Office of Head Start

Early Childhood Science

National Webcast Series

Discovering Science

Webcast #4: Bringing it All Together with Intentional Teaching in Effective Environments

Science Webcast #4 Script

JEAN SIMPSON: Welcome to Discovering Science. This is the fourth and final episode of our series on building the foundation for science in the early years.

UP CG:

Jean Simpson

Education Specialist, Office of Head Start

My name is Jean Simpson. I am an Education Specialist in the Division of Educational Development and Partnerships at the Office of Head Start. Thank you for joining us today.

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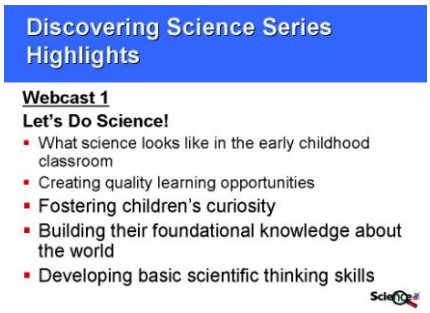

During the first Webcast, we explored what science looks like in early childhood settings and discussed some of the challenges in creating quality learning experiences. We also discussed goals for science in the early years, including fostering children's curiosity,

building their foundational knowledge about the world, and helping them to develop basic scientific thinking skills.

Slide:

In the second Webcast, we focused on the development of five, key science process skills from birth to five: using the senses for learning, observing, classifying, investigating, and predicting.

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The third Webcast focused on several ways teachers and parents can foster development across domains through science experiences, with an emphasis on age appropriate literacy.

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During today's Webcast, we are going to discuss how to create environments to foster science skills and understanding.

Our experts for this Webcast are Shari Ellis, Barbara Dowling, and Michele Plutro. Shari is the Senior Early Childhood Science Advisor for the Office of Head Start and Project Director of the Center for Informal Science Education at the Florida Museum of Natural History. Barbara is a Head Start teacher in South Dakota and a 2008-2009 Head Start Fellow in the Office of Head Start. My colleague Michele is also an Education Specialist in the Division of Educational Development and Partnerships at the Office of Head Start.

Shari…

UP CG:

Shari Ellis

Senior Advisor, Early Childhood Science, Office of Head Start

SHARI ELLIS: Thank you, Jean. It's great to be back with you. I hope you find today's program useful and informative.

The information in today's Webcast is organized around some of the thoughtful questions we have received from you – the viewers. Our responses to the questions reflect additional thought from the panel of experts who generously shared their wisdom and experience with us earlier this year. You have been introduced to some of them in previous videos. We are grateful for their contributions and recognize them in the credits at the end of this Webcast.

As in the past, we will take more of your questions later in the Webcast. You can simply type your question in the "Ask a Question" form on your screen. You can also download a copy of the Learner's Guide for this Webcast by clicking "Learner's Guide" located at the lower portion of your screen. We will also e-mail a feedback form, inviting your continued comments on the science series and your suggestions for the future.

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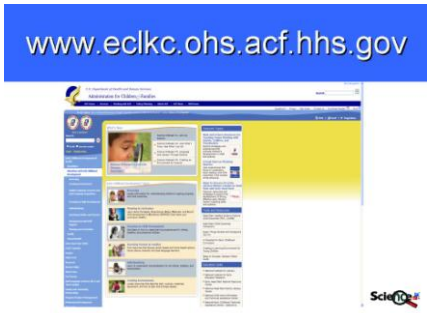


If you want to watch these Webcasts again, or you want to refer a friend or colleague, this series is also available on the Web through the Early Childhood Learning and Knowledge Center, also known as the E-C-L-K-C.

UP CG:

Barbara Dowling

2008-2009 National Head Start Fellow, Office of Head Start

BARBARA DOWLING: Let's begin our conversation today as we did in Webcast one, by reflecting on what science looks like in early childhood. One of our experts, Karen Worth, provides an informative overview. Let's listen now…

Roll Tape!

