

**Baby Talks**  
**Brilliantly Bilingual: Growing Up With Two Languages**

Sarah Lytle: Good afternoon, everyone, and welcome to Baby Talks. We're ready to get started, and we're so pleased to have you join us today. Baby Talks is a series of webinars for teachers, providers, and home visitors working with infants and toddlers serving Early Early Head Start, Head Start, and child care programs. These webinars will introduce you to some of the research behind the Head Start Early Learning Outcomes Framework, the ELOF. I'm Sarah Lytle from the National Center for Early Childhood Development, Teaching, and Learning. My colleagues and I are from I-LABS, the Institute for Learning and Brain Sciences and we'll be presenting these webinars. I-LABS is one of the leading infant research centers in the country.

This series will provide a deeper understanding of why the subdomains and indicators of the ELOF were chosen. The ELOF stresses the importance of supporting dual language learners using intentional planning of learning environments that support diversity and strategies to promote home languages and English acquisition. This webinar today focuses on dual language learners' early skills, behaviors, and knowledge and how best to support them as they learn two or more languages. Before I turn it over to my colleague, let me give you a little bit of information about how this webinar platform works. During the phone call, your phones will be on mute. If you would like to make a comment or ask a question, please type it in the chat box. If there's time at the end, you'll be invited to ask these questions. And with that, I will turn it over to my colleague Jane Hu.

Jane Hu: Thanks, Sarah. Hi, this is Jane and I'm pleased to be here with you today. So we'll be talking about the latest research on bilingualism and how you can support children who are growing up with multiple languages. So after this webinar, you'll be able to understand the brain's role in supporting dual language learning, explain how everyday experiences build bilingual children's language skills, describe the cognitive, social, emotional, and cultural advantages of learning more than one language, and also learn strategies to support the dual language learners that you work with. We'll discuss what it means to be bilingual, or a dual language learner, the foundations of language learning, how consistent, high-quality experiences build language skills and what dual language learning may look like in the children that you work with.

So what does it mean to be bilingual, or a dual language learner? Let's start by defining what we mean by bilingualism. Bilingualism is the ability to speak two or more languages. Bilingual and dual language learner are both terms that you'll hear referencing children who speak more than one language or are learning to speak a second language. In contrast, someone who speaks one language is called monolingual. About 20 percent of people in the United States speak more than one language at home. Bilingualism is even more common around the world. Roughly 2/3 of the world's population is bilingual. Bilingual speakers are diverse, learning languages at different ages, and in different contexts. Proficiency and dominance in languages varies among dual language learners. Some children start learning two languages from birth.

They are simultaneous bilinguals. Simultaneous bilingual speakers have two native languages or home languages. Other children learn one language before they learn another one. They are sequential bilinguals. Sequential bilingual speakers learn their second language any time from early childhood through adulthood. As you will learn later, the human brain is best prepared to learn language in the first few years of life. And as people age, it becomes more challenging to learn a second language. So as we think about the intersection of language and culture, let's consider the importance of language to you and your community. Why might speaking two languages be valued? How are language and culture related? And from your personal perspective, what does your language or languages mean to you? Please take a minute or two to type your responses in the chat box, and we'll share a few of the responses with the group.

Sarah: So it looks like we have multiple people talking and typing in their responses right now. People are saying things like, you know, language gives you the ability to communicate with clientele in their native language. It maintains culture, develops children's brains, which is, as we know, very important. Language and culture connects you to your family. Language means identity and perhaps positive identity. Oh, somebody says -- this is interesting -- somebody says that one of their elders told us that

when we are able to bring back the language, we would bring back more of the culture. So again, this very tight intersection between language and culture. Being able to communicate and talk to families in multiple languages. Communication from the perspective of a different culture. That's an interesting response. I like that. Expression of needs in a culturally sensitive manner. Expands vocabulary and encourages appreciation for diversity. These are some great answers.

Jane: So this is great. Thank you all for sharing. Well, I'm sure people will continue to share some responses in that box, and please feel free to. But I think we'll go ahead and move on. So before we jump into research about bilingualism, let's start by talking about the brain development that serves as a foundation for all learning. This sets the stage of children's language development, no matter how many languages they're learning. Rapid brain growth supports children's language development, whether you're learning one or many languages. A child's brain grows faster in the first few months and years of life than it will at any other time. At birth, a baby's brain is already 1/4 the volume of an adult brain. The rest of a newborn's tiny body is not even close to 1/4 of their adult size. If it were, the average newborn in North America would weigh about 40 pounds.

