

**UP CG:**

**Michele Plutro**

**Education Specialist, Office of Head Start**

MICHELE PLUTRO: We have also received several emails asking if there are core science concepts, in other words “Big Ideas” that should be covered during the early years. Let’s compare this question with our previous series on Math. In the Office of Head Start Math Webcasts, for example, we covered both math concepts and mathematical skills and thinking.

In this series, some of you have noticed that there are few specific recommendations regarding science content. Rather, there has been constant focus on the five science process skills, and teaching methods and strategies that support children’s experiences and learning of these skills. We have demonstrated through approximately 40 videos that there is science content being talked about, learned, and even challenged by some of the children, and Barbara and Shari have shared many examples of where appropriate science content comes from.

One reason we have not focused more on specific content and concepts is that there is relatively little consensus regarding what is the most important science during the early years. This was not the case with math.

Professional organizations such as the National Science Teachers Association and the National Academies of Science have not yet offered such content frameworks for K-12 science. This may be because there is insufficient research upon which to base such a framework or content recommendations. However, research *has shown* that young children are capable of developing a rich understanding of their world and how it works. How does this understanding develop? They must have frequent opportunities to pursue their scientific interests and even more frequent opportunities to learn and use science process skills. They must also engage in thoughtful and planned experiences that allow science ideas to be explored in-depth and over time.

I hope this has been clear through these Webcasts that we, along with the other experts, have described the importance of early childhood science in the development of thinking and communication skills, and for developing dispositions such as curiosity and persistence rather than the mastery of isolated facts.

All of that said, early childhood science, like other domains of learning, needs to revolve around worthwhile content. While you look not only to the children but also beyond the children, where can you go to identify additional content, concepts, and these big ideas that might help you support children's learning now and to lay the foundation for later science learning?

One place to start is your local curriculum. You may also want to reference the Head Start Child Outcomes Framework, the Head Start Leaders Guide to Positive Child

Outcomes, or your State or county early learning standards. While many States emphasize the process skills as we have, some State standards also offer “big science ideas” such as “what living things need in order to survive.”

I’m going to ask Shari, if there are other big science ideas you could share?

**UP CG:**

**Shari Ellis**

**Senior Advisor, Early Childhood Science, Office of Head Start**

SHARI ELLIS: Well, one is the distinction between living and non-living things. A defining feature of living things is reproduction. A related idea that young children can explore is that offspring look like their parents—kittens look like cats, puppies look like dogs, and seedlings look like mature trees.

Karen Worth mentioned “life cycles” as a Big Idea. A related idea is “change.” This idea could be investigated over and over again with explorations focusing on growth, decay, leaves, and even changes in states of matter, like ice and water.

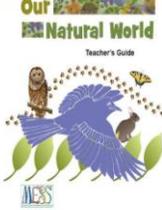
Discussions of the human body often focus on body parts—both the observable on the outside and the bones and organs on the inside. The idea of “insides and outsides” could be expanded to other natural things such as plants and seeds or objects made by people such as toys and machines.

The list of potential "big ideas" is almost endless.

**MESS**

MESS components include:

- Background Information
- Materials List
- Core Experiences
  - ✓ Aim
  - ✓ Science Concept
  - ✓ Vocabulary
  - ✓ Approach
  - ✓ Science Center
  - ✓ Integrated Experiences
- Take-Home Experience
- Recommended Books
- Head Start Domains and Indicators from the Child Outcomes Framework



**Slide:**

Another place to look for ideas is a new science resource already beginning to appear on the ECLKC, *Marvelous Explorations Through Science and Stories* or MESS.

MESS was funded as an Innovation and Improvement Project by the Office of Head Start. There will ultimately be 10 MESS Guides available on the ECLKC.

Each Guide is designed to help teachers create opportunities for children to engage in important science process skills and learn foundational science ideas. The background information answers questions teachers might have about the content area and targets the big ideas to be introduced. The Guides also include recommendations regarding materials to use to support investigations including tools, objects, and books.

