

BTT-2014 Plenary: Building Baby Brains: The Importance of Early Experiences

Jennifer Boss: Good morning. Good morning, everyone. Audience: Good morning. Boss: Wonderful. We have a nice, bright crowd here this morning. And I know we have many people who are probably still getting their breakfast and getting themselves settled, and they will be joining us as the day goes on this morning, but I want to welcome all of you who are here.

I'm Jennifer Boss. I'm the director of the Early Head Start National Resource Center. And we are so very delighted to welcome you to the 18th annual Birth to Three Institute. That's 18 years. I'm gonna say that one more time: The 18th annual Birth to Three Institute. That's a lot of BTTs. And we at the Early Head Start National Resource Center have had the privilege to bring you this institute for these many, many years on behalf of the Office of Head Start, and we are very, very happy that you're here with us. I also want to say welcome to the 700 people who are watching us via Livestream. We're very happy that you're here with us, as well.

I have a few housekeeping notes that I want to say to the folks who are here at the institute with us. And then I have a few more messages that I want to share with you. Just quickly, your program. In your program, we have the sessions. Let me find a session. We have the sessions labeled by levels. Those levels that you see are not the levels of the hotel where the sessions are located. Those levels are the learning levels. So, you have next to your session, it might say level 2, and then it might say Capital Congress. Level 2 is the learning level. Capital Congress is on its own level in the hotel. You have to look in the back of your program to look at the map to see where the Capital Congress room is located. But don't confuse the level with the level of the hotel. That's the learning level. Okay?

I know a few people have had questions about that already. One other quick note, on Wednesday at 12:30. Let me make sure that's the right time. Wednesday at 12:30, there will be a meeting, a listening session for the AIAN programs, Region 11 programs that are here with us this week. There will be a listening session with the federal staff from Region 11 and some T.A. providers in the Mint Room on Wednesday at 12:30. So, any of our AIAN programs who are attending, we would love to have you join that listening session Wednesday at 12:30 in the Mint Room.

If you didn't catch that, you can always go to the information desk and get that information again. Okay. Those are my two housekeeping notes.

So, I want to go back quickly to the fact that we are here at the 18th annual Birth to Three Institute, and I also want to tell you that the staff of the Early Head Start National Resource Center work really, really hard to bring this professional development experience to you. And when I say "to you," I'm referring to Early Head Start and Head Start programs, providing services for infants and toddlers, training and technical assistance providers, community partners, parents, and our colleagues at the federal/regional offices. When we put together this program for the Birth to Three Institute, we try to keep all of you at the focal point and be really thoughtful about what is it that you need: What is the information that you need, the resources that you need, so that you can do your job to the best extent possible and you can get what you need from this experience. So, I just want to say to that end that our whole team at the Early Head Start National Resource Center comes together to prepare for this experience, but I want to take a minute to just give a public thank-you to the small team of folks who work day and night to attend to every little detail of this conference.

Please, join me in saying thank you to my colleagues Danielle Peyton, Claudia Gomez, Renita Street, Tecumseh Deloney, Terra Bonds Clark, and Joe Preece. Thank you, BTT team. Your hard work pays off. I also mentioned that this is the 18th annual Birth to Three Institute, and we're also celebrating another milestone this year. Early Head Start turned 20. Yes. So, our esteemed panel up here will say a few more words about the significance of this incredible program turning 20 years old, but I just want to make sure that you all saw in your materials that you received when you registered that we will be having a birthday celebration for Early Head Start on Wednesday at six o'clock in the ballroom here. So, we hope everyone will stop by and join us for some cake and to sing "Happy Birthday."

So, I also mentioned that the Early Head Start National Resource Center has been bringing you this conference on behalf of the Office of Head Start, and we absolutely would not be able to do the work that we do without the guidance and leadership and support from the Office of Head Start. And the person who provides us with that leadership and guidance is Angie Godfrey. And Angie is an infant and toddler program specialist at the Office of Head Start and the lead on most everything Early Head Start. And for those of you who know her, you know that she is a fierce, fierce, fierce advocate for children and families and programs.

And not only is she passionate about ensuring that children and families receive the support that they need to support healthy growth and learning, but she's incredibly knowledgeable and very wise. And we at the Early Head Start National Resource Center are very fortunate to be the beneficiaries of her knowledge and wisdom, and we count our blessings every day that she is our federal project officer and that everything we produce, everything we develop, all the materials and everything we carry out, including this institute, is guided by her wisdom. So, I'm very happy to ask Angie to come up to the podium to speak with all of us and, then to introduce our next speaker. Angie?

Angie Godfrey: Good morning, everyone.

Audience: Good morning.

Godfrey: Thank you for coming, first of all. I would also like to thank Jen and her staff. This is, for me, always a wonderful opportunity to understand what goes on in the field and how important the work is. I just can't imagine more important work in the world and particularly the work that we do, not just with babies, but babies and their families, that it's intertwined and it's cohesive in the work that you do, and I thank you for that, And I think you're going to have a wonderful few days. I said to Jen, I love all the research-based sessions. There's nothing that supports work more than understanding the research and then being able to go back and have support to implement the things that you learn here. So, I'm very excited about that.

I'm gonna introduce a person very special to me in a minute. But I was thinking this morning, every time that I've stood before you, I've said, "This is such an exciting time," every year for the past several years, because it is an exciting time. And, of course, doing the work that we do, it's incredibly exciting, and I so respect each of you and your programs. And I just have to give a shout-out to Audubon, because I saw all those orange shirts, and I wanted to go down and have an orange shirt with them. So, I love that you all dressed alike. So, I do think about that, but the thing that I guess I was struck with is like a core belief I've had for years. And I say this with such love for Early Head Start and for early care and education programs.

Babies don't know if they're an Early Head Start baby or a Child Care baby or a Healthy Start baby, or right up the street, There's this wonderful center called Bright Horizons. Babies don't know. They know if they're loved and if they're cared for and if they're supported in a nurturing and respectful environment. They'll know if their parents are comfortable and feel loved and respected and nurtured in that environment. And the most exciting thing to me about the coming future is partnering. Some of you have been partnering forever.

Some of you have worked in isolation. But you all have an opportunity to serve families, and those families need everyone who lives in that community and who works in that community to serve them. So, I'm very excited. I can't imagine a nicer or better time for Early Head Start and our partners. And, again, I thank you all for coming here, and it's my pleasure to introduce Ann Linehan, who I've known for years and years and years and who, in fact, when I first started working with American Indian programs was one of the people that interviewed and hired me, so I have a special place in my heart for her. She has been at the Office of Head Start for 20 years. She's the same age as Early Head Start. And although she worked at the regional office and in program, she started as an early special education teacher many years ago. She was director of quality assurance. She was deputy director for several years, since 2011, and she's currently the acting director of the Office of Head Start and an amazing advocate for Early Head Start and Head Start in all children Birth-to-Five. So, Ann, I'd like you to come up.

Ann Linehan: Good morning. I guess I made a great hiring decision, didn't I? I am so happy to be here. And I thought they were salmon color, but you do stand out. That was a very, very good move. This is emotional. Twenty years ago, although I was not part of the conception, I was part of the delivery. And I remember the first year, and in those days, you're all probably used to responding to funding-opportunity announcements. In those days, they were posted in the Federal Register, and I can remember the first funding notice that went out in the Federal Register. It said we would likely fund between 17 and 21 programs. Well, that first year, we funded 68, and then we had... I don't know if there's anyone here that was one of the first funded programs.

