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The Early Science Initiative Face-to-Face Meeting
11-13 January, 2017
The Mutiny Hotel/Educare Miami

<u>Wednesday, 11 January, 2017</u>

(Evening)	Arrive in Miami

<u>Thursday, 12 January, 2017</u>

8:00 a.m.	Travel to United Way Miami (*Uber – groups TBD)
8:30 a.m. – 9:00 a.m.	*Breakfast, introductions, norms
9:00 a.m. – 12:00 p.m.	Session 1 - *What is a "good" science experience?* - *Science play break!* - *"Good" can look different* - *Science play break!* - *Survey completion*
12:00 p.m. – 1:00 p.m.	*Lunch
1:00 p.m. – 5:00 p.m.	Session 2 - *Paired video viewing and discussions* - *Unpack the experience: What did we do? Why did we do it?* - *Reflection: What supports do your teachers need to get from here to there?*
5:00 p.m.	Conclusion day 1

<u>Friday, 13 January, 2017</u>

8:00 a.m.	Travel to United Way Miami (*Uber – groups TBD)
8:30 a.m. – 9:00 a.m.	*Breakfast
9:00 a.m. – 12:00 p.m.	Session 3 - *PLC: problem solve and celebrate* - *Science play break!* - *Plan for implementation & MT goals* - *Surveys*
12:00 p.m. – 12:30	*Lunch
12:30 - 2:00 p.m.	Session 4 - *Planning for site visit*
2:00 p.m.	Conclusion day 2

**Breakfast and lunch will be provided both days (dinner on your own).*
**We encourage groups to share Ubers to and from the meeting site (United Way of Miami), to designate one person to pay the fee, and to have that person reimbursed.*

Each statement below describes a science experience or study/project topic that may occur in an ECE classroom. Although many of these experiences could have a follow-up, evaluate each based on ONLY what is written.

Please mark the box to indicate whether you think the experience is a "good" science experience.

	Yes	No
1. A study on dinosaurs		
2. A study on how things move		
3. The children use shaving cream to draw letters on the table. The teacher asks them, "what letter is that?"		
4. A study comparing animals' body parts to people's		
5. In a toddler classroom, children mix flour and water together to make dough. The teacher asks, "what happens when you add water?"		
6. A child tells a story about going camping with his family over the weekend. The children are interested in campfires		
7. While outside, the teacher points to the tree and says to the infants, "I see you looking at the leaves. I wonder what they feel like. Let's use our fingers to find out!"		
8. A teacher asks the child, "how do cell phones work?"		
9. During morning routine in a toddler classroom, the children sing a weather song.		
10. In an infant classroom, the teacher lets the children play with ice and comments on how it feels and how it is melting.		

In general, what makes a science experience "good"?

What is a "good" science experience?

Purpose:
To discuss what "good" science means and practice how to dial up the science in a given experience.

Directions:
Read the following vignette. Think about and discuss with your team whether this is a "good" science experience. What is the criteria you used to determine if the experience is "good"? How can the experience be improved?

Experience A (preschool/toddler):

The teacher in a preschool classroom is sitting in a small group with 5 children. She has pipe cleaners, construction paper, and colored tissue paper in baskets along the table. "We are going to make flowers like this one" the teacher says to the children and shows them her premade paper flower. "First, we are going to take the pipe cleaner and use it to make a stem" she says, and hands each child a pipe cleaner. Then, she gives the children a piece of construction paper and explains that they are going to use this to make leaves. She continues to help the children assemble their flowers by giving them each one of the materials and showing them how to use it to make their flower. At the close of the lesson the teacher comments on how pretty the flowers look.

Experience B (infant):

The teacher in an infant classroom is sitting outside with two children. One of the children crawls onto the teachers' lap and reaches behind her toward the plants. The teacher says, " Oh, you see the plants? Yes, those are flowers." She sits the child back down and hands him a shiney green ball to play with.

What is a "good" science experience?