Children's brains continue to grow and quickly. A recent study calculated the rate or how fast infant brains grow and researchers found that an infant's brain grows at an incredible rate of about 1 percent every day and then flows down to about 0.4 percent per day by the end of the first three months. By the end of children's first year of life, their brain is already 75 percent of its adult size. And by 5 years of age, it's grown to about 90 percent of adult size. An important thing to note is that while a 5-year-old's brain might be 90 percent the size of an adult brain, that doesn't mean that the child's brain is 90 percent finished developing by age 5. A 5-year-old has much, much more to learn. For example, even by age 4 or 5, children are still learning how to control their impulses. They need support from adults to improve those skills. The parts of their brain that control impulses, like the prefrontal cortex, still need a lot more time and experience to develop. Scientists estimate that the brain doesn't finish developing until well into the third decade of life. But by 5 years of age, children have most of the raw materials, like brain cells or neurons, that build the brain.

Children's brains are uniquely primed to learn from the experiences that they have every day. At this stage, the brain is like a rough draft ready for the experiences of life to continue shaping it into the specialized brain of an adult. When children are born, they already have the majority of neurons, or brain cells, they'll ever have. What is missing are the connections between neurons. Our experiences help determine which connections form between neurons and how strong those connections are. When we learn something new, we are shaping how the neurons in our brain connect and communicate. Some connections form in our brains as a result of common experiences that all typically developing children are exposed to, like light, sound, touch, and taste.

Other connections form as a result of our unique experiences, such as the languages we learn or the foods that we enjoy eating. Scientists are still investigating exactly how these connections form, but they do know that the more exposure that we have to a particular experience or set of experiences, the stronger the connections between neurons become. This is true of both positive and negative experiences in our lives. Because the connections between neurons in our brain depend on the experiences that we have in our lives, newborns don't yet have all the connections in place. And this is a really good thing, because we each have to become an expert at living our own lives. Flexibility in our brains is how we become wired and that's what allows us to become experts at living our own lives. Children's brains are particularly sensitive to experiences, in part, because during the first few years of life, connections between neurons are forming rapidly. In fact, by age 5, a child's brain has about three times the amount of connections that an adult's brain has. That's more connections than it will ever need.

Over time, the brain systematically reduces the number of connections it has, keeping the frequently used connections and removing the infrequently used ones. This process of refining the number of connections between neurons is called pruning. This is an incredibly important process for healthy brain development. You can think about the process a little bit like the process of caring for a rose bush. At first, there's this period of rapid growth when the brain is blooming. During that time, the brain makes many extra connections. These extra connections actually make the brain less efficient,

just like after a period of rapid growth in the spring, a rose bush can become gangly with too many branches going in all different directions. After that period of blooming and the brain connections are refined, or pruned, based on the experiences that we have in our lives. Connections that we need and use are kept and connections that we don't need, ones that are actually making it more difficult for the brain to function, are removed. The results of this process is a brain, or a rose bush, that is healthy and thriving. The branches, or the connections, that are left are stronger and the brain is more efficient. Throughout brain development, there are multiple periods of blooming and pruning. These bursts occur at different times and in different regions of the brain. Scientists think that these bursts of blooming and pruning align with sensitive periods in the brain. Sensitive periods are times when our brains are particularly open to new experiences and to learning. Research suggests that the brain has sensitive periods for learning different skills.

So sensitive periods for different skills occur at different times and the sensitive period for language learning specifically, is in early childhood. Have you tried learning a new language as a child, an adolescent, or as an adult? Think back on the experience. Was it more or less difficult than you imagined it would be? I'll pause for a second for you all to reflect. So it might be surprising how much more difficult it is to start learning a new language in adulthood, especially if you've not tried it. So to examine language learning ability over time, scientists looked at how well people were able to learn English at different ages in their life. They measured this by giving research participants a tricky grammar test. Native English speakers and people who learned English as a second language participated in that study. So on the bottom of the graph, you can see the age at which speakers learned English. On the side of the graph, you can see how well the speakers performed on the grammar test. The better people did on the test, the better their English language skills were. On the top left corner of the graph, you can see the grammar score for native English speakers in red.