Woman: Whoo!

Linehan: Oh, congratulations. And, then, for those of you who've been around for several years, we had the waves. And we had, I think, about six or seven waves, where the babies just kept coming and coming. And what was so significant, you know, the folks that conceptualized what Early Head Start ought to be like were so very wise, because from the get-go, we started out with research.

Of the first cohort of Early Head Start programs, 16 had local research partners, and we learned so much from those partnerships. We had a tremendous amount of diversity, and when I say "diversity," these were programs that were partnering with prisons, with high schools, all sorts of partnerships to reach the most vulnerable children and, many, many times, the youngest parents. I think the other thing that was so significant about the first years in Early Head Start was how we opened the door to bringing dads in and how meaningful -- we knew that if you had a father participate in the birth of the child, the likelihood that that dad was gonna be more involved in that child's life was significant. And when I think about how you all brought those dads in, and many of them uncomfortable with their own parenting skills, but Early Head Start has grown and matured.

We had our bumps and bruises, no doubt, but we have benefited from some very, very rich research, ongoing T and TA resources, and a lot of dedicated staff across this country. Today, we know we serve -- there are nearly, from the first 68 to nearly 1,000 Early Head Start programs serving about -- if you look at the accumulated enrollment in the years now, we're talking about 150,000 babies. And though it sounds like a lot from the beginning, we're just serving a drop in the bucket of all the children in this country who are eligible for Early Head Start. So, now we're at the juncture of another incredible opportunity for you in the audience, for those out there who have worked in the trenches of the Early Head Start, to begin to share all we have throughout our communities.

And I know my two colleagues to the right will begin to talk more about the partnerships. But because we have matured and because we are seasoned and because we are experienced, it really is our charge now to take the knowledge and the depth that we have and extend it to those in the community. As Angie said, a baby doesn't know whether or not they're in Early Head Start or Child Care. But what we want to achieve...and I'm always amazed at the trust that parents have in Early Head Start. I'm always amazed when that young mother comes in and hands over her 6-month-old baby to the early-child-care giver, to the teacher, and entrusts that caregiver to care for her baby, her infant, for eight to 10 hours a day. That is amazing trust that people put in your arms every day. So, we have a lot to live up to.

It is a great, great time for Early Head Start, and it's also a great time for Child Care. And with that, I want to introduce -- I have had the pleasure for many years off and on, but in our last iteration to work side by side with Shannon Rudisill, who is the director of the Office of Child Care. Shannon is a great partner, and what I love about Shannon is she is relentless in her efforts to improve the quality of child care in this country, absolutely relentless.

And I think under Linda Smith's leadership, I think that we can really push the envelope in this country to really make it better For many, many, many more infants and toddlers. So, with that, I'd like to introduce my esteemed colleague, Shannon Rudisill.

Shannon Rudisill: So, I was jealous, but agreed when Jennifer said that Angie was fierce, but now I get the adjective "relentless." That's a great adjective for the morning. So, anyway, I want to thank Ann. It's so much fun to work with her. So, I get to talk to you just a little bit about what the president, the vision that he has laid out to work on a continuum of care for kids birth to five, and what I want you to know about that is the thing that we're most excited about at ACF is the Birth to Three part of that and the fact that we really get to take most leadership responsibilities across the whole administration for services for kids birth to three and how exciting that is for all of us, to really use the opportunity that the Early Head Start/child-care partnerships bring to shine a spotlight on babies and toddlers and their needs.

If you read the news clips, you might be reading a lot about pre-K, but if you're in our office, all you'll hear us talking about right now is babies and toddlers. And so we're really committed to using the opportunity that the Early Head Start/ child-care partnerships bring to just keep babies and toddlers in the forefront of not only our minds, but also the minds of folks across the country and not just you all, who have already devoted your life and your professional life to that, but to really use it as a platform to bring the needs of infants and toddlers to everyone, so everyone understands that learning begins at birth. And I just want to say a word about the babies and toddlers that we serve in Child Care.

Currently, with the Child Care and Development Fund, we have over 400,000 infants and toddlers every month that we provide a child-care subsidy for. And, you know, I had this talking point that I was using for a long time, which was that half of the children in Child Care that we currently serve with a subsidy are at or below the poverty level and, 80-ish percent, maybe even higher, are at or below 150 percent of poverty. So, the kids that we serve in Child Care are also quite poor. They face a lot of educational risk. But I actually think that this is sort of emblematic of what the partnerships have done for us. Because we wanted to focus more on infants and toddlers, we actually then cut the data by age, which was something that we did not typically do, was cut our data actually by each year of age. And what we found when we looked at that in terms of the babies and toddlers that we serve in the Child Care and Development Fund, it wasn't necessarily good news, but I think that it just shows why we need to focus specifically on infants and toddlers, because when we looked at that age group, we found that, not surprisingly, if you know the national statistics, the babies and toddlers are actually more likely to be living in families in poverty than the average.

So, they're up over 60 percent. Close to 65 percent of the kids that we have, that we serve with a child-care subsidy, are below poverty level, are living in families that are trying to get by on that. And this is despite the fact that their parents are working a lot of hours, so there's a lot of stress on these families. And it means, look, just, they're the same babies that are in Early Head Start. They look just like that. But if they come into Early Head Start, you know what you offer them, right? You offer them services that wrap around the whole family in terms of health supports, in terms of early identification of any possible learning challenges, in terms of family support, and if they come through Child Care and they get a child-care subsidy, they might end up in care that offers some of that, because we actually have hundreds of thousands of child-care providers that strive to do that on something like half the amount that we pay for the average Early Head Start slot.

But we know that a lot of them aren't going to be able to receive what you're able to offer, and that's why we're so excited about the Early Head Start/ child-care partnerships. When I think about what I've learned over the time I've been in the government, which is not quite 20 years, more like about 18 years, when I moved here to D.C., my vision of what good infant/toddler care looks like, mostly, I think, comes from Early Head Start. But I don't think that's just me. I think Early Head Start has been a gift to our entire early-care and education field in terms of understanding what good infant/toddler care looks like.

When I think about the importance of the continuity of relationships between a caregiver and a child, I actually learned that here, at the Birth to Three Conference, from a keynote that Jerlean Daniel gave some years ago. When I think about people talking about individualizing for each baby, I learned that from talking to folks who work on Early Head Start. And when we think about the relationships that Angie described that you form with parents, all of these things that you've really brought to the field, the first time I ever heard anybody talk about how babies were being too confined, they come in in a car carrier, and then they're moved to a swing, and then they're moved to the high chair, and then they're moved back to the swing, where was the first time I heard people talking about that? Early Head Start.

So, I feel like you formed a learning community. As part of this partnership, we've been talking to a lot of folks in Early Head Start who've already done partnerships, and sometimes I've asked a couple of them, "Twenty years ago, would you have thought about that practice in that same way?" "No." In fact, even maybe some of you weren't thinking of practice in the same way 20 years ago.

But Early Head Start has given you the opportunity to work with cutting-edge research and to think, What is our image of great infant/toddler care? And I think that's what you've given us. And that's why we hope that the partnerships will give us the opportunity to bring that to tens of thousands of more infants and toddlers who wouldn't have been able, say, last year to enroll directly in an Early Head Start program, because there's just not capacity. We really hope that the partnerships will serve as a platform to bring it to 10,000 more kids through the partnerships. And then -- we're not shy at Administration for Families.