Dialing up the science

Experience A (Preschool/toddler):
The teacher in a preschool classroom is sitting in a small group with 5 children. She has pipe cleaners, construction paper, colored tissue paper, and cut sections of brown string in baskets along the table. That morning, the children picked daisies from the perimeter of the playground. Many of them still had their roots attached. The teacher collected these flowers from the children and is now handing them out to each child. "We are going to make models of flowers" The teacher says to the children. They have discussions about what a model is. The teacher then directs children to look at their flowers. They pick them up and examine them. She says, "let's talk about the parts of the flower. What do you see?". One of the children says that she sees a long green string part. The teacher says that this is the stem and explains to the children that they are going to use the green pipe cleaner as the stem for their flower models because it is long and rigid just likethe stem. Another child points to the dirt covered roots on his flower. "What did you find Reggie?" Asks the teacher. Reggie is quiet. "Those are the roots," says the teacher. "The roots go in the ground and help the plant get nutrients and water. Which one of our art materials can we use to model the root?" the teacher and children continue to explore the daisy, talking about the name of the parts, their function, and what materials would be best to model each part and why.

Experience B (Infant):
A teacher in an infant classroom is sitting outside with two children. One of the children crawls onto the teachers' lap and reaches behind her toward the plants. The teacher says, "Oh, you see the plants? Yes, those are flowers." The teacher encourages the infant to touch the leaves. "You are touching the leaves of the plant." She repositions herself and the other child so that she can better explore the plants with the children. "Let's touch the leaves" she says and guides the children toward feeling the leaves. "The leaves are smooth and shiny," she says. Then she shows the children the flower. "Look, this is the flower. It has petals. Let's feel the petals. Do you think the petals will feel the same as the leaves? Let's touch them to find out. Do the petals feel the same as the leaves?" she asks as she helps the children touch the petals of the flower. "I wonder if other flowers have petals and leaves too," she says and proceeds to search the garden for other flowers. "Petals and leaves, petals and leaves," she says as she helps the children touch the petals and leaves each time they find a flower.

What is a good science experience?

Facilitator Guide

Small group

1. Finish pretest and submit
2. Let's share out some of our thoughts to what makes a rigorous science experience
3. Read Experience A and prompt MTs to think about whether this was a good or bad experience, discuss why and how to make it better. Use items 1-3 to guide your discussion.
4. Discuss what makes "this" (either your co-constructed, revamped experience, or the written example) a rigorous experience. Table lead take notes and prompt to think about items 1-3 from experience A discussion. Extract criteria for "good" experiences.
5. Share out and create criteria (whole group)

1. Is this a "good" experience? Why? (have discussion)

not:

- *teacher directed, children are not engaged in the practices, instead they are following directions,*
- *not engaged in understanding any crosscutting concepts… overall learning is not rich. It is rote. although there may be some vocabulary relating to the parts of a plant, there may not be any questions to engage children in critical thinking relating to structure function and systems/system models*

2. Is there any science going on? (ID science across three dimensions)

  a. *Observation*
    i. *Potentially, but not in given scene.*
  b. *Developing and using models*
    i. *teacher is modeling, not children.*
  c. *Systems and system models*
    i. *parts of a flower make a whole. Are children engaged in thinking about this? Are children engaged in thinking about this (seems more like an art lesson)?*
  d. *Structure and function*
    i. *Different parts have different purposes. Are children engaged in thinking about this (seems more like an art lesson)?*
  e. *Life science*
    i. *Potentially learning the names for parts of a plant. Are children engaged in thinking about this? (seems more like an art lesson)*

There is some science going on but, the children are not engaged in the practices (hands on, but not minds on), the teacher may not be asking questions or modeling thinking to prompt children to think about the crosscutting concepts (this seems more about completing an art *project), children may be hearing some names for parts of a plant (e.g., stem, petals), but this seems like rote learning, not critical thinking.*