The next dot in blue is the grammar score for people who learned English as a second language between the ages of 3 and 7 years old. Their scores are identical to children who speak English as their native language. Children who learned a second language early in life were just as fluent in that language as native speakers. Children who learned English when they were 8 to 10 years of age did slightly worse on the grammar test. The older a person was when they started learning English, the worse their score on the grammar test. Of course, that doesn't mean that we can't learn a second language as adults. We can always learn new things. It just means that it will be harder for us. And this is partly due to how our brains develop. When a child is young, as we were just talking about, connections form at a rapid rate and the brain is particularly sensitive to new experiences, but as we age, we stop making as many new connections between neurons. Our brains are less sensitive to the experiences that we have in our everyday lives.

And while we can still learn new things as adults, we'll likely have to try harder or repeat the tasks more times than we would if we were learning the same thing as a child. Scientists at the University of Washington's Institute for Learning and Brain Sciences, or I-LABS, were interested in learning about how infants begin learning their first language or languages. So specifically, they wanted to know how well babies could tell the difference between sounds in their native language, or home language, and sounds in a foreign language. To test this, researchers have a baby sit on their parents' lap while they listen to vowel sounds from their native language, English, and a non-native language, Japanese.

A given vowel sound is repeated several times, like, ah, ah, ah, ah, and then a different vowel sound plays, ee, ee, ee, ee. In the few seconds after the vowel sound switch from ah, to ee, for example, the black box to the child's left in that picture, lights up. A toy puppet starts playing the symbols and children really like watching that, so much so that after a few times, they'll learn to turn their head in anticipation as soon as they hear that vowel change, before the toy even lights up. So using this method, researchers can figure out if very young children distinguish between vowel sounds. If the child turns their head to look at the toy after the vowel sound changes, but before the toy lights up, the scientists know that the child can tell the difference between the sounds. In the first few months of life, even though babies may recognize that a language they're hearing isn't their native language, they're just as good at telling the difference between sounds in their native language as they are in telling the difference between sounds that are in foreign languages. They're citizens of the world. But very quickly, their experiences begin to shape the connections that are forming in their brains. So by

10-to-12 months old, babies are already becoming native-language specialists.

In other words, they're really good at telling the difference between sounds in their own language, but not as good at telling the difference between sounds that they rarely hear, or that aren't used in their native language or languages. So research suggests that the brain is primed to learn different skills at different times, as we were talking about earlier, and these results are an example of that. At around 9 months of age, a child's brain is primed to learn, or is particularly sensitive to, the sounds of their specific native language. And during this early sensitive period, children's brains are really good at picking out the sounds of their native language, or languages, and learning to recognize them. Since bilingual children are exposed to two language, they remain sensitive to the sounds of both of their languages. They have more sounds in their repertoire than their monolingual peers. What all this means is that the process of brain development is really the process of building our brains through the experiences that we have every day. Because our brains are so busy forming new connections early in life, the type of experiences that shape those connections really matters.

The more often a child has an experience, positive or negative, the more likely that experience is to shape the connections forming in their brains. So I want you to take a moment and think about the kinds of experiences that the children that you work with have on a daily basis. So what kinds of language experience do these children get in each of their languages? What's an example of a positive language experience that children might experience frequently? And just take a second to reflect on that and type your answers into the chat box and we'll share a few with the group. So again, those questions were, what kinds of language experiences do children that you work with get in each of their languages, assuming they speak more than one language? And also, what is an example of a positive language experience that children might experience frequently?

Sarah: Okay, looks like we've got lots of people typing. I see people suggesting that Spanish speaking at home with parents, music and television. English-speaking songs and experiences at daycare. So, "A simple example would be songs," says Jana. Christie says songs, stories, and conversation in their native language. So songs are definitely coming through. Lots of people suggesting that songs are a really good, positive experience for kids. Bilingual staff in the classroom. Books on CD. Rhyming in both languages. That's a good one.

Jane: Mm.

Sarah: Somebody suggests greeting children every day in their native language. Having a multilingual daycare environment, so all staff being bilingual, perhaps. Again, this idea to say hello or good morning in different languages for the group.