I think we hope it'll come to hundreds of thousands of more kids, possibly through the waves. I like the waves. I hope we get more waves of partnerships. But also, because it will just expose more people to the vision of quality that is part and parcel of Early Head Start, which means more people will start to see what great care looks like and think about how they can deliver it themselves. And so that's why we're so happy to be here. We're building our own capacity through working together with Office of Head Start, not just -- I think we've had good management connections for a long time. But the joy that my staff across the country in the central office and regional offices have working now with Angie and with many other people who work on Early Head Start, has been actually a great rejuvenizing opportunity for our staff to think about infants and toddlers.

And that's a great place for me to stop and thank the person who's really making that possible, which is our deputy assistant secretary for Early Childhood Development, Linda Smith. She has pulled our staff together in a way that I think we had only sort of dreamed about before, to think about kids, keeping them at the center of our vision, and to pull all the staff together across the country, to focus on how we can make this opportunity happen for children and families, building on her decades of experience, doing that with the military child-care system all around the world. So, it's my great pleasure to introduce our deputy assistant secretary for Early Childhood Development, Linda Smith.

Linda Smith: I just have to say that they cautioned us not to lean on this podium, so watch me just go headfirst over here, in true form. Well, I want to thank you all for being here, and I especially want to thank Ann and Shannon. We're separated on this podium, but I have one of my favorite things back in the office, which is a paper doll cutout of the three of us, because we have become inseparable as we go out and talk about the work that we're doing and the partnerships, and I think it is a real partnership at the federal level, and we are hoping that it will result in the same at the state and local level.

I just want to pick up on what Shannon said, because I think that she said some very important things there about the lessons that she learned from Early Head Start, and I want to point out the lessons that our nation has learned from Early Head start. And I think she alluded to those. Twenty years ago, this program was born. I would prefer now, and I always -- It's great. Congratulations. And it's 20 years of real growth and change in this country. But I really want to focus my remarks now on where are we going with the next 20 and try and talk to you a little bit about the vision that we have as we move forward with this initiative. I think one of the things -- actually, I can say this, and I probably -- I was one of the people who volunteered in one of the very first Head Start programs on an Indian reservation in my home state of Montana. Now, that was right after I graduated from kindergarten, just so you don't try and do the math and figure out how old I am.

But I have really, over my lifetime, watched what has happened with the Head Start program and now with the early Head start program, as it has come to maturity. So, what are the lessons that we are learning from these two programs, and how do we take this forward to the work that we're trying to do? Well, one of the things that we know in this country that we need is a real clear foundation on which we build high-quality early care and education, beginning at birth. And that's where you all figure into this. The president's initiative is a continuum of services, beginning with home visitation, Early Head Start, Child Care, pre-K, and on into the school system.

We need that foundation, and we need it desperately in this country, because, as Shannon described, the child care in this country -- we have 415,000, I think, young babies and toddlers in programs that we have very little knowledge about the quality of that and the quality of the experiences that they're getting, yet we know what they need. We know based on the work that you all have done and the work that we have done around this country on the brain development, on a lot of the research what we need to do.

So, how do we build that foundation? And that's where you come in. Because we know the only way to use the research and the learning and the lessons that we have learned, not just from Head Start, but from Early Head Start in particular, is to figure out how to transition that and, if you will, slide that learning across into our child-care system and create that foundation for our infants and toddlers that we so desperately need in this country. So, you know, our thinking on these partnerships is critically important, and it's very important that you understand your role in that in the future as we move forward to the next 20.

We say that Head Start is the nation's laboratory for early care and education, and it is. But it can't be a laboratory that doesn't share what it knows and it doesn't share what the experiences are with the rest of the country. And so what we need for this group to do now is step up and figure out how to share everything you know with your child-care partners in your communities and in your states, and that's what we're asking you to do. I was told when I came here that there might be some child-care partners in the audience. Are there?

Do we have any who are Child Care partners with Early Head Start? Over here in the back.

Congratulations to whatever organization you came with. And we all need to learn more about what you're doing. It's very important, though, that we figure out how to make these partnerships work. And I wanted to just talk about a couple of things, because not only is it sliding across what we know from the research and the experience of Early Head Start into the child-care community, as Shannon pointed out, there is a huge gap between what we are paying for CCDF subsidies to parents and the average cost that we know what it takes to do this work well.

So, the second piece of what we're trying to do with these partnerships is also figure out how to finance that work, and that is where these partnerships come in, because as we fund these partnerships and we move the money into the child-care partners, then we can expect from them the quality that you all have come to produce in Early Head Start. So, we can't continue to ask our child-care providers. And what Shannon didn't say is we actually average, I think, \$5,500 a year per infant that we pay for with a CCDF subsidy.

Now, does anybody in this room think they can produce high quality for \$5,500 a year for a baby? Anybody think you can do that? So, that's our problem. So, by creating the partnerships and moving the money across, we are trying to figure a way to finance the quality that we want to get to. So, financing it as well as using the research and getting the quality across into these child-care programs that we're after. We have set the stage for this with our Birth-to-Five pilot that we have done with the re-competition of the first cohort and the second cohort in DRS, and we intend to continue to look at Birth-to-Five as a continuum for Head Start.

As states build out their pre-K, we need to refocus our efforts, as Ann said, on those babies and how important they are. So, one of the things that I...there are two things I want to close by saying that are very important to me. I have actually said to the staff here in Washington that some of you have been around a long time, done a lot of things, and I've kind of told this story now a few times.

In 1989, when the Military Child Care Act passed, I was at the secretary of Defense's office, in a crowd not unlike this one. And people were really excited because the act passed and we were really gonna make change in the military's program. And I was looking at this crowd going, "Oh, be careful what you wish for. You don't know what we're in for here." But what was, I think, one of the most takeaways from that experience -- Well, there were two, actually. One, that we really did turn a system around in a relatively short period of time. It took us about six years before we really could say with any confidence that you can go anywhere and look at any program in the military and see a very good quality of care. That was one thing, but the other thing that I learned through that experience is it takes a team, and it took everyone in the military system working toward the same goal, which was high-quality care and education for every child paid for by the Defense Department.

It was a pretty simple goal. That was what we were trying to do. Now, and I've said, I've seen a lot of résumés over my career lately, and every now and then, I'll come across one, and somebody will have in their résumé that they were a part of building the military child-care system. And I say, "Well, gee, I don't know that person," you know, but I think to myself, that is really great that so many people at every level of DOD took ownership for that program and the success of it. It wasn't one person or two people or three people. It was every person up and down that military system that produced the quality. And I say to myself when I see that, "Gee, that is really great," because that person feels ownership for something that was really significant."

Now, my challenge to this group is that in 10 years, I want you to look back and for you to be able to put on your résumés, no matter where you work, that you were part of a movement in this country to change the experiences for infants and toddlers in a much bigger way than just the kids that you care for, but for all infants and toddlers, by reaching out and working with your fellow child-care providers in your communities to lift this country out of what is really a bad situation for our youngest citizens.

I would like in 10 years to be looking at a whole stack of résumés and every one of you have it on your résumé that you were a part of the change that occurred as the result of the Early Head Start/ child-care partnerships that we are gonna be implementing over the next few years. So, keep that tucked away in your mind as you think about and leave this meeting about how you can break down the stovepipes and reach out and find those people who really need to know what you know and share it.