3. **How could we revamp this experience to make it more rigorous?**
   a. **What practices could the children actively engage in? What would the teacher need to do/say to engage the children in thinking about these concepts?**
      i. Observation: using real flowers to look at and then build a model out of various materials
      ii. Developing and using models: the teacher can ask the children what materials would best represent (model) given parts of the flower (e.g., here is a long, skinny, green part of the flower. It's called a stem. What material could we use to model the stem?
   b. What crosscutting concepts could they begin to generate an understanding of? What would the teacher need to do/say to engage the children in thinking about these concepts?
      i. Systems and system models: the teacher can ask questions/make statements like, "if we didn't have a stem, what might happen to the flower?", or "the leaves are an important part of the plant because they help it make food. Without the leaves, the plant might die"
      ii. Structure and function: the teacher could ask questions/make statements like, "the flowers are colorful so that bees and other insects will come to the flower to drink nectar"
   c. What core ideas can the children start to learn? What would the teacher need to do/say to engage the children in thinking about these concepts?
      i. The names for parts of a plant
      ii. The functions for some parts of a plant
4. How would these changes influence the purpose of the experience?

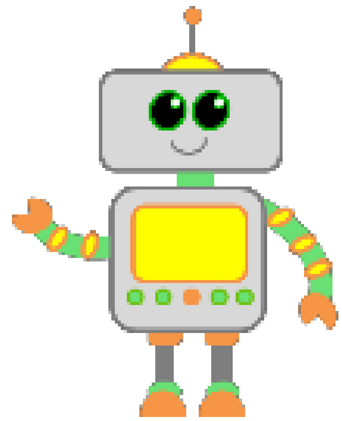
Science Play Break!

Purpose:

1. We want you to have time to play! Remember, science is fun and engaging! That's one of the reasons why it works so well with kids.

2. We wanted to give you an opportunity to experience different kinds of questions like we discussed in the "Right Question at the Right Time" article.

3. We wanted to give you some time to sample different experiences (across the disciplinary core ideas) as an inspiration for potential site visit activities to do with your teachers.



Directions:

1. During a break time, visit **one** of the four centers. You will have about 7 minutes to engage at the center and another 7 or so to snack, coffee, cell phone, restroom …whatever. You will be able to visit each center before the close of day two.

2. Read the directions posted at each center.

3. Explore! Experiment! Have fun!

4. Think about what this might look like in one of your classrooms. What science did you engage in? Would your teachers feel comfortable with these materials? Would kids enjoy these experiences?

Good Can Look Different

Purpose: *The purpose of this experience is to understand that "good" science interactions and experiences can look different in various contexts and varying levels of complexity.*

Directions:

1. *Read each vignette*
2. *Identify the science across three dimensions*
3. *Discuss the rigor of the science that is present*
4. *Discuss the difference across the vignettes*
5. *Reflect on where your teachers are and where you think they can go*

Good Can Look Different - Preschool

Naturally occurring: Water spilled in the hallway and children were walking back to the classroom from the playground as the janitor was cleaning it up with the mop. Jon pointed out to Ms. Marisol that the water was "going away" as the janitor used the mop. "Yes, the mop is absorbing the water, where do you think the water is going?" he did not respond. She then pointed out to the yellow bucket and said, "Did you notice the water in there? How does it get there?" "He dumps it there from the mop" Jon replied. "Yes, the mop absorbs the water from the floor and then holds it in until it is in the bucket" she said. "Do you think the same thing would happen if we used a broom to absorb the water?" Ms. Marisol she asked him. "I don't know" he said. "How can we find out?" Ms. Marisol asked. "We can put the broom in the water!" Jon said. Ms. Marisol asked the janitor if they could experiment with the broom and proceeded to place the broom in the water and observe with the children what happened. " I wonder why it didn't absorb the water" Ms. Marisol said, " how are the mop and the broom different?"	**Planned provocation:** The teacher wants to engage children in thinking about absorption. She "accidentally" spills water and engages children in a conversation about what she can use to clean it up.