To illustrate, let's return to our discussion of animals. In my experience, efforts to explore animals indirectly in classrooms are often not very scientific. And this is true whether the focus is on familiar pets or animals that live in far off, exotic locations. For example, it is common to see animal explorations organized around the idea of animal homes or habitats. This can be a great start but it is less so when homes and habitats are interpreted as animals that live on farms, animals that live in zoos, and animals that live

in jungles. This organization is not based on a scientific classification scheme and it can be confusing. A tiger might be a jungle animal, zoo animal, circus animal, and where I live in Florida even a farm animal.

Science ideas about animals can be accurately and productively explored in the absence of live specimens by using objects. You might want to reflect on our presentation of object learning in Webcast 2. An example of such an idea is that animals have different adaptations that help them survive. One hands-on way to investigate this idea with young children would be to explore body coverings.

## **Shari Demonstration**

### **Show body coverings board, feathers, turtle shell**

For example, here I have a board that has body coverings of different mammals. Objects can be used to support rich conversations about the functions of fur, a hard shell, and different types of feathers.

With the support of MESS materials, even dinosaurs can be studied in a way that builds scientific understanding although it is impossible for anyone to experience ancient life directly. An important science idea here is that scientists study fossils to learn about animals that lived long ago. Although the concept of geologic time is beyond the grasp of young children—and most of us—they can understand that there are rock-like remains of animals that lived long ago and that these remains take the shape of bones, teeth, and even remains preserved inside a rock or other matter. Hands-on exploration of fossils provides opportunities to practice observation and classification skills and can lead to further exploration of what animals eat, how different animals have different kinds of feet and leave different tracks, or even to a broader investigation of bones.

### Resources used by You— the Viewers

- A Head Start on Science
- A local science curriculum (Stafford Schools, SC)
- Creative Curriculum Study Starters
- Preschool Pathways to Science
- Project Approach Website
- ScienceStart!
- Young Scientist Series



#### **Slide:**

In our last “Save-the-Date” announcement, we asked you, the viewers, to share science resources you find helpful. Such resources, when you choose wisely, might also help you identify important science ideas and concepts. Are there other big ideas to share with our viewers?

**UP CG:**

**Barbara Dowling**

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

BARBARA DOWLING: (PAUSE) We’ve shared some examples of object-based learning to illustrate that there are many ways to teach science well in the early childhood setting. Inquiry science based on questions children generate from their direct experiences is a wonderful way to support the development of science process skills and knowledge. Objects are another way to both inspire and to answer children’s seemingly endless questions.

## Discovering Science

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

**Slide:**



This leads us to our next topic for today: What kinds of materials are helpful in supporting science in the early childhood classroom?

**UP CG:**

**Michele Plutro**

**Education Specialist, Office of Head Start**

MICHELE PLUTRO: (PAUSE) When we assembled the panel of experts to discuss early childhood science and to gather suggestions for possible content of these Webcasts, we asked if there were any “must have” materials for early childhood science. There was remarkable consensus among the experts and you might be surprised by those suggestions. Though we do not have time to review all of their ideas, Barbara and Shari are going to share a few that will be helpful and available to all.

**UP CG:**

**Barbara Dowling**

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

**Materials to support children's science learning**

- Books and photographs



**Slide:**

BARBARA DOWLING: Panel members emphasized that books-especially nonfiction titles and realistic photos are essential supports for science in early childhood.

**Materials to support children's science learning**

- Books and photographs
- Take advantage of the natural world.

**Slide:**



As we discussed in Webcast 3, these tools can jumpstart investigations, serve as sources of information, and help children make connections between the real world and representations.

The panel held strong beliefs about the central role that nature plays in early childhood science. We can see that many of the materials that offer big ideas for scientific study are those found in nature.

The wonders of nature intrigue children. They naturally enjoy observing and thinking about nature. It is a free ever-changing laboratory where many phenomena can be discovered and investigated. The best thing is that it is just outside your door whether you live in a rural area or an urban area. It's there for you to explore.

Take advantage of the natural world.



Science

**Slide:**

So what does nature offer? Go outside your center and stand still. Close your eyes and listen. What do you hear? Can you hear the birds? The crickets?

Take advantage of the natural world.



Science

**Slide:**

The sounds of construction work? Walk around the building and look at the environment at the child's level. What do you see? You may be surprised how different nature looks from that perspective.

Take advantage of the natural world.



SciEd

**Slide:**

Look up. What do you see? Clouds, the sun, the moon, birds flying?