So, the last thing I want to say is I always try to remind everyone -- and I think Shannon said this about me -- I often tell people that I try every morning when I get in my car to think about a child, some child that is out there that I've known along the way. Sometimes, it's my grandchild. Sometimes, it's a child that I've seen in a program or in a shopping mall or whatever. But I try to think of a child and keep myself motivated for why we're doing this work. Last week, we were in a program in a state, and we toured a program, and I saw a child. There were a whole bunch of children. We quickly went around and were touring the rooms. And there was a child in the group, and I won't forget this, and I've actually said -- Shannon was with me on this one. All the kids are, "Well, see my hair," and do this, and they're dancing around, and they're showing us. They're all excited. One little girl stood in the back, and she was very quiet, and she had circles under her eyes. And you could tell that there was something going on with that child, and that has haunted me.

And every day that I have gotten in my car, I've thought about that child, and I need to follow up to figure out what's going on and how can we help. You know, what is going on with that child that somebody is missing? But I want to challenge you to think that way, too. Think about a child -- and you guys see them every day. I know that. But think about these individual children and what is going on in their lives and how we can help make a difference for them and their families so that they turn out exactly like all of you sitting in this room. So, I challenge you to think about a child and how you're gonna make a difference in their lives in the next 10 years, because I think the work that we have before us is very important, and I think it is a moment in time that will not come again for a long period of time if we don't take this opportunity to make changes and make these partnerships work. So, that's sort of my challenge to you, and I appreciate the time that I've been given today to ask you to do that work. Thank you.

Boss: Thank you so much, Linda and Shannon and Angie and Ann. I think I can speak for everyone here when I say how appreciative we are that we have such informed leadership over the Head Start and Child Care programs. And I think it's pretty clear to all of us that you all get it, that early experiences really do matter for infants and toddlers. So, thank you all once again. And speaking of early experiences, I'd like to shift now to our opening plenary, focused on how those earliest experiences impact and shape brain development.

And our speaker, Dr. Sarah Roseberry Lytle, will inform us of the most recent research in this area and what we know about early cognitive and social, emotional development in the earliest months and years and the connection to later school readiness.

Dr. Roseberry Lytle is the director of the Outreach & Education division at the Institute for Learning & Brain Sciences at the University of Washington. As part of the I-LABS Outreach division, Sarah has presented and communicated scientific findings to parents, educators, and opinion leaders and has had the opportunity to feature I-LABS' research in several keynote addresses. Sarah was previously a postdoctoral fellow at I-LABS, working under the supervision of Dr. Patricia Kuhl. Before coming to the Institute, she earned a B.A. in psychology and Spanish from the university of Notre Dame and a PhD in developmental psychology at Temple University, where she worked with Dr. Kathy Hirsh-Pasek. Both at I-LABS and at Temple, Sarah's research focused on the role of social interactions in infants and toddlers and language learning and how social cues might help toddlers learn from screen media. So, we have a very interesting and informative presentation for us this morning, so please help me welcome Dr. Roseberry Lytle to the podium. Thank you. We'll excuse ourselves.

Dr. Roseberry Lytle: Well, welcome, and thank you so much for having me. I'm thrilled to be here this morning. And I must tell you that the birth-to-three age range is very close to my heart, and I've been studying infants and toddlers for a very long time and have worked with infants and toddlers at I-LABS at the University of Washington, so I'm thrilled to be able to talk to you today about sort of the culmination of everything that we know thus far and to really give you the latest research on these early experiences.

And I know that on some level, I'm probably preaching to the choir here. You all, I think, are converts and understand that children's early experiences are so very important. If you didn't, you probably wouldn't do what you do, and we thank you for that. But what I'd like to do is really give you the latest science that supports all of the wonderful work that you are doing. And since we're talking about early experiences today, I actually thought that we would maybe start with a bit of an experiment here in this ballroom. And the point of this experience, up front, is really to demonstrate for you that you, in fact, as an adult, have been shaped by your own experiences over the years.

And so, I'm gonna play a series of three sounds for you, and I will give you the answers up front. They are either the sounds "Ta" or "Da," but the trick is, after each one, I want you to tell me what you hear. Is it "Ta" or "Da"? Okay? So, let's listen to each of these three sounds.

Here's the first one. "Da" or "Ta"? [Audience murmurs] Okay. Sound number two. [Audience murmurs] Okay. Sound number three. [Audience murmurs] Okay, how many native Spanish speakers are in the room? If you could raise your hands? All right. Wonderful. So, no pressure here, but you are our test group here. All right.

So, typically speaking, if you play these three sounds for groups of native English speakers and groups of native Spanish speakers, typically speaking, English speakers will hear the first two sounds as "Da" and the third sound as "Ta." Now, in contrast, native Spanish speakers will typically hear that first sound as "Da," the second sound as "Ta," and then that third sound as some sort of weird, unclassifiable "Ta." So, native Spanish speakers, was that your experience? Thumbs up. I see some nods. Wonderful. And so if you do this over and over and over again, this is the general result that you get over a wide range of people and over a wide range of tests.

Now, the reason for this is very simple. "Da" and "Ta" exist on sort of a language continuum, and they're very, very similar linguistically. But the trick is that different languages carve that continuum in different ways, and so English will bucket a certain portion of that continuum into the sound that we call "Da" and a different portion of that continuum into the sound that we call "Ta." And in contrast, Spanish will separate that continuum a little bit differently. They'll cut the continuum so that a different set of sounds result in "Da" and a different set of sounds result in "Ta." And then you'll see that there's some part of that continuum that just doesn't really exist in the Spanish language. And so the idea here is that your experiences with language over however many years you've been here on Earth have really shaped the way that you hear sounds in the world.

If you're an English speaker, some sounds are "Da," and some sounds are "Ta." If you're a native Spanish speaker, a different set of sounds are "Da" and a different set of sounds are "Ta." But that is entirely based on the experiences that you have had with language for however many years. Now, just like your experiences have shaped the way that you hear sounds in the world, experiences shape the way that infants and toddlers experience the world, too. And, in fact, we know that infants are completing a very, very similar task to the one that you just completed even before they're ever born. And so we know that hearing develops in the womb at about the beginning of the third trimester or so, and from that point on, baby is bathed in Mom's language environment.

So, whatever sounds Mom is hearing, baby is hearing, too. Whatever sounds exist in the mother's environment, the baby is hearing, too. And over time, the baby starts to learn the sounds that exist in Mom's native language or the languages that are spoken around Mom. And we know that hours after birth, if we test babies, we can tell that babies are able to distinguish sounds from Mom's native language from sounds that they've never heard before. That's incredibly impressive.

And so, when we talk about the importance over these early experiences, we know it doesn't begin on day one. It actually begins before birth. Those experiences are a powerful learning experience ever before a child enters this world. And you can see here in the photo that we actually test these babies in a very fun way, so we know that babies will suck on a pacifier much more rapidly and harder when they hear something new.

And so, if you play sounds for a baby and you have a pacifier that's conveniently connected to a computer, you can tell when baby is sucking a little bit harder and a little bit faster, and we know that those sounds are novel to them, that they've never heard them before. So, learning begins before birth. And, in fact, learning continues immediately after birth. This is some research that has been done.