Small group experience: Noticing that the children were interested in absorption, Ms. Marisol decided to engage the children in a small group experience to further develop their understanding of absorption. Ms. Marisol gathered various materials (e.g., cotton balls, towels, wax paper, sponges, Ziploc bags, etc.), eye droppers and cups of water. She gathered a small group of children around a table with the materials, reminded them of the mop experience from the previous day, and asked them what questions they could ask about the materials. Children wanted to know which materials could hold water like the mop. Ms. Marisol then asked the children to sort their materials into which ones they thought would absorb the water and which ones would not. She asked them to explain why they sorted materials the way they did. Next, Ms. Marisol asked the children how they could use the materials to test their predictions. Some children decided to dip their materials in the water. Others decided to use the eyedropper to add water to their materials. Ms. Marisol prompted children to talk about what was happening to their materials when they added the water.

Isolated experience: The next day, the teacher focuses on math during her small group time.	**Extension to a project:** Because the children were so engaged in this experience, the teacher thinks about other ways to help children explore absorption. She changes materials at the water table to allow for independent investigations, engages children in a planning web to elicit their wonderings about absorption, and plans for other small group experiences to further explore absorption.

Good Can Look Different – Toddler

Science during daily routines (Toddler):

During breakfast Ms. Sally and the children discuss eating cereal with and without milk. “No milk?” Anna asked Ms. Sally. “Milk makes my stomach hurt,” she replied. “I notice a difference between my cheerios and yours. Do you?” Ms. Sally said. Anna looks at the cereal but doesn’t respond. “I wonder if we can use our fingers to feel the difference?” said Ms. Sally. Ms. Sally uses a spoon to place one of Anna’s Cheerios and one of her own Cheerios on a napkin for them to feel. “How does it feel, Anna?” Ms. Sally asked. “Hard,” Anna said, as she presses her finger onto Ms. Sally’s Cheerio…

Good Can Look Different – Infant

Naturally occurring: Emmie is nine months old and was sitting at the water table in her classroom. Mrs. Woofter noticed Emmie splashing her hands in the water and watching where the water was going. "Emmie, I see when you splash your hands in the water it spills out over the side", Mrs. Woofter says.	**Planned provocation:** The teacher wants Emmie to notice how the water spills out of the water table when she splashes in the water. Mrs. Woofter splashes her hands in the water. "Emmie did you notice that when I splash my hands in the water the water spills out?" Mrs. Woofter said. "Emmie, now you try", she says.

Planned experience: Mrs. Woofter noticed Emmie picking up one of the soft toys on the water table and squishing it until some water squeezed out. After all the water was out of the toy Emmie put the toy back in the water and squeezed the toy until all the water was gone again. "Emmie, I see you squeezing the water out of the soft toy," Mrs. Woofter said. "Look all the water is out of the toy! Are you going to put more water inside?" Mrs. Woofter said as Emmie put the toy back into the water. "Wow! The toy absorbs water when you put it in the water. What do you think will happen when you squeeze the toy? Will more water come out? Let's squeeze the toy and see what happens!"

Isolated experience: The next day, the teacher facilitates Emmie's exploration of musical instruments.	**Extension to a project:** Because Emmie enjoyed the water table experience, the teacher focuses on having the infant explore other materials that absorb water. She places new soft materials at the water table to allow infants to play and absorb water. Later she adds materials that don't absorb water to compare and contrast the different materials.

Good Can Look Different

Facilitator Guide

1. Read each of the vignettes (small group)
2. For each:
    a. Good or not?
        i. Why?
    b. Identify science across 3 dimensions
    c. Identify learning goal/purpose of the experience (point out that learning goal is a crosscutting concept)
3. Talk about differences across these vignettes
    a. Reflect on grain size, level of intensity (isolated experience vs. full blown project), continuum of inquiry/continuum of teacher directedness (when this is appropriate and when the teacher can guide and prompt instead of control)
4. Where do you see your teachers?
    a. List out your teachers and write down **where they are** (how would you sum up their general practice and how they are integrating the science framework)
    b. **Where do you think they can go** (how would you like to see them implement the science framework more into their practice)? Ultimately, what do you think is a reasonable goal for this T and/or, what might be the first step (or weeks of steps) to take to move toward that ultimate desired goal).
        i. (Start by shifting one small experience (where? Small group time? Personal care routine? Free play?), engage in a project (big idea with smaller experiences contributing to that understanding), somewhere in between
        ii. General engagement in various practices and later fold in crosscutting concepts, or, start with CC and focus on practices as they emerge?
5. Share out whole group