Take advantage of the natural world.

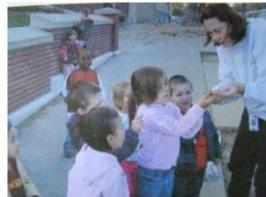


SciEd

**Slide:**

Look down at the ground or the sidewalk. What do you see there beneath your feet?

Take advantage of the natural world.



SciEd

**Slide:**

Perhaps it is a snake or insect.

Lots of what we find right outside in our natural world—dirt, water, plants, worms, spiders, ants, birds, rabbits and squirrels attract and hold children's attention for hours and possibly days.

Children can also observe, reflect, record, and share nature's patterns and rhythms. If you model discovery on walks with the children, they will learn to discover.

Not only is nature a great laboratory for scientific investigation it offers other benefits. There is much research happening in regards to the affects of children having nature-based experiences.

Some of the pertinent findings are:

**Video: Hartford Nature Field Trip (voice-over)**

Being outdoors helps create a sense of wonder which children can carry over to other aspects of their life. Being in nature helps children to become more aware of their world. Nature gives children the chance to engage all their senses, and as we discussed in Webcast 2, using senses to explore our world is one of the key science process skills.

A recent Canadian study found that children whose school grounds include diverse natural settings are more physically active, more aware of healthy nutrition, more respectful to one another, and even more creative.

The opportunity to explore helps children improve their attention spans and learning. By studying science, through outdoor experiences, children can connect to their local environment and become stewards of their community's natural resources.

Remember, if you are excited and amazed by nature your children will be too.

*-End of Hartford Nature Field Trip Video-*

**UP CG:**

**Shari Ellis**

**Senior Advisor, Early Childhood Science, Office of Head Start**

**Materials to support children's science learning**

- Books and photographs
- Take advantage of the natural world.
- **Create collections for and with children.**

**Slide:**



SHARI ELLIS: Another category of materials offered by our expert panel was to create collections.

**Create collections for and with children**



**Slide:**

With appropriate safety rules and supervision in place, even the youngest children can safely explore the natural world by bringing collections of natural items into the classroom.

Collections are an important science resource in any early childhood setting. Do you recall Barbara's discussion of collections in Webcast 2 where we presented very young children exploring collections, doing, sorting, and classifying?

Create collections for and with children



**Slide:**

Collections are a great way to foster an appreciation of the similarities and differences in all types of objects—things like shells, rocks, and even dead insects.

Older children can use collections to help answer science questions. You might remember this story from Dr. Katz. The project began with a basic question about whether all balls are round—and whether then all spherical objects are balls? To help answer this question, the class ended up with a large collection.

Create collections for and with children



Create collections for and with children



**Slides:**

There are a number of scientific fields that study collections. For example, at the Florida Museum of Natural History where I work there are over 28 million specimens and objects! Scientists from all over the world come to the museum to study the collections to answer many different questions about climate change, the origins of disease, or the similarities and differences among plants and animals found on the Earth. They are not

doing inquiry in the same way that scientists do experiments. But they are beginning with a question they try to answer using careful observation and other scientific tools.

**UP CG:**

**Barbara Dowling**

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

BARBARA DOWLING: Although I talked about collections in an earlier webcast, I want to take this opportunity to point out that collections can also be used to support children's interests that cannot be explored in their immediate environments.

Create collections for and with children



Science

**Slide:**

You might wonder how Tommy, a young child growing up in South Dakota, developed a passion for seashells. Well, Tommy's grandmother lives on the Oregon coast and so he gets to hunt for seashells when he visits. I do not generally provide seashell collections in my classroom, but that year I did and it grew into a marvelous exploration.

**UP CG:**

**Shari Ellis**

**Senior Advisor, Early Childhood Science, Office of Head Start**

**Materials to support children's science learning**

- Books and photographs
- Take advantage of the natural world.
- Create collections for and with children.
- **Use high quality science tools.**

**Slide:**



SHARI ELLIS: Our expert panel also emphasized the importance of investing in high quality science tools that can be used to explore many different topics. I have some examples here.