Karen Worth 3:05 [delete Shari's question] to 7:07

Incue " You begin…"

Outcue: "…that's new theories"

TRT: 4:03

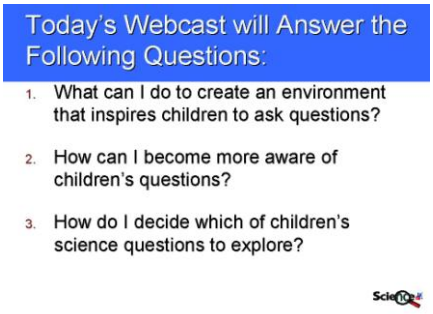
As we heard, children's questions are the starting point for science in the early childhood years. Many of the questions emailed from you ask how to find and support children's inquiry and questions.

UP CG:

Michele Plutro

Education Specialist, Office of Head Start

MICHELE PLUTRO: Thank you, Barbara. Let's look at some viewer questions. Today's webcast will answer the following:



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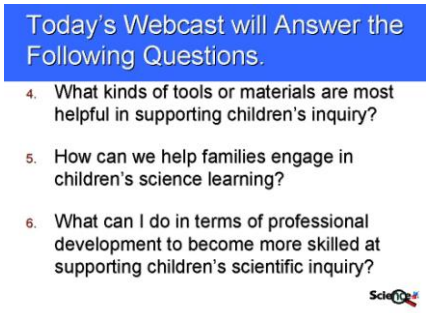
* What can I do to create environments that inspire children to ask questions?

* How can I become more aware of children's questions?

* How do I decide which science questions to explore?



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* What kinds of tools or materials are most helpful in supporting children's inquiry?

* How can I help families engage in children's science learning?

* What can I do in terms of professional development to become more knowledgeable and skilled at supporting children's scientific inquiry?

Slide:

UP CG:

Shari Ellis

Senior Advisor, Early Childhood Science, Office of Head Start

SHARI ELLIS: **(PAUSE)** Some of you have written to say that you need help creating environments that lead children to ask questions. When we use the term "environment" in relation to early childhood, we often think of the physical world—furniture, equipment, books, computers, and the outdoors. We are going to describe some types of materials used in learning environments. But the first steps in creating an environment that leads children to ask questions involve teacher beliefs and child attitudes toward, and dispositions for, inquisitive learning.

We are going to highlight three beliefs and dispositions that are key to a supportive learning environment for science. These features are important across the grades for learning science—not only in early childhood settings.

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The first belief is that all children can successfully experience and learn science. We received a number of emails from viewers who are intrigued by the stories Barbara has shared about her teaching experiences. Several of you are curious about the composition of her classroom. Specifically, you wonder whether Barbara happens to have an extra special group of children. Barbara, could you share more about the children in your classroom?

UP CG:

Barbara Dowling

2008-2009 National Head Start Fellow, Office of Head Start

BARBARA DOWLING: My classroom is filled with children very much like yours in many ways. They are a diverse group of children, many facing challenges in a variety of areas. I firmly believe in addition to the gifts of the children, it is about the teaching and my attitudes about children and how they learn. In other words, “my image of the child”. It makes all the difference in how children interact and learn. I believe that all children who enter my room are competent, capable, and full of wonder and possibilities.

Slide:

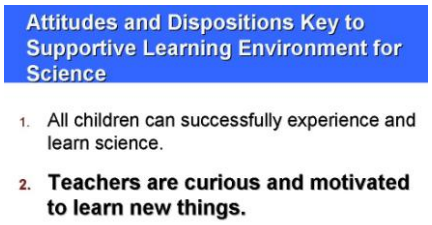
They come with so many ideas, eager to learn and many experiences to share – and even more they want to have a head start. They are creative and curious about nearly everything around them, and how and why things happen.

2 Slides :

My teacher roles are to carefully observe, to really listen, to engage in dialogue with the children, to create moments that surprise and delight, to fill each day with possibilities, and to be engaged **with** the children in the process of learning. When engaged with the children, you really see discovery unfold and you join in the joy and amazement of the ah-hah moments.