Paired Video Viewing

Purpose:

The purpose of this activity is to use these video samples as **a starting point**, and **critically think about how we can move from this starting point towards more rigorous and intentional science experiences**. We want to think about the quality of the experience as it stands and think about how we can **use the science framework to dial up the science and infuse more rigor into the experience**. At the close of this experience we will be "unpacking" what we did so that we can create a protocol for you to use with your teachers.

Directions:

1. Watch each video
2. Use the "Looking for Learning" chart to identify the science
3. Discuss the quality/rigor of the science and the experience as a whole
    - Guiding questions:
        - Was this a rigorous, high-quality science experience?
        - Were children actively engaged in practices?
        - Were children able to think about crosscutting concepts?
        - How did the teacher scaffold the experience?
4. Brainstorm ways to modify the experience to dial-up the science
5. Reflect and unpack the experience

Paired Video Viewing

Facilitator Guide

1. **Introduce purpose of the experience**
    a. The goal for this afternoon is to use these video samples as **a starting point**, and **critically think about how we can move from this starting point towards your goal for this teacher**. We want to think about the quality of the experience as it stands and think about how we can **use the science framework to dial up the ambition**/rigor. We want to consider any limitations the given experience may have and think about how we could reframe some of the what we see happening to allow for greater exploration and application of the framework. This is not intended to judge your teachers, but is a way **to meet them where they are, surface the science that is already happening, and make plans for moving forward… think about how the teacher can better scaffold children and support their learning**. Stop and get feedback/reactions
    b. We are going to watch the video a few times. We will watch it once to get a big picture idea of what's going on. Then, we will watch it again to look for the science. As we discuss and think together, we can view specific instances and/or pause and re-watch certain segments. We have the science framework and the "right questions" one-pager to reference.
    c. We are working in a triad today to serve as thinking partners together. When your video is being watched, you will be asked to introduce the video so that we have a little context for our watching (any relevant background info on the teacher or kids, why you chose this segment to share). If you are watching your partners video, you will serve as a thinking partner. I will also engage as a thinking partner and help move the conversation along.
2. ***Watch video and discuss.. remember, this is flexible and is to serve as a guide for us to refocus***
    a. Identify science across three dimensions and share out
        i. Start with practices (start at a different place if it feels appropriate) :
            1. Share out practices (be ready to challenge practices that are not
                a. Go through each practice and ask:
                b. Were kids engaged in these practices? *Could they be? How?* Reference "right questions at the right time article" *(think about how the children may respond to test if this idea will be effective).*
            2. *Were there practices that did not occur in this video?*
                a. *Could we incorporate this practice into this experience? How?*
                b. *If not, can we think about a related experience that may be appropriate to engage kids in these missing practices?*
        ii. *Crosscutting concepts:*
            1. *Share out crosscutting concepts*
            2. Go through each crosscutting concept and ask:

a. Were kids able to begin to understand these concepts? What did the teacher do to help kids start to think about these concepts?
b. Could the teacher do/say something to make this learning more visible? Reference "right questions at the right time article"
c. *Can we think about a related experience that may be appropriate to engage kids in thinking more about selected crosscutting concepts?*

iii. Core ideas:

1. Share our core ideas
2. Go through each core idea and ask:
    a. Were kids interested? How do you know?
    b. Is this valuable information for kids to know? Or, is this more about memorization of facts?
    c. Was the engagement in practices intended to develop children's understanding of these ideas?
    d. What did/could the teacher do or say to help children think more deeply about these concepts?

b. What is the purpose of the experience? Is this clear to us as viewers? Think about how this could be a problem…
    i. Did the teacher make the purpose of the experience clear to children? How?
    ii. Relate this back to crosscutting concepts and core idea (content)
    iii. What is the question (s) that children can answer?
    iv. What questions *could* children ask about this topic?
        1. Do these questions support investigations (experimenting first hand)? How?
    v. If the topic is limiting (difficult to study hands-on) how can we reframe this topic to allow for children to ask (teacher to model) more investigable questions? Test out these new ideas by thinking about how children can investigate.