It's very classic research done by Andy Meltzoff, who's one of the co-directors of I-LABS, and he would ask moms to call him on their way to the hospital. And minutes after birth -- the youngest infant he tested was 42 minutes old -- minutes after birth, if you stick your tongue out at a baby, the baby will stick their tongue out right back at you. If you open your mouth, the baby will do the same thing, and if you purse your lips, the baby will purse their lips.

And so, we know that at 42 minutes of age, babies have never seen their own face in a mirror. They really don't know what their tongue and mouth and lips do yet. But they are still able to use those experiences to really start to form those very early social and emotional connections with another person. They really are using those early experiences to learn. And so when we think about learning, we know that it is not just the skills that children have when they enter school that matter for success, but we really very strongly believe that the path matters a lot. How children get to school readiness and get to that first day of school really seems to matter. It's not just that end goal that we're looking at.

We really are very deeply invested in figuring out those building blocks that set children up for later success. So, that's we're gonna talk about today; so, we're gonna talk about how do you build a baby brain. I'm gonna start by giving you some more evidence that these early experiences really prepare a child's brain for early learning, and then, we're gonna talk a little bit about, okay, so, those early experiences are important, but what goes into those early experiences that really helps children learn?

So, what are the ingredients of those experiences? And, then, finally, we'll talk a little bit about why you should care about things that happen in the first year. I know you care, but what are the arguments that you can use that help demonstrate that those early skills really do impact later skills, especially skills for school readiness?

So, we'll start, then, with some more evidence that experience has prepared children's brains for learning. And so if you think about what's going on in the first three to five years of a child's life, one of the very first things we know is that there's an enormous amount of brain growth going on. When a child is born, their brain is already 25 percent of what it will be as an adult size. Speed forward three years, and you see that the brain has already reached 85 percent of its adult-size weight in terms of weight. By 5 years of age, we're already at 92 percent of adult size in terms of brain weight. And so, you can see this enormous amount of growth from the time a child's born to the time they reach age 3, and then again by the time they reach age 5, or about when they will enter school.

And so, there's a lot of brain development going on. And we have a very new, fun technique that allows us to measure the impact of children's early experiences on our brain growth. And, so, this new, fun toy that we have at I-LABS is called magnetoencephalography, or MEG for short. It looks like an old-fashioned hair dryer or a hair dryer from Mars. And you can see that there's a seat and there's a dome in which you place your head, and this very safely and noninvasively measures the changes in magnetic current around your head.

So, when you think, when your neurons fire, it emits a very small amount of electric current. That changes the magnetic field around your head, and we're able to measure it with this MEG machine. And so here you can see baby Emma in the machine. You can see she's as happy as a clam. She's got a little koosh ball to squeeze and hold on to. But as she's listening to sounds through some insert earbuds that you can't really see in this video, we're able to measure exactly what's going on in her brain, and we can tell exactly where it's happening with one millimeter accuracy, and we can tell exactly when it's happening with one millisecond accuracy. And so, this machine allows us to do a lot of measurement with baby brains that we weren't able to do before. And, in fact, the best part about this machine, frankly, is that it's completely silent, and so we don't have to deal with the noise of an MRI, for example; and so, it's very, very good for studying baby brains.

And so, this really allows us to look at the impact of early experiences on children's brain development. And we know that one of the ways that experience physically shapes the brain is through the development of connections between different structures of the brain. The connections that go between different structures of the brain are called fiber tracks, and these fiber tracks, you can think of them as like the superhighways of the brain. They allow information to pass back and forth between different, related areas of the brain. And so based on data from MEG, we're able to track the development of these connections that are formed in the brain, and you can think of this as really the physical architecture of the brain.

And so in the example that you see here, this is the infant brain, and you can see all of these fiber tracks that are in the infant brain. There's the corpus callosum that connects the left side of the brain to the right side of the brain. You can see that the fiber tracks for an infant are mostly colored blue here, and that means that they are more immature than the pink ones. The pink ones are the more efficient networks. And so, what we're gonna look at here are particularly the bundle of fibers that connect two language-related areas.

Here's the 5-year-old fiber tracks. Again, the corpus callosum connecting the left- and the right-hand side of the brain. And, then, here's what an adult brain looks like. And so when we look at a particular fiber track or a particular superhighway that connects the speaking and listening areas of the brain, what you can see -- Oops. Let's go back here. What you can see here is that a couple of things happen over time. So, the first thing that happens is that you get more fiber tracks over time; your brain is forming more connections. That's potentially not a surprise, right? We would expect that. The second thing that happens is that you start to see more pink over time. That tells us that as the child develops, as you develop over the course of your life, your brain becomes more efficient.

Remember, those pink tracks are the ones that are more efficient, more developed. And so, over time, those superhighways in your brain, it's almost as if they expand from a two-lane highway to a four-lane highway. You have more room. Traffic is able to pass back and forth much more efficiently. And, then, the third thing that happens over time is that you start to see some of these little offshoot fibers. And what that tells us is that the brain is starting to make some exits on that superhighway that connects different areas of the brain.

And so, these exits are gonna go to related but maybe not integral parts of the structures. And so, if we're looking at the superhighway that connects the language areas of the brain, the speaking and listening areas of the brain, some of those exits might take us to emotion processing or motor control, things that are certainly involved in language but might not be language per se. And so, over time, we know that experiences really impact the development of this architecture. The only way that the superhighways in your brain are gonna go from two lanes to four lanes is if your brain has reason to believe that that expansion needs to happen.

And so if you have lots of information passing back and forth over that superhighway, at some point, your brain will say, "We need to expand. This has to become more efficient." And that's how you build efficiency. That's how you build those fiber tracks. And the physical architecture of the brain is really shaped by those early experiences. The second thing that we can do with this MEG machine is really take these superhighways out for a test drive, in a sense. And so we want to see how information can be passed back and forth between two different areas of the brain in real time.

And so, again, we're looking here at the speaking and listening areas of the brain. The listening areas are on the top for newborns, 6-month-olds and 12-month-olds, And the speaking areas of the brain, you can see on the bottom for newborns, 6-month-olds, and 12-month-olds. Now, what you see is that as infants are simply listening to language, you see a lot of activation in that newborn listening region of the brain. That's no surprise. We expect that newborns, that we're gonna see activation in the listen area when kids are listening to language. The interesting thing for us is what happens at 6 months of age. It's a little hard to see, but you'll have to trust me that there are pink areas of activation in both the listening and the speaking areas of the brain at 6 months of age.

Now, let's think about that for a minute. So, at 6 months of age, kids are babbling. They're probably doing some cooing and gurgling. But they're not yet at real words. They're not yet to the point where they've produced their first word, in all likelihood. Nevertheless, as a 6-month-old is listening to language, their speaking area of the brain is lighting up. It's activating, almost in preparation for later speaking. That's very, very powerful. It's almost as if our brain needs to rehearse the action before it actually complete the action.

And so, because we have this brain data now, we know that that rehearsal is taking place as early as 6 months of age, which is incredibly powerful. But think about when that rehearsal is taking place. It's taking place as a child is listening to language. And so what does that mean? It means that a child needs all of that rich language input in order to rehearse, in order to really become an efficient and productive later speaker. And so, again, you see the power of these early experiences, not only for forming the physical architecture of the brain, but also for preparing that brain and teaching it how to activate and teaching that information how to go back and forth over time.

And then you can see stronger activation in the 12-month-old brain. Again, we would expect that 12-month-olds are probably at a point where they're speaking their first words. And so you see stronger activation in both the speaking and listening areas of the brain.