2 Slides:

This is what sustains me as a teacher. It also creates those dispositions for young children to think like a scientist—being curious—investigating, collecting, recording precise data, cooperating, communicating, seeking answers, asking new questions, and persisting.



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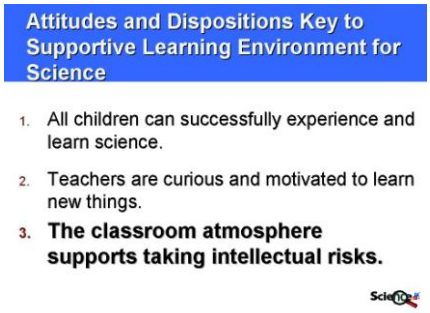
SHARI ELLIS: Thank you Barbara. Barbara embodies another critical feature of a science-rich environment—a teacher who is deeply curious and motivated to learn.

V/O Florida Footage:
Mr. Archimedes with children and teacher in circle doing water displacement exercise with rocks; make sure shot of boy with braces is in clip.
TRT: 0:31

Recall from Webcast 1 that science is learning about the world and how it works. To engage in science requires that one approach the world with a deeply questioning mind—some would say a sense of "wonder." Teachers and parents who model curiosity and an interest in finding answers foster these dispositions in children.



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A third feature of a supportive science classroom is one in which it is safe to take intellectual risks. So much of science involves exploring materials and ideas that one knows little or nothing about. By definition, science often involves being uncertain, surprised, and even totally wrong! Science is also a social activity. Recall from Webcast 2 that sharing discoveries with other people is a basic science process skill. Our confusions and errors as well as our discoveries are generally public.

Slides:

Science cannot be enjoyed when we are afraid of making mistakes or looking foolish to others. Successful science environments are those in which teaching creates an atmosphere where children feel comfortable taking risks in learning and communicating with others, and where all children are valued for their ideas.

Discovering Science

How can I become more aware of children's questions?

Slide:

We have also received a number of emails asking for help listening for children's questions. Another expert who contributed to this Webcast series is Dr. Lilian Katz. She shared a delightful story that illustrates both how to listen for topics that can develop into investigations AND how to have a conversation with multiple children.

UP CG:

Michele Plutro

Education Specialist, Office of Head Start

Roll TAPE!

"LIGHT-UP" SHOES FOOTAGE

MICHELLE PLUTRO: There were a few four years old sitting together in their preschool class and three of the children were wearing sneakers that would light up when they stepped on them.

The teacher said, "Wow look at your shoes, that's cool! They light when you step on them. "

Christian said, "Yup they do! Watch!" and she jumps up and down several times.

The teacher asked, "How does that happen? How does it light up?"
"Cuz they're new," she said.

The teacher said, “Well my shoes are new but they sure don’t light up.”
Sean said, “No because they light up when you step on them and steps down hard several times.”

The teacher said, “Okay let me step on mine. Hmm? That’s funny mine don’t light up when I step down.”

Karlie added, “No, no, no, you have to have holes.” and points to the holes in the shoes.

The teacher points to the holes in her shoes, “Well I have holes in mine and they still don’t light up and Josh has holes in his sneakers too and his don’t light up. I wonder why?”

Then Rachel chimed in, “I think you need batteries. KEDS need batteries.”
Christian said, “Yah you need batteries to make them work!” and then she thinks, “but I didn’t see batteries when I put my toes in.”

“I think maybe they’re under the toes,” Michael said.
And Sean said, “I can’t feel batteries under my toes.”
And then the teacher said, “I wonder how we can find out about this?” and that lead them into an investigation.

UP CG:

Barbara Dowling

2008-2009 National Head Start Fellow, Office of Head Start

BARBARA DOWLING: So how is it we become aware of children's interests in ordinary moments like this? One tool teachers can use to help them recognize children's interests and questions is "Learning Stories" first developed by Margaret Carr.

A learning story can be about a single child or a group of children. "Learning Stories" bring together a teacher's observations and wonderings about a child's learning to make the child's learning visible.