3. **Repeat with second video**
4. **Unpack experience**
    a. What did we do? (step by step, think about what we did/talked about)
        i. What did we talk about?
        ii. What questions did we ask?
    b. Why did we do this?
    c. What was the most valuable part of this experience?
        i. What did we do that allowed/supported that?
    d. How might we move forward from here? If you do something similar with your teachers, what might the next steps be? What do we do with all this rich conversation and good ideas?
5. **Share out key points with whole group**

Professional Learning Community

(2 groups of 5)

"…[to] help educators sustain courage in the face of predictably chronic problems. The point of the [PLC] is to gain the benefit of others' perspectives and thereby inform one's own, to draw on others' creative resources and thereby replenish one's own, and to experience in the process the encouraging efforts of sharing one's burdens for an hour or so."

Problem solve and celebrate!

1. Look at the list of various contexts for facilitating embedded professional development.
2. Think about a time you have used one of these contexts to support your teachers in developing and implementing science experiences in their classrooms.
3. What did you find successful? How did you make this possible? Why did you prioritize this experience? How did you prioritize? What learning were you able to promote in your teachers through this experience? How did you know they learned? What was challenging about this experience? How did you address that challenge?
4. Turn to a partner and discuss.
5. Share out!

Science Break!

Planning for implementation!

1. Think about key takeaways from yesterday's experience. How you will begin to engage your teachers in moving towards rigorous science and inquiry experiences. What challenges might you have? How will you support your teachers? How will you continue to provide this support? What changes do you need to make to your daily, weekly, monthly routines to engage your teachers in moving towards rigorous science and inquiry experiences?
2. Turn to a partner and discuss.
3. Share out!

Planning for Site Visit

Site visits are intended to allow us to provide individualized, onsite, support for you and your teachers. It is a time where we can plan together how to support your teachers in their critical work with young children.

1. Think about where you would like to see your teachers. How do you want to see them grow and develop as professionals? How can the site visit support these goals?

2. What do you want teachers to get out of this experience?

3. What do you want to get out of this experience as MTs?

4. What experiences will support # 2 and #3?

Appendices

Practices

- Making observations
- Asking questions and defining problems
- Making predictions
- Developing and using models
- Planning and carrying out investigations
- Using math and computational skills
- Documenting, analyzing and interpreting data
- Constructing explanations and designing solutions
- Communicating information

Crosscutting Concepts

- Patterns
- Cause and effect
- Scale, proportion, and quantity
- Systems and system models
- Structure and function
- Stability and change

Disciplinary Core Ideas

Physical Science

- Matter and its interactions
- Motion and stability
- Energy
- Waves and their applications

Earth and Space Science

- Earth's place in the universe
- Earth's systems
- Earth & humanity

Life Science

- From molecules to organisms
- Ecosystems
- Heredity and traits
- Biological evolution

Engineering, Technology & the Application of Science

- Engineering design
- Links among engineering, technology, science and society

The Early Science Framework

(Adapted from the K-12 Framework for Science Education)

In 2012, the National Research Council outlined a new Framework for K-12 Science Education. The Framework was designed to help shift the nature of science education from the memorization of discreet, shallow facts to a more meaningful and effective approach to science education. This approach challenges teachers and students to engage in *doing* science within the context of a rich set of ideas that are consistent and connected across children's academic careers. The framework outlines three dimensions of science education: 1) Practices, 2) Crosscutting Concepts, and 3) Disciplinary Core Ideas. An essential element of this Framework is the idea of three-dimensional science learning. In essence, these three dimensions are intended to overlap, intertwine, and be introduced to children, not in isolation, but in a working combination.