But, really, I want to highlight that 6-month finding. I think it's an incredibly powerful argument for these early experiences. And so that's the brain data, and I hope that that's convinced you that these early experiences are incredibly important for building baby brains. But now that we know that experiences are important, it must not be the case that every experience is equal, and I think that you all can attest to that. You all know that not every experience that you have with a child is equal. And so we want to look now at these ingredients of early experiences. What components of these early experiences are best if we're gonna help children learn through those early years? Well, on a basic level, we wanted to know whether the type of experience mattered. I think that we all would say yes, of course it does, but until about a decade ago or so, there wasn't a lot of really hard research looking at this.

And so, we wanted to look at children's early experiences with language and how they learn those sounds of language. And so we know that about at 9 months of age, children are in a place in development where they're learning a lot about the Sounds of language. When babies are born, they can hear all the sounds in all of the languages around the world, and that continues to be the case until about 6 or 7 months of age. And, then, over that second half of the first year of life, Babies become specialists in whatever language they're exposed to. They start to get really good at distinguishing the sounds that exist in languages they hear, and they start to lose that ability to hear sounds in languages that they're not exposed to. And so we brought babies in at 9 months of age, when we know they're learning a lot about the sounds of language, and we exposed them to Mandarin Chinese, a language that they had never heard before.

But the trick was we gave them one of three experiences in order to learn this Mandarin Chinese. We either gave kids this live interaction with a live human being, we gave them the same information over a DVD, or we gave them the same language information through an audio CD. They were just listening to the Mandarin. We brought kids in 12 times over about 4 weeks, and in total, they had about six hours of exposure to Mandarin Chinese. And so here is an example of what one of the live interactions looked like.

[Video begins]

Woman: [Speaking Chinese]

Dr. Lytle: Hmm. This one has sound. Is the sound on? Well, unfortunately, I can't re-create the Mandarin for you, but you can see what the interactions looked like.

And so, you can see that this native Mandarin speaker is speaking to a child. [Video ends] She's reading the books. She's having this rich, live interaction with this baby. And so that's what the live interaction looked like. The TV/DVD was the same, only the person was on the DVD. And then, the audio-only condition, people just heard what was on the CD. And so here's the pattern that I described to you earlier, where until about 6 to 8 months of age, Kids are able to hear all the sounds in all the languages of the world.

And then, over that second half of the first year of life, kids become specialists, and so you can see on that top line, those are the babies who had been born in Taiwan and exposed to Mandarin Chinese every day for the first year of life. And you can see that they've gotten really good at hearing the sounds that exist in Mandarin Chinese. Now, that bottom line, those are the babies that were born in Seattle and exposed only to English. And you can see that over that second half of the first year of life, they've started to lose the ability to hear Mandarin sounds. That's good.

We know that they're also starting to specialize in hearing the sounds that exist in English. But they are starting to lose that ability to hear Mandarin sounds, because they've not ever been exposed to it. Now, the first thing we did is we brought a group of kids in, and we wanted to expose them just to English. We wanted to make sure that simply by coming to I-LABS, you're not gonna spontaneously learn Mandarin Chinese. And, in fact, that is the case. So, kids who never had experience with Mandarin did not show any evidence of learning Mandarin, so this is a good thing as researchers.

The second thing we looked at was what happened with kids who were in that live interaction. Well, you may or may not believe this, but we found that kids who were exposed to Mandarin through the live interaction, after six hours of exposure, they're able to distinguish those Mandarin Chinese sounds just like the kids who had been exposed to Mandarin for the first 12 months of their life in Taiwan.

That's incredibly impressive, so on a very basic level, we know that kids learn a lot in a very short amount of time. And next, we looked at kids who were exposed through the audio, and we found no evidence of learning, so simply hearing this disembodied Mandarin language does not seem to result in learning. And then, we looked at the kids who were exposed to Mandarin through the TV or DVD, and, in fact, they also showed us no Evidence of learning.

So, now we know that in order to learn Mandarin Chinese or any language sounds, you not only need some exposure, but it has to be the live exposure. You need to have this live, social interaction. And so, this tells us on a very basic level that all experiences are not created equal. We know that live social interactions really do seem to be incredibly important for children's learning. But, of course, live social interactions aren't gonna get us all the way. There are other components to these early experiences. And so, if we start to think about, well, what went on in that live interaction? How did that live person interact with a baby that allowed them to learn these sounds of language?

Well, if you think about all of these ingredients, we know that there are lots of different ingredients that make up every interaction that we have, and so I want to highlight a couple of them for you today and the research that supports them. So, on a very basic level, we know that children need to hear language. We talked about this a little bit before, when we think about how infants are learning to coordinate activity in different areas of the brain, they need to hear the language in order to practice and rehearse that activity.

Well, we know that hearing language also results in higher later vocabulary. This is classic data from Hart and Risley when you see that kids who are in the high-socioeconomic-status families, those kids tend to hear more language and tend to have more vocabulary later on, and the same is not necessarily true for children growing up in middle-SES families or low-SES families. And so simply by virtue of hearing more different kinds of words, kids' vocabulary is going to increase. That is going to help them learn. But it's not just the quantity of language that matters. It's also the quality of language that matters. We've done a lot of research at I-LABS on infant-directed speech, and you may have heard infant-directed speech referred to as "motheries" or "parenties." We're starting to move away from those terms, because we know it's not just mothers that do it.

It's not just parents that do it. Grandparents, neighbors, older siblings do it, too. But this infant-directed speech is the singsong kind of voice that we tend to use when we talk to infants, and so you can see here on the top line, this is A.D. speech, or adult-directed speech. And you can see that a speech sample we took from a mom who came into our labs, she said, "I had a little bit, and the doctor gave me Bendectin for it. So, her speech is relatively flat across that entire sentence. She actually gets a lot of words in in a very short amount of time. But then she turned to a 2-month-old baby, and you see the infant-directed speech on the bottom line.

And so the 2-month-old baby, she said, "Can you say 'Ah'? Say 'Ah.' "Hey, you. Say hi! Hi!" She's literally off the charts by the time she gets to that last "Hi," right? And so what you can see here is there's a huge amount of variability in the frequency of her speech. She's actually not included a lot of words, and that's because when we use infant-directed speech, we tend to elongate our vowels, make our words longer, slow down our rate of speech. But then we also tend to put exaggerated pauses between words when we use infant-directed speech. Now, why might that help a child learn? Well, if you've ever been in an environment, maybe a foreign country where you don't speak the language, you know that it's very, very difficult to determine where one word ends and the next word begins. But by putting those exaggerated pauses between words in infant-directed speech, we're giving kids a tool to help them carve up that sentence into the individual words, and that, of course, will help language learning.

We also know that this quality of speech invites children to respond and be a conversational partner with us. So, we know that the more children hear infant-directed speech, the more they're gonna babble back to us. And babbling is, of course, practice for later speaking. Again, we're getting back to that, the idea of rehearsing later skills. And, conversely, the more infants hear adult-directed speech, the less they tend to babble. And so, the more we give infants this kind of quality, this singsong quality of speech, the more they're going to rehearse their later speaking. And, in fact, we know that the more that infants hear infant-directed speech at 12 months of age, the higher vocabulary they have at 24 months of age.

And so, we know very concretely that these early ingredients that we're including in our social interactions are going to help children learn. Now, infants are not only attuned to the language they hear, but they're also attuned to the emotions in the room. And we've done a lot of research lately looking at how infants understand the emotional tone of the room, in a sense.