**Materials to support children's science learning**



**Slide:**



**-Shari ad lib-**

### Materials to support children's science learning

- Books and photographs
- Take advantage of the natural world.
- Create collections for and with children.
- Use high quality science tools.
- **Use recycled materials.**

**Slide:**



The experts discouraged us from spending funds on expensive materials that have a single use. Instead, they suggest frequent use of recycled and found materials as well as materials acquired from families or inexpensive items from hardware stores—all materials that can be used in many ways. This video clip provides a nice example.

**Roll Tape!**

**Videatives Playground Physics**

**TRT: 2:00**

**UP CG:**

**Barbara Dowling**

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

**Materials to support children's science learning**

- Books and photographs
- Take advantage of the natural world.
- Create collections for and with children.
- Use high quality science tools.
- Use recycled materials.

**Slide:**



BARBARA DOWLING: Thank you Dr. Forman and videotives for providing that wonderful clip of a child experimenting with physics on the playground. Our experts also observed that it is very enriching to teach science with a digital camera and access to a color printer. Wouldn't it be ideal if teachers had access to a camcorder as well?

**Materials to support children's science learning**

- Books and photographs
- Take advantage of the natural world.
- Create collections for and with children.
- Use high quality science tools.
- Use recycled materials.
- **Use digital a camera, color printer, or camcorder.**

**Slide:**



Digital cameras and camcorders can enrich investigations in many ways.

## Slides:

Uses for Digital Cameras and Camcorders



Uses for Digital Cameras and Camcorders



SciEd

SciEd

Uses for Digital Cameras and Camcorders

- Document investigations
- Support conversations with children
- Improve teaching
- Document children's progress
- Communicate with families

SciEd

We can use photographs to document children's investigations. We can show the changes that occur in an experiment, or take photos of the outdoors so that we can study them in the classroom. Photographs and video are wonderful ways to support conversations with children about what they were doing or thinking during their explorations.

And, as I described earlier with Learning Stories, photographs also can be used to help teachers reflect on and improve their practice.

Similarly, by documenting children's learning on film, we have a ready tool to communicate with families. This brings us to our next question—How can we help families support children's science learning? Several of you have emailed questions that fall into this category.

## Discovering Science

### How can we help families engage in children's science learning?

#### Slide:



How can we help families engage in children's science learning? I'd like to begin to answer this question by describing how the Learning Story tool we described earlier can be used to engage families in their child's learning. Remember that a learning story is first and foremost an interesting and engaging story that makes visible a meaningful and valued learning experience. At the end of the learning story is a blank page titled "parent voice." Here is what Josie's parents wrote:

#### Josie Drips Story

**Parent's voice:**

"Josie you are amazing. I see you do this kind of close looking many times. Now you can see yourself doing it, too."

"It was a joy to read this story to Josie."  
We read it over again and again."

#### Slide:



"Josie, you are amazing. I see you do this kind of close looking many times. Now you can see yourself doing it too."

"It was a joy to read this story to Josie. We read it over again and again."

## Josie Drips Story

**Parent's voice:**

"I never would have paid any attention to those horizontal lines at the bottom of her painting without seeing the pictures of her absolute concentration in making them."

"Thank you, teachers, for stopping to look at this precious person we love."

**Slide:**



"I never would have paid any attention to those horizontal lines at the bottom of her painting without seeing the pictures of her absolute concentration in making them."

"Thank you, teachers, for stopping to look at this precious person we love."

What an incredible reflection from Josie's parents. In making learning visible we are able to inform parents, ourselves, and others of the incredible competence of young children and their understanding of the world. These stories, done well, help foster home/school communication. They inform teachers about children's learning and they point to additional opportunities and possibilities to further develop children's strengths and interests. Additionally, they inform parents about their child's learning, allowing the panelists to deepen their understanding of their child's strengths and interests. By including a blank page for the family to respond with their ideas and reactions, Learning Stories also encourage parental observation and dialogue with their child and with the teacher.

There are other simple techniques to help parents become more aware of their children's questions. Dr. Jennifer Jipson suggests parents make a list of their children's questions over the course of a few days or a week. You might be surprised at the kinds and variety

of questions that children ask. Let's make another visit to Sid the Science Kid to listen to how children ask questions and parents repond.