Although this framework was designed for the K-12 system, current research finds that very young children are not only able to engage in concepts of all three dimensions, but that doing so fosters development across multiple developmental domains.

We have specifically adapted the K-12 Science Education Framework for early childhood settings to be used as a reference throughout this project. Due to the co-constructed nature of this initiative, this framework will exist as a living document, and will be revised and informed by reflecting on our learning process together

Early Science and Engineering Practices

(Adapted from the K-12 Framework for Science Education)

Scientific practices are the behaviors that scientists engage in to explore and develop knowledge.

1. **Making observations**
   …how children use their senses and tools for observation to collect information about their world (e.g. using their hands to feel if a rock is smooth or rough; examining a caterpillar with a magnifying glass).

2. **Asking questions and defining problems**
   …how children display interest and curiosity, demonstrate what they know and what they don't (e.g. "What's inside of a ball?"), and identify something that needs a solution (e.g. "The juice spilled on the floor and we need to clean it up").

3. **Making predictions**
   …how children use knowledge from observations and prior experiences to make an informed hypothesis (e.g. "This rock is heavy. I think it will sink in the water").

4. **Developing and using models**
   …how children mentally and physically represent real world phenomena to develop and deepen their understanding (e.g. drawing a house and building it in the block center).

5. **Planning and carrying out investigations**
   …how children organize and implement a procedure to test a hypothesis (e.g. rolling marbles down ramps of varying inclines to see which one goes faster).

6. **Using math and computational thinking**
   …how children use mathematics to quantify and describe their world (e.g. measuring the height of two plants and deciding which one is taller).

7. **Documenting, analyzing and interpreting data**
   …how children record, organize, and make sense of data (e.g. drawing pictures to show which objects "sink" or "float" during an experiment).

8. **Constructing explanations and designing solutions**
   …how children interpret data to generate evidence-based answers to their questions and design solutions to problems (e.g. "I know spiders are alive because they crawl").

9. **Communicating information**
   …how children document and share their explanations and conclusions (e.g. drawing & having teachers write their dictations about what they saw on a nature walk).

Early Crosscutting Concepts

(Adapted from the K-12 Framework for Science Education)

Crosscutting concepts are big ideas that help scientists connect knowledge from various experiences to draw conclusions and create a coherent view of the world.

1. **Patterns**
   ...the idea that events, processes, and structures repeat. (e.g. the sun rises in the morning and sets at night each day).

2. **Cause and effect**
   …the idea that a change in one event, process, or structure is the result of something else (e.g. the force of a rolling ball knocks over a block).

3. **Scale, proportion, and quantity**
   …the idea that things differ in size and quantity, which can be used to help identify patterns and draw conclusions (e.g. pools and oceans both have water, but there is more water in the ocean than there is in a pool).

4. **Systems and system models**
   …the idea that all things exist and interact in organized systems (e.g. the gears and parts of a wind-up toy exist within a system and interact to make it function).

5. **Structure and function**
   …the idea that the way things are built and/or organized determines what they do and how they do it (e.g. round things roll).

6. **Stability and change**
   …the idea that some things change and some things stay the same (e.g. living things grow and non-living things do not).

Early Science Disciplinary Core Ideas

(Adapted from the K-12 Framework for Science Education)

Disciplinary core ideas are the content that provide a context for engaging in practices and developing an understanding of crosscutting concepts.

Physical Science

1. **Matter and its interactions**
   …learning about what things are made of and how they affect each other (e.g., liquid can be made solid by freezing).

2. **Motion and stability**
   …learning about how things move or stay where they are (e.g., kicking a ball makes it roll).

3. **Energy**
   …learning about energy sources that power our world (e.g. animals eat food for energy).

4. **Light and sound waves and their applications**
   …learning about how light and sound move and its impact on the environment (e.g. light waves can be blocked by certain objects, creating a shadow).