And so, I'm gonna show you a series of videos that really demonstrate how adept kids are at picking up on the emotions from other people. And so, you're gonna see here two experimenters, the experimenter in the red shirt and then her friend Nina is in the white shirt. And the experimenter is gonna push a button on a toy that makes a noise that Nina is going to find very objectionable, and she's gonna say, "That's very aggravating." And all the time, a child is gonna be sitting there and watching wide-eyed as this is happening. All right. Here's the first video.

[Video begins]

Experimenter: Nina, look at this. [High-pitched beeping]

Nina: That's aggravating. That's so annoying.

Experimenter: Oh, I thought it was really interesting.

Nina: Well, that's just your opinion. It's aggravating.

[Video ends]

Dr. Lytle: Okay. So, none of that has been directed at the child. It's simply an interaction between two adults that the child is witnessing. And now, if we give the child the toy, what do you think the child will do? And so we know that under normal circumstances, kids love to imitate, and they will absolutely make that noise with the button, right? But after they've seen this experience, will they make that noise with the button? And so Nina stays in the room here, and we give the child the toy, and this is what happens.

[Video begins]

[Laughter]

[Video ends]

Dr. Lytle: So, that is a very shortened video. Actually, the whole thing goes on for a very, very painful 30 seconds before we ask for the toy back. But you can see very clearly that she's looking at Nina. She knows exactly what's going on in that room, right?

And so, we wanted to try another sort of condition of this experiment to see whether the child was just freezing in the moment, whether she just wasn't going to do anything after she witnessed that interaction, or whether it really was that she's not pushing that button because Nina's in the room. And so this time, we had the child watch that same interaction, and then Nina gets up and leaves the room, and we give the child the toy, and you can already get a hint as to what will happen. So, here's what happened.

[Video begins]

[High-pitched beeping]

[Laughter]

[Video ends]

Dr. Lytle: So, this child is very, very happy to make that noise, even though it made Nina angry, but Nina's no longer in the room, "so it's completely fine for me to make that noise." And so what you see here I think is a very powerful example of how infants pick up on emotions, and so they realize that based on the tone of voice, based on facial expressions, they're able to regulate their own behavior and make decisions about how to act based on what they see going on and based on the emotions in the room.

And now I should note that we use fairly complicated language, for these 18-month-olds, and so we used words like "aggravating" and "annoying," but we did that on purpose. We didn't want the child to figure out what was going on based on the content of the language necessarily. We wanted them to pick up on sort of the vibe of the room, in a sense, and they, in fact, were very, very good at doing so. And so we know that the emotions of a situation will help a child learn, either for better or for worse, right?

And so, in this particular situation, the child learned a very powerful lesson, which is that some behavior is not acceptable when Nina is in the room, or at least that Nina thinks that some behavior is unacceptable. And so emotions can be a very powerful tool that we use to help children learn. Now, one of the things that children use in this particular situation was eye gaze, and so they really looked back and forth between Nina, between the experimenter, to figure out how to act. And we know that kids use eye gaze as one of those very powerful ingredients in these early experiences. And on a very basic level, if you have an experimenter that sits across the table from a mom and child, it establishes eye contact, and we have two robots on either end of the table here.

And then, if the experimenter turns to look at one of those robots, what do you think the child will do? Of course they're gonna turn and look at that same robot. And that's the same whether the experimenter turned right, whether they turned left. We know that kids are very, very good at following an adult's eye gaze. And, in fact, they're very, very picky about it, and so if we have the experimenter turn with her eyes closed, children are much, much less likely to follow her eye gaze, because they know that open eyes are really what they're after. Open eyes really tell you that "I'm looking at something." It's of no use to me as an infant to follow your eyes, if your eyes are closed.

And so, we know that kids are actually pretty sophisticated in their use of eye gaze, and one of the things that we think eye gaze is doing is really pointing infants to sort of these hot spots for learning, and so if you think about what you do as an adult, when you label something, when you talk about something, you look at it, right? And so, by following your eye gaze, kids are able to eliminate 90 percent of the things that you could be talking about and focus in on exactly what it is that you're referring to. And it may not be a surprise, then, that children's ability to follow eye gaze leads to learning, and in particular language learning. So, kids who are better at following an adult's eye gaze naturally stay on, follow an adult's eye gaze and stay and remain looking at that object for a very long time, those kids are gonna have nearly 200 more words in their productive vocabulary by age 2 than average.

That's a huge advantage simply by being able to follow eye gaze. And these kids also, I should mention, are the ones who sort of spontaneously offered a point in that direction, too. And so, by looking, by looking longer, by really being deeply invested in following an adult's eye gaze, and even by pointing, Kids are really understanding that what you're talking about, what you're referring to is over here, and "I'm going to learn the words for this" or "I'm going to learn the words as you talk about a particular action." And so, eye gaze, then, emerges as another one of these very powerful ingredients for early experiences.

We talked about imitation a little bit before. We know that kids are very, very good imitators.

[Video begins]

Dr. Lytle: And this is a video from when Alan Alda visited our lab for his PBS show, and we were showing him the power of Imitation. And so there he is, putting some beads in a cup and then gives the child the beads in the cup. And as you know, it's very, very tricky to actually get those beads into the cup, but the child finally does it, and she's very, very excited. [Laughter] And, so, this is one of those camping cups, and flip it over and squash it. And you can see the child look at the cup, look at the person, look at the cup, and we say, "Do you want a turn?" And of course she does it immediately.

And she's very fascinated by this. And this is a fun toy that we have. It looks sort of like a barbell that you can pull apart. And, again, you can see the child study the object, the person, the object, the person. And she finally pulls it apart, and Alan Alda says "Good pop." And so, then, we asked Alan Alda to do the craziest thing that he could think of, and so he ended up laying his head down on top of this box. And we ask her if she'd like a turn. She says yes. [Laughter] And her head immediately goes down on the box.

[Video Ends]

The interesting thing here is that, nothing happened when they laid their head down on the box. Nothing lit up. No noise was made. There was no result of this action. Nevertheless, children are imitating it. You know, a very distinguished-looking older gentleman did it first, and "Maybe it's important, so I'll learn how to do it, too." And so we know that kids are really, really invested at being like us. They want to be like the adults in their life, and this is a very good example of how they might do that. Imitation is indeed the sincerest form of flattery. And so when kids imitate us is really them trying to find and form those social, emotional connections to be like us.

And so, we know that imitation can be very complex. If you think about the number of things that a child might imitate, things can be very, very simple, like putting your head down on a box. But maybe it's more complex, like making a sandwich. How would you begin to make a sandwich? There are lots of steps involved in making a sandwich. And so we know that over time, children's imitation ability increases, and they're able to increase relative to the complexity of the task, but also the length of time for which they remember the task and remember how to imitate.

And so, you can see here that over time, kids get much better, they're able to imitate more complex tasks, and they're able to remember these actions for a long time. Of course, children will remember more if it's reinforced. Always a good thing to remember in the imitation for better or worse realm. But children are able to increase the complexity of this imitation, and this really is an indication of the increasing level of their learning and the depth of their learning. And we have some recent evidence that really shows us, in fact, what's going on in a child's brain as they are imitating.