**Roll Tape!**

**Sid the Science Kid Perfect Pancakes**

**TRT: 0:55**

**UP CG:**

**Michele Plutro**

**Education Specialist, Office of Head Start**

MICHELE PLUTRO: Another way to engage families in children's science learning is to create science experiences that children can do at home with their families. One very successful way teachers accomplish this is to ask children to collect data in order to answer a question.

One delightful example that Dr. Katz shared at the meeting involves the concept of "a chair."

**Slides:**

Home-school-work

Home-school-work



Things We Sit On						
bicycle	rocking chair	sofa couch	wheel chair	chaise lounge	toilet	shopping cart
						

ScieDe

ScieDe

Home-school-work



ScieDe

The children were provided clipboards, drawing paper, and pencils to take home. They were asked to look around where they live, and draw anything they see that they could sit on. The variety of objects that children described was remarkable—there were high chairs, rocking chairs, toilets...and even shopping carts. The children began to refer to this kind of assignment as their “home-school-work.”

Home-school-work is always done with an adult and is related to what is going on in the curriculum. It engages adults in exploring with children and it helps them understand what their child is learning.

**UP CG:**

**Shari Ellis**

**Senior Advisor, Early Childhood Science, Office of Head Start**

SHARI ELLIS: There are more wide-reaching ways to engage families in children's science learning. These include summer science programs, family science nights, and inviting parents on science-related field trips. In our work at the museum, we have found these strategies can be highly effective and perhaps life-changing. Let's listen...

**Roll Tape!**

**Florida Field Trip**

**TRT: 3:15**

SHARI ELLIS: The final question we would like to address today is where you should go from here in terms of professional development. Michele is going to cover this right after we return from our short break. We'll see you in 3 minutes.

**\*\* 3 minute BREAK \*\* Roll PSA**

**UP CG:**  
**Michele Plutro**  
**Education Specialist, Office of Head Start**

**Discovering Science**

What can I do for professional development to become more skilled at supporting children's scientific inquiry?

**Slide:**



MICHELE PLUTRO: Welcome back! I'm happy to have some time to be here to talk with you about this important question—where can you go from here?

It's an important question to be answered in two ways: where do you as an individual go in your professional journey, and where can your program go to enhance the implementation of science experiences?

In today's webcast Shari and Barbara have been weaving in both some review and some new content as they responded to many of your questions. Of course, they have not been able to answer every question nor have they been able to present everything you need to know about early childhood science or about being an effective teacher of young children. Only your continued professional development can help you reach those goals.

In comparison with sustained professional development, these 4 webcasts total less than 6 hours of exposure to early childhood science. In contrast, an early childhood education

science methods course in a 2- or 4-year degree program would likely be more than 20 classroom hours of classroom time.

So I am here in part to urge you to continue your professional development in this area and others where you want to see growth over time. This can be accomplished in a number of ways: through college courses on a campus or college course online; through a community of practice or peer study group. Or you might take advantage of mentor coaching, reflective supervision, technical assistance, or even demonstration teaching with a colleague.

Today seems like a good time to also mention why we were unable to answer some of your questions during these webcasts. There was a subset of questions that are so specific to individual, local programs that we simply could not provide an answer. Each local program needs to make key decisions for their children and families that are in keeping with the Performance Standards and other regulations.

You will need to engage in the hard work that is necessary to arrive at the "right answer" for your specific situation. Specific answers must match the context created by your identified curriculum and the backgrounds and skill levels of your children, and in keeping with the local program plans and policies for implementing Head Start services there.

There are many ways programs pursue local answers for local questions—through your curriculum, an education advisory committee, by working with your education coordinator, child development specialists even through the work of consultants, and in some cases, by working with local licensing representatives.

Resources	Resources <small>(continued)</small>
<ul style="list-style-type: none"> <li>■ The Head Start Leaders Guide to Positive Child Outcomes</li> <li>■ The Head Start Mentoring Guide, <i>Putting the Pro in Protégé</i></li> <li>■ <i>Steps to Success-Decision Making Guide</i></li> <li>■ State Early Learning Standards</li> <li>■ Department of Education early education website</li> </ul>	<ul style="list-style-type: none"> <li>■ CLASS</li> <li>■ SOLAR</li> </ul>

**Slides:**

Many programs have found assistance by using the publications you see now on the screen.

