get a sense of the spaces, objects, and environment in which the children live and, specifically, the natural opportunities for STE learning to occur
- Guidelines for entering child's home
  - Match child's language
  - Match child's demeanor
  - Be polite, talk quietly
  - Follow child's lead
- When you enter the child's home, be sure to introduce yourself to the child and get on the child's level, as well as introduce yourself to any adults in the room. The family will know why you're there. Then, follow the child's or parent's lead.
- During your visit, take note of the following:
  - Physical environment -
    - How are spaces organized?
    - Prominent (important) places for child or family?
    - Main objects? Accessibility to child?
  - Social setting: *(+these objects are accessible? e.g. top shelf?)*
    - Who's present?
    - Where do adult-child interactions occur?
    - Around what?
  - Presence of STE :
    - What in the environment (physical and social) appears to be a rich source of STE learning?
      - Activities?
      - Routines?
      - Objects?
      - People?
- Also during your visit, have conversations with the child about:
  - Where do you spend your time?
  - Who do you spend time with?
  - What do you like to do with \_\_\_\_?
- This could be the place where you introduce using the camera with the child to capture important places, objects, people, routines, activities. Please only use project cameras for this purpose (no cell phones or personal cameras) and allow the family to view the pictures if they ask to see them. You can also offer to have copies made for them, and we will do so.

*const and complete*

*most likely +  
ve Rb al information  
from parents > child*





# Pair-and-Share (5 minutes)

- **What ideas do you have for bringing parents and teacher together?**
- **For engaging families in curriculum?**

# Large Group Share Out (10 minutes)

# THANK YOU!!



[christine.mcwayne@tufts.edu](mailto:christine.mcwayne@tufts.edu)