And so, if we show a child an experimenter who performs an action, either with her hand or with her foot, and then we measure what's going on in the infant brain, as they watch these actions, we again see this evidence for sort of preparatory or anticipatory activation in the brain. And so you see the brain reacting as if in rehearsal for performing the action themselves. And so here on this graph, down means activation, and so if you can see that when a baby observes the experimenter touching the toy with her hand, the hand area of that baby's brain is activated.

When you see the baby watch the experimenter touch the toy with her foot, the foot area of the brain is activated. And so, again, you start to see this sort of rehearsal-type activation in the brain in preparation for actually performing that action themselves. And so this is very powerful evidence that there's really a neurological, a brain basis, for all of that rich imitation behavior that we see from kids. And so, imitation, then, also emerges as one of these ingredients of early interactions. I'll add just two more for you. The first is the power of these back-and-forth interactions. And so we all know that going back and forth and creating that turn-taking behavior with a child leads to a very rich interaction.

And, in fact, in some of the research that I've done, I looked at children's ability to learn language, either from a traditional video or from a live interaction or from Skype, which is a really interesting sort of medium, because it is a screen medium, but it allows you to have that back-and-forth interaction, and it turns out that kids are able to learn from a video-chatting experience, just as they are from a live interaction, because you have that turn-taking-type behavior. And so it's not so much the screen per se. It's that traditional screens lack that ability to have that responsiveness, that real-time interaction between an adult and a child. And so that back-and-forth quality seems to be incredibly important.

Now, what goes on in this back-and-forth interaction, well, oftentimes, you see a lot of scaffolding going on. So, scaffolding is the way that we support children while they're learning. So, just as scaffolding outside of a building supports a building when it's under construction, Scaffolding with children is a way that we support them while they're learning.

We ask questions. We relate things in the storybook or in the event or in the environment to things that have happened in the child's life. And this can be a very powerful way that children learn. And so traditionally, scaffolding came from book reading, but we know that it can exist in a variety of contexts, and so if you imagine reading "Caillou Visits the Doctor" with a child, you might ask questions like, "Do you remember going to the doctor, like Caillou?" You're relating the content of the book to the child's own experiences. You might say things like, "What do you think Caillou will do at the doctor's office?" You're asking the child and inviting the child to become an active storyteller. You're asking them to make predictions, which is a very complex skill, but you're asking the child to make predictions about what will happen, perhaps bringing in and incorporating some of their previous knowledge of things that typically happen at a doctor's office.

And then, you might offer new vocabulary words and explain them. You might say things like, "That's a tongue depressor. Can you stick out your tongue like Caillou?" Again, that new vocabulary, explaining what you do with a tongue depressor, how does a tongue depressor work, and can you do it yourself. Again, inviting that active participation. So, scaffolding seems to be this very, very powerful experience traditionally in books, but we know, in fact, that it can happen in the environment in an everyday experience, as well. And you can imagine going to a grocery store, for example, with a child and employing the same techniques of scaffolding that you might during a book-reading exercise. You might say things like, you know, ask your child to sort cans of fruit from cans of vegetables. You're working on categories. What is a fruit, what is a vegetable, and can you sort them?

You might ask your child to help count money or fake money to pay for groceries. You're working on a fantastic set of math skills there: counting. You know, maybe you're distinguishing between coins and paper bills. You might say "Milk comes from a cow. What else comes from a cow?" Again, you know, leading to potential new vocabulary words. Maybe you're going to talk about dairy, which is a very, very complex concept, because milk is part of a category of dairy. And then you might offer new vocabulary words, talk about things that you've not talked about before, things like squash, asparagus, dairy, or eggplant.

And so you can use these same set of scaffolding skills outside of a book-reading experience and really to enhance those everyday interactions that we've been talking about. And so, if we take a step back for a minute, then, and think about what are these ingredients of quality, early interactions we talked about a lot today? We've talked about everything from needing this live person there to really paying attention to the quality and quantity of language, employing this back-and-forth, turn-taking interaction, using eye gaze, being aware that children are very perceptive of emotions, and looking at children's imitation, looking at those scaffolding skills that we can employ in a wide variety of settings.

Now, this is by far not to say that every quality experience must include all of these. I don't think that's true, and I think that you all probably have lots of evidence that that is not the case. You can have a very, very rich interaction with a child and maybe only use two or three of them, but I think it's worth us taking a step back for a minute to think about those everyday interactions that we have with children and think about, were there elements of quality in that particular interaction? If maybe there weren't or if there were other opportunities to include more of these ingredients, how can you start to slide those in and incorporate a lot of these research-based ingredients into those everyday interactions to make them all that more powerful?

And so, lastly, then, I just want to give you some evidence that these early experiences, things that we've talked about today, are not isolated to these early years, and, in fact, we're starting to get more and more evidence that these early skills really do build to a very impressive set of later skills. And so if we look at this timeline of things we've talked about, one thing I didn't mention today is some fairly new evidence from our lab that relates the volume of gray matter in 7-month-olds to later vocabulary. And so we know that children who have a greater volume of gray matter in their brains -- so, gray matter is largely composed of your brain cells.

So, kids who have a greater volume of brain cells are gonna have larger vocabularies out to 12 months of age. So, again, this brain measure that we can collect within that first year of life relates to something a little bit down the road. And, now, you might ask, how can we enhance gray matter in children? And the answer is, in fact, through these early experiences. We know that kids who had these very quality early experiences are likely to have a greater volume of gray matter in their brain. And so if that's the case, then we can build gray matter to increase later learning. I did mention this briefly; so, we know that hearing infant-directed speech at 12 months of age is related to later vocabulary, out to 24 months of age.

We know that children's ability to read social cues -- that's the eye gaze following here in this case -- that leads to later vocabulary out to 24, and we also have some data leading to vocabulary at 30 months of age, so at 2 1/2. And then we looked a little bit at speech perception today -- so how good are kids at hearing the "tas" and "das" and "ras" and "las" in their native language? And we know, in fact, that kids who are better able to distinguish those sounds in their native language at 7 months of age have larger vocabulary out to 30 months of age, and, in fact, we have some recent evidence that links that to reading readiness at age 5.

And so, simply by hearing, by being better able to distinguish those sounds in your native language at 7 months of age, that might predict reading readiness at age 5. I think that's a very, very powerful indicator that things that happen in that first year of life are by far not isolated to that first year of life. They really do form that foundation for later skills, and later skills that will, of course, be integral for school readiness.

And, so, we think, then, about what makes a school-ready child. I think everybody in this room would agree that it's not just the ABCs, it's not just the 1-2-3s and colors and shapes, but it's having those supportive relationships. It's having those communication skills. It's understanding emotions and then having the communication skills to talk about them, right? And it's those everyday experiences in play that really get kids to that place where they are school-ready by age 5. And so with that I will close, but a quick plug before we leave.

So, our Outreach & Education Division at I-LABS is dedicated to doing the dissemination of the latest science, and as part of our effort, we have created a series of online training modules. They are free. They are readily available to you on your own time. You can assess them from our website. You have to register, but they are free. We currently have four training modules that are available, and the idea is that we are gonna keep adding as we are able. We envision a library of about 50 or so training modules in about 5 years. I think we have the next five or six training modules in various stages of development, and we'll be able to update them also, as we get new information on a particular area. So, I would encourage you to look at these training modules, and we're always ready for feedback and willing to hear feedback; so I'd love to hear from you, not only that you've completed them and have looked at them, but I'd love to hear what you think, and we will modify our future modules accordingly. So, thank you so much, and I hope you have a wonderful conference.