

Daryl Greenfield: Encouraging Our Youngest Scientists at Work

Jan Greenberg: Daryl, I am delighted to be sitting here with you today, having a conversation about the Head Start Early Learning Outcomes Framework, or ELOF, and talking about cognition, in particular, for infants and toddlers, and then how that leads into scientific reasoning for preschools. So, I'd like to start by asking you to introduce yourself and talk a little bit about your background and current involvement as it relates to cognition and science.

Daryl Greenfield: Thank you. I'm Daryl Greenfield from the University of Miami and the Department of Psychology and a professor in the Department of Psychology and Pediatrics.

And for the last 30 or so years, I've been very interested in doing research around early development, focusing on low-income populations. And for the last 10 years or so, my focus has been on science, education, and early childhood.

Jan: That's fabulous. So, coming back around, the ELOF was developed to help us understand what children should know and be able to do to prepare them for success in school and in life. So, can you tell us about important findings from current research that would help with our understanding of what children should know and do in the areas of cognition, which we know, in the ELOF, relates to infants and toddlers, as well as in science, which relates more to preschool-age children?

Daryl: There is a notion that infants are born scientists, and at every age, young children—infants and toddlers and preschool-age children - really want to understand how their world works. And if you think about what makes the content of how your world works, it's about the people around you, it's about things that grow, changes that occur.

In the life sciences, children want to know "why my shoes don't fit anymore," why clothes don't fit, how they're growing, and so forth. And that's actually the focus of life science. Children are also interested in the objects that are in their environment—what sinks, what floats, what's hard, what's soft, what bounces. Children, infants, for example, will consistently drop things off their high chair to just see what happens. So, in some sense, the children are experimenting already at a very, very young age, and they're trying to make predictions. So, the aspects of physical science are also relevant for young children.

Third main content of science is earth and space science. And, again, children at very young ages are interested in, you know, what's outside, what the earth is made of, what's this big ball in the sky during the day, and how come that changes to something different at night. So, earth and space science is also a focus of children.

So, if you think about how children learn best—to pick on something, choose something that is motivating to them, it's goal-directed, they want to find the answers. They're curious about it. They can do it in an engaging way so that they're actively engaged in understanding it, as well as thinking about it and can do it with other children, as well as with adults. This sort of makes learning work best, and the content area of science is what young children from a very early age are motivated to understand. So, science really is a great focus for not just preschool but also for infants and toddlers.

Jan: Okay. If you were to give some important guiding principles or concepts to teachers, family childcare providers and home visitors who are working with parents in the home, what are some important ones that they should keep in mind as they are working with children, thinking about those early cognitive foundations leading into some more refined scientific thinking?

Daryl: If you look at infants and toddlers and preschoolers, if you look at practices like observation, making predictions, doing little experiments, certainly infants can't do them to the same extent that older children can do, but you see, when you watch infants, you see them doing these things. Infants that will take objects and drop them off the high chair, they're, in some sense, observing what happens.

They're making predictions about what they think is gonna happen. Some objects are gonna bounce. Some objects are gonna splat. And they keep doing it to see, you know, "Is this replicable?" Which is sort of the essence of how you do science experiments. They're also paying attention to patterns, they're seeing cause-and-effect relationships, and they're interested in people, the life science. They're interested in objects in their environment.

So, what teachers need to realize is that observing children from this particular frame, from this reference, the children are engaged in scientific practices. The goal is to identify the science that's happening in the classroom, see what the children are doing in your classroom, and then ask yourself what practices are you observing. What crosscutting concepts do you see that potentially would be available that you could help scaffold and help the children learn? What's the content area that the child is currently focusing on?

So, a lot of the earlier science was learning facts, scientific facts, as opposed to how to ask questions. Because science, really, is not so much about what we know but what we don't know. And young children, you know, don't know lots of things, so teachers are frightened by doing science because they're afraid that children will ask questions that they don't know the answer to, but that's exactly what you want to happen.

And even if you don't know the answer to the question, instead of telling that child the answer, do an inquiry project with the children. You can say, "That's a great question. How can we together explore and answer that question?" We encourage the teachers to let the children ask

questions because then you can start a feedback loop in which you're making the child's thinking process more visible and helping the child answer the question and the child is not gonna leave with the answer to a fact, but a deeper level of understanding of the concept that the child was interested in.

What's also great about children's questions is that it tells you right away what are the children interested in, so now you've got something that is motivating the child. And it also tells you what does a child know, what does a child not know.

Jan: Daryl, thank you so much for taking the time to talk with us today about how early-childhood educators can integrate science into their everyday activities with young children. You've helped us see that it's not about teaching science facts, but, really, it's about building on children's natural curiosity about the world around them and helping them think about how things work and why things happen—and that it doesn't have to necessarily be a special science activity that you do, but rather building in scientific concepts like cause and effect, patterns, into what is already happening in the environment and, most importantly, that you don't have to have all the answers, because the idea is to get the kids' own wheels turning. That is such a helpful way to think about this. Thank you so much.

The Head Start Early Learning Outcomes Framework, birth to 5, shows the continuum of learning for young children and provides us with information about what children should know and be able to do in preparation for school and beyond. For more information, visit the ELOF page on the ECLKC.