During each webcast, if you have not been asking yourself about the status of science experiences in your curriculum, about the effectiveness of science teaching in your program, and about the outcomes for children in your program, now is a good time to ask those questions and now is the time to begin formulating "where to go in professional development."

For that reason I want to take some time to highlight some very important aspects of the Head Start Act of 2007.

## The Head Start Act of 2007

The Head Start ACT of 2007 requires that:

- "information from the assessment of teachers is inform professional development plans to lead to improved teacher effectiveness"
- Each Head Start teacher shall attend not less than 15 clock hours of professional development per year

**Slide:**

Did you know that the Act now requires that “information from the assessment of teachers be used to inform professional development plans to improve teacher effectiveness?”

The Act contains a great deal of helpful information related to quite specific teacher in-service requirements. I encourage you to take time to review these requirements.

Here are a few examples:

Each Head Start teacher shall attend not less than 15 clock hours of professional development per year.

## The Head Start Act of 2007

The Head Start ACT of 2007 requires that:

- Professional development needs to be high quality, sustained, intensive, and classroom focused

**Slide:**



The Act, which is in keeping with current research, says that this professional development needs to be high quality, sustained, intensive, and classroom focused in order to have a positive and lasting impact on class instruction and on the teacher's performance in the classroom.

## The Head Start Act of 2007

The Head Start ACT of 2007 defines **professional development** as high-quality activities to improve the knowledge and skills of Head Start teachers and staff and to provision of services and instructions.

**Slide:**



The Act defines 'professional development' as high-quality activities to improve the knowledge and the skills of Head Start teachers and staff.

The Act specifies that professional development experiences are to increase teacher competencies in approximately 20 different areas.

## The Head Start Act 2007

**Professional Development Plans-** Each Head Start agency and program shall create, in consultation with each employee, a professional development plan for all full-time employees.

**Slide:**



Each Head Start agency and program is also to create, in consultation with you the employee, a professional development plan for all full-time employees who provide direct services to children and ensure that the plans are regularly evaluated for impact.

Before we go to today's final questions from you, I would like to share some insight from Dr. Shirley Malcom, the director of Education at the American Association for the Advancement of Science.

Nearly a decade ago I heard Dr. Malcom say "science matters **FOR** children because it matters **TO** children." That phrase has been with me ever since!

Throughout this series we have illustrated that principle and investigated **HOW** science matters to children —it matters in their questions, in their observations, in their sensory learning, and yes even in their hypothesizing!

As Barbara shared her teaching experiences within each webcast, we observed how children are by nature trying to make sense of the world. They are demonstrating powerful, and at times, complex ways of knowing about the world. Shari and our other

experts have helped us see how well designed, hands-on experiences and extended conversations in the early years prepare children for more formal science study.

And all of our guests have given us many reminders that we must not set limitations, but rather, have limitless high expectations for every child, beginning in infancy.

Dr. Malcom also describes science and math as the great equalizers and the builder of bridges to later educational and life opportunities.

Will you help? Will you have high expectations for every child? Will you become more effective at planning and implementing curriculum experiences? Will you accurately assess each child and continue to build bridges of learning with them? Shari...

**UP CG:**

**Shari Ellis**

**Senior Advisor, Early Childhood Science, Office of Head Start**

SHARI ELLIS: Thank you Michele. Now it's time to answer some other questions you have emailed to us today. Here to help is Dr. Jean Simpson from the Office of Head Start.

**UP CG:**  
**Jean Simpson**  
**Education Specialist, Office of Head Start**

JEAN SIMPSON: Thank you. It's not too late to send in your questions. Remember you can type your question into the "Ask a Question" form on your browser.

Our first question is from....

**Live Q & A Segment (20 minutes)**

JEAN SIMPSON (ON CUE): Thank you Shari, Barbara, and Michele. Thanks to all of you and our many experts who supported our work throughout this series.



Please visit the E-C-L-K-C for additional information related to science, other curriculum support and professional development resources.

Email questions and suggestions  
to:

[ScienceWebcasts@esi-dc.com](mailto:ScienceWebcasts@esi-dc.com)

**Slide:**



Feel free to send suggestions for future Webcasts to the e-mail address at the bottom of your screen. Once again, thank you for the time you spend in making a difference in the lives of Head Start children and families.

**-End-**