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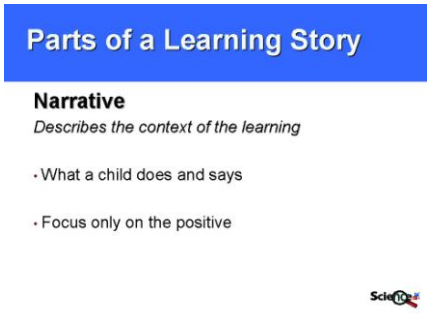
Generally, learning stories have 4 parts to them: a Narrative, a Reflection, Opportunities and Possibilities, and at least one photograph. These parts can also be referred to as What? So What? Now What?

So how does a teacher go about creating a learning story? First, choose the subject. You can find an activity that amazes you, or one that will make learning visible, or one that has the potential to lead to deeper and richer experiences that you have captured in photographs.



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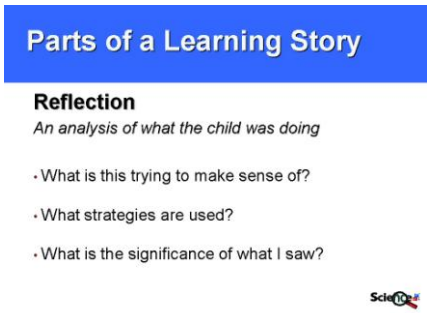
Begin by writing the narrative which describes the context of the learning. Write about what the child does and says, focusing on the positive.



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Then write your Reflection, which is an analysis of what the child was doing. And ask yourself, "What is this child trying to make sense of? What strategies are used? and what is the significance of what you saw?"

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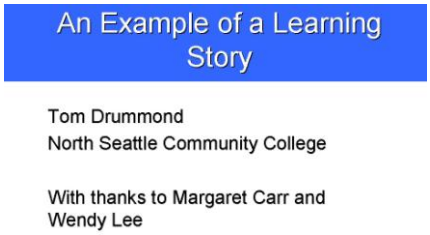
The third part, opportunities and possibilities, focuses on what you do to make this learning deeper and more complex, and what you can do to provide support so the child or children can achieve their goals.



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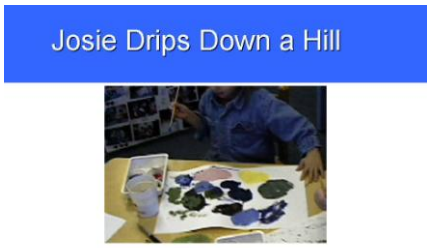
Now let's look at an example of a learning story from Tom Drummond, of North Seattle Community College. We thank him for this contribution.



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The story is **Josie Drips Down a Hill**. We begin with the narrative, the "what" of the learning story.

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Josie had been painting a while when I saw her make a hill by pushing the paper toward the paint tray.

I had never seen anyone do this before, so I began to take pictures. Josie was closely watching the paint.

Slide:

I had never seen anyone do this before, so I began to take pictures.

Josie was closely watching the paint.

Josie touched the brush to the painting at the top of the hill. A drip slowly ran down the hill making a blue line.

Slide:

Josie touched the brush to the painting at the top of the hill. A drip slowly ran down the hill making a blue line.

Josie filled her brush again and added more blue paint at the top of the slope in the very same place.

Slide:

Josie filled her brush again and added more blue paint at the top of the slope in the very same place.

Then she added paint to the pink area on top of the hill.

Slide:

She added paint to the pink area on top.

This second drop of paint began to slide down hill through the pink area. The first drip line was now all the way at the bottom.

Slide:

This second drop of paint began to slide down the hill through the pink area. The first drip was now all the way at the bottom. Josie watched intently as the drip slowly made its way to the bottom of the hill.

Josie pushed the paper towards the paint tray and made the hill steeper. The drip was going almost straight down now.

Slide:

Josie pushed the paper toward the paint tray and made the hill steeper. The drip was going almost straight down now.

She added more paint to the top.

Slide:

She added more paint to the top.

Josie watched intently as the drip slowly made its way to the bottom of the hill.

Slide:

Josie watched intently as the drip slowly made its way to the bottom of the hill.

Now let's look at the teacher's reflection, the "so what" of the learning story.

What it means:
Josie, you discovered how to make paint draw a line by sliding down a hill. You concentrated on how it moved. Not only were you a painter, today you were a scientist. You did an experiment. You watched the effect of the hill on the drip that you caused. That careful looking is how scientists discover how things work.
You wondered about something and figured it out.

Slide:

"Josie, you discovered how to make paint draw a line by sliding down a hill. You concentrated on how it moved. Not only were you a painter, today you were a scientist. You did an experiment. You watched the effect of the hill on the drip that you caused.

That careful looking is how scientists discover how things work. You wondered about something and you figured it out."

Slide:

Opportunities and Possibilities
Josie seems to have a disposition to wonder and be intrigued with the physical properties of paint that is worth exploring in greater detail. We can bring out the easels tomorrow with thick paint and water that she can mix. Eye droppers may help, too.
We will want to show these drip lines to the other children, for it may spark their interest, too. Then a group of children might have some ideas of what to try next.

The third part of the learning story, the "now what," looks at opportunities and possibilities that can be considered for further study. The teacher determined that Josie seems to have a disposition to wonder and be intrigued with the physical properties of paint that is worth exploring in greater detail. They could bring out the easels tomorrow with thick paint and water that she can mix. Eye droppers can help, too.

We will want to show these drip lines to the other children, for it may spark their interest, too. Then a group of children might have some ideas of what to try next.

As you see, Learning Stories offer a powerful and compelling view of children's learning and in this example, scientific thinking. They help the teacher plan appropriately to both support and to challenge children. Learning stories also allow us to revisit key experiences with children. Revisiting an experience with children allows us to create shared meaning; to allow children to clarify their own thinking, and to support children in moving toward a new level of complex thinking.

I will talk more about learning stories and the important role parents play later in the webcast.

UP CG:

Shari Ellis

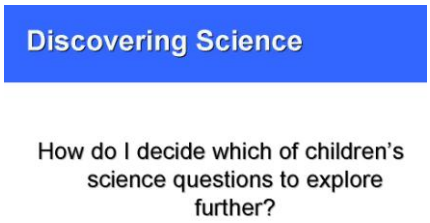
Senior Advisor, Early Childhood Science, Office of Head Start

SHARI ELLIS: Today we also want to offer some additional criteria for you to consider when you make decisions about the kinds of questions and studies to pursue with children.

Karen Worth and other experts in this discovering science series are advocates of inquiry science. They shared with us inquiry science involves "hands on exploration" that allows children to ask a question, make observations, engage in investigation, and share their discoveries.

Inquiry science begins with open-ended questions that lead to real investigations—not those *follow-the-recipe* kinds of science experiments that you might recall from a chemistry class. Inquiry Science is definitely <u>not</u> memorizing facts, and it is not learning science from a book or a video.

Advocates of inquiry science at all grade levels, not just with young children, explain that the best way for students to learn science process skills is to use them to answer a question they are curious about. There is abundant evidence that comprehending science facts and understanding concepts increase when they are learned in a meaningful context.



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So how do you decide what to explore? Let's listen to Karen Worth offer insight on selecting topics…

Roll Tape!

Karen Worth 7:08 – 11:18

Incue "What topics…"

Outcue: "…big ideas."

TRT: 4:00

UP CG:

Barbara Dowling

2008-2009 National Head Start Fellow, Office of Head Start

BARBARA DOWLING: Karen listed several criteria to consider when selecting topics to investigate. We will elaborate on a few of these.

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First, the question or topic must be interesting to the child. That question or topic should interest the teachers as well.

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Other important criteria are: the topic can be explored in depth and over time; it can be experienced directly, and there is the potential for children to learn about "Big Science Ideas." We will describe these three additional criteria in more detail.