Life Science

1. **From molecules to organisms**
   …learning about the needs and characteristics of living things (e.g. roots help trees absorb water).

2. **Ecosystems**
   …learning about how living things interact and use their environment to survive (e.g. birds use twigs from their surroundings to build nests).

3. **Heredity and traits**
   …learning that living things have features that are similar and/or different from each other (e.g. all dogs have fur and four legs, but some are small and others are big).

4. **Biological Evolution**
   …learning about how living things evolve and change (e.g. lizards resemble dinosaurs).

Earth and Space Science

1. **Earth's place in the universe**
   …learning about the patterns, cycles, and movement of the earth, sun, moon, and stars (e.g. the sun is visible during the day and the moon is best visible during the night).

2. **Earth's systems**
   …learning about the natural systems on earth and how they shape it (e.g. a squirrel lives in a place with lots of trees because it uses trees for shelter and food).

3. **Earth and human activity**
   …learning about how people and the world interact (e.g. humans need water, air, and resources form the land to live).

Engineering, Technology, and the Applications of Science

1. **Engineering Design**
   …learning about how people design tools to help them answer questions and solve problems in everyday life (e.g. a child uses a wood plank to cross a small stream on a nature walk).

2. **Links among engineering, technology, science, and society**
   …learning about how people use tools to help them answer questions and solve problems in everyday life (e.g. using a magnifying glass to observe the parts of a leaf).

The Right Questions at the Right Time

"The right question leads to where the answer can be found: to the real objects or events under study…where the solution lies hidden."
- Jos Elstgeest

Attention-focusing questions

Attention focusing questions help children focus on a particular aspect of something.

"Have you seen…?"

"Did you notice…?"

"What do you see, feel, hear…?"

Action questions

Action questions spur simple experimentations and exploration of the properties of unfamiliar materials.

"What happens if…?"

"What happens if you use the heavy ball…?"

"What happens if you put the paper in water?"

Measuring and Counting questions

Measuring and counting questions add accuracy to attention focusing questions.

"How many…?"

"How long…?"

"How often…?"

Problem-posting questions

Problem-posting questions are more sophisticated and complex and require children to engage in planning *and* experimentation.

"Can you find a way to…?"

"Can you find a way to make your marble turn?"

"Can you find a way to get the clay to float?"

Comparison questions

Comparison questions help children bring order into chaos and unity into variety. Classifying, sorting, or making tables of collected data, are disguised comparison questions.

"How are ________alike and different?"

"Is it longer/heavier/stronger/more…?"

How and Why questions

How and Why questions call for reasoning and explanation based on children's *own experiences*.

"Why do you think the red ball knocked over the tower?"

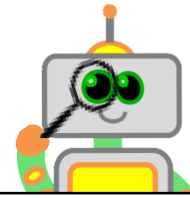
"How do tricycles work?"

"Why do you think the sponge sinks?"

ELN Embedded PD Routines

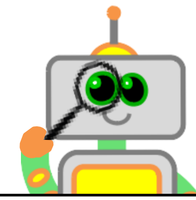
1. Facilitated team lesson planning
2. Coaching (whichever model is being used)
    a. 3-part coaching model
        i. Planning conversation
        ii. Observation
        iii. Reflection and feedback
    b. Side by side coaching
    c. Practice-based coaching
3. Individual reflective supervision
4. Group reflective supervision
5. Data dialogues
6. Communities of practice
7. Reviewing lesson plans and providing feedback to teachers
8. Lesson study
9. Touchpoints Mentoring Groups

Looking for Learning



Practices	Crosscutting	Core Ideas	**Other** (CLASS, Gold objectives, "Right questions", etc.)

Looking for Learning



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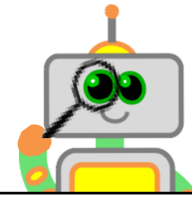

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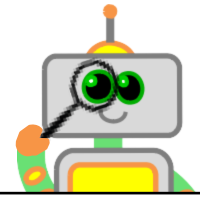
Looking for Learning 

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