Jane: Great. Yeah, looking at these responses, they're all great ideas. Yeah. Yeah, so knowing that, you know, these early experiences are so important. These are great ideas to try and give children more experience with language, especially multiple languages in their learning setting. Great, so I'm going to go ahead and move on. So given that early experiences are so important for children learning language, we are just reflecting on our answers to those questions we asked and a lot of them touched on some components of high-quality interactions with children. So in this next section, we're going to be talking more in depth about that and what research tells us about how those experiences help learning. So being engaged face-to-face is an important component of children's learning. Research shows that children learn best when they learn from other people. So in one study, I-LABS' researchers compared how well English-learning 9-month-old babies learn sounds from a foreign language after 12 25-minute language-learning sessions. So some of those infants had all 12 of those sessions, learning Mandarin Chinese with a live native speaker of Chinese. So that Mandarin speaker read the infants books, they sang songs, and they played with toys together. And another group of infants, they just watched DVD recordings of those same 12 sessions. And then a third group actually only listened to the audio recordings from those sessions.

So all three of those groups were exposed to the same amount of language, but their experiences with the language were different. So this graph might look familiar to you. We just saw a similar graph earlier, but the blue line shows show well babies born in Taiwan, where Mandarin is a native language, can tell the difference between sounds in Mandarin Chinese. The black line shows how well babies

born in the U.S., who do not have any experience learning Mandarin, can tell the difference between sounds in Mandarin. So you can see that at 6-to-8 months, Mandarin learning babies and English learning babies are equally good at telling the difference between sounds in Mandarin Chinese. But by 10-to-12 months, Taiwanese babies get much better at telling the difference between the sounds in Mandarin, whereas babies that are born in the U.S. who aren't hearing any kind of Mandarin Chinese, they tend to get worse. So now let's look at the results of the study.

Babies who were born in the U.S. who are exposed to Mandarin Chinese during the live interaction with the Mandarin tutor, so those were the children who actually got to play with someone who speaks Chinese in person, they were just as good at telling the difference between sounds in Mandarin as children who are growing up in Taiwan. So those infants are shown in red on the graph. But what about the babies who watched the DVD or listened to the audio recording? Those infants are shown in green and yellow on the graph, or I guess it kind of shows up as orange here. They actually did not show any evidence of learning. Those infants weren't any better at telling the difference between sounds in Mandarin Chinese than the English-learning babies who didn't have any experience with Chinese. So what the results of the study tells us is that for young children, language learning happens during interactions with the adults in their lives.

So what is it that happens during a live social interaction that makes them such a powerful learning tool for infants? One component could simply be that the exposure to language is important. The language used by caregivers helps children learn and we know that from research that the number of words and the type of language that children hear are really important. So very young children learn best when they listen to something called infant-directed speech, or sometimes it's called parentese. I mean, it sounds like a sing-song, exaggerated tone of voice. You might naturally use this when you're talking with children and babies love to listen to it. Science has shown that babies who hear more parentese actually babble more and because babbling is essentially practice for later language, this is an important step in language learning. Not only does parentese give children an opportunity to practice speaking, but it also helps children learn new words. Studies have shown that when children hear more parentese at 12 months of age, they have higher vocabularies at 24 months of age.

Rich and varied language input affects vocabulary development, as well. So in addition to using parentese, it's important for adults to speak to young children so that they model rich vocabulary and varied grammatical structure for children to hear. It's not always possible for adults to model multiple languages to children, but that's okay. The most important thing is to give children a solid base in at least one language, which research has shown can actually help ease children's learning of a second language. You should make sure to speak with children in the language that you feel most comfortable and fluent in. But exposure to language is unlikely to have been the main driver in the results of that study that we were just talking about, since all the children heard the same amount of language from the Chinese speaker.

So what else could it be? Well, the live Chinese speaker was able to do something that the video or audio recording could not, respond to children's cues. They could use nonverbal cues like eye gaze, pointing, and gesturing to keep children's attention in the interaction. Children's ability to follow adult's eye gaze and pointing have been shown to correlate with larger vocabularies later on. This means that it is fundamentally important to have face-to-face interactions with young children. Even if children aren't talking back yet, listening and participating in quality interactions gives them positive language experiences. So far, we've discussed how experiences shape language ability. You can imagine that for a dual language learner, experience with multiple languages is a crucial part of their developmental trajectory and researchers have begun to examine exactly how bilingual brains respond to their experiences with two languages. One study from I-LABS and the University of Texas, San Antonio, recruited Spanish-English bilingual infants to see how children's bilingual language environments influence their brain's processing of that language and whether that related to children's later language development. The researchers recorded the language environment of children in the study to see what proportion of time children heard English and what proportion of time that they heard Spanish. So if you're bilingual, or have worked with bilingual children, you probably won't be surprised to hear that there's lