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

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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

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
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 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”

Lo hice yo solito.
El tren esta pasando por debajo del puente

Allyson está creando un puente
Oh no se me rompio en el centro, "ya lo voy a reglar"
Tengo mas de 12" Block"
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
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

Partners in PD

STE Coaches

PD with Teacher (lever of change)

Community Experts (consultants/ liaisons)

Parents (PLs)

PTDs

Families

Policy Council

PLC

Classroom
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.
Sample Connected and Extended Learning Experiences

**Matter and Interaction**

Marsiela 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 clothesline 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?

**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?

*Don’t try this at home!*
A COLORFUL DAY

公园里有很多花，树木，
和色彩缤纷的野菇。
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.
# 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.

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**Sample Extended Learning Experiences**

**Stability and Change**
In her book, Desti 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.

- 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**
Desti describes how children lie down on the grass and look up to the sky. This poetic image allows us to enter Desti’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 Desti! 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 Desti 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?
HOME VISITING PROTOCOL ADDENDUM

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:
    - 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.
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!!

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