Why is it important to be able to study a question in depth and over time? This issue is sometimes the focus of debate in K through 12 science reform efforts. Some say that science education in the United States is wide, but shallow. That is, school-age students know a little about many science topics, but often lack a depth of understanding of any of them. In other words, our students memorize a lot of facts, but have few opportunities to use the science process skills that are valuable beyond the classroom.

How do these observations apply to early childhood? The wide, but shallow approach to science is often reflected in early childhood settings when teachers select a hodge-podge or other random collection of science activities such as growing beans one week and mixing colors the next. It's almost like how much can we cover, rather than how deep can we go using science process skills to uncover many ideas about a single concept.

From birth to five, our goal is to introduce the children to a variety of objects and events while being sensitive to individual interests and temperaments. For example, very early on, there are children who will explore a toy or other object for a long time, while other children lose interest very quickly.

But, as children's attention and self-regulatory skills mature, they are able to explore in-depth materials that are very interesting. This in-depth exploration provides opportunities for children to practice science process skills, build deeper understanding, and acquire knowledge. Adults play essential roles in helping children develop exploratory skills. Adults facilitate children's explorations by asking questions, drawing children's attention to details, and by selecting appropriate materials and experiences.

An example of science that is difficult to explore is what Karen referred to— magnetism. The science behind magnets quickly becomes complex and beyond children's grasp. Of course, magnets seem to be a permanent part of many early childhood settings. If teachers facilitate children's initial explorations with magnets and rotate a variety of different kinds of magnets and test objects in the science or discovery area, magnets can be a

valuable tool for discovery. They do not, however, support in-depth exploration of related scientific concepts such as electrical fields or polarization.

UP CG:

Shari Ellis

Senior Advisor, Early Childhood Science, Office of Head Start

SHARI ELLIS: Another criteria to consider when selecting science topics is whether it can be experienced directly by young children. The reason the topic of dinosaurs is rejected by many for inquiry science is that children cannot explore or experience them directly.

But there are a number of science topics that appear in early childhood classrooms that are nearly as inaccessible as dinosaurs. These include exotic environments such as the rainforest, Antarctica and oceans, or the Solar System.

And, what about animals? If licensing permits live animals, then children can have some direct experience with them. But, when live animals are not an option in the setting, does that mean animal studies are “off-limits”—or limited to mealy bugs and other insects in the local environment? Barbara, how do you respond to this issue?

UP CG:

Barbara Dowling

2008-2009 National Head Start Fellow, Office of Head Start

BARBARA DOWLING: I am fortunate to live in a farming region where it is acceptable and allowable to have live animals in the classroom, and it is easy to find permanent homes for them after our studies.

Slide:

I am aware that many teachers feel their most successful science projects involve live animals— be it hatching tadpoles or caterpillars, or observing other small animals such as worms and snails.

Slide:

But even in my region, children express interest in animals that live far away, or that cannot be easily explored directly. The live animals—even the smallest ones—do pose challenges related to individual fears, sanitation, health, and safety. And there are ethical

issues involved in caring for animals. We need to insure their survival—which means we do not hatch caterpillars when it is too cold to release the butterflies outdoors. And, we need to select species that are native to our location—or find a zoo or facility willing to contain them.

So, you wonder whether it is appropriate to substitute less hands-on or less direct experiences with animals for direct experience with live ones? It is helpful to reflect on several questions. The first is, is it possible to find materials and activities to create experiences for in-depth exploration?

Another question comes from expert Karen Worth—might the exploration foster an understanding of important science concepts—or Big Science Ideas? What is the potential to connect with big science ideas?

Slide:

When evaluating whether to begin any exploration, it is important to reflect on what science and understanding you would like to foster.

For example, hands-on experiences with live animals can be an extremely effective way to foster an understanding of what it means to be a living thing.

Slide:

Feeling a small animal's heartbeat or its breath on your skin, watching it move, or making sure it has proper food and shelter makes clear some needs of living things.

Are there other Big Science Ideas that can be addressed less directly or less hands-on? And how might we figure out what some of these Big Science Ideas are in the first place?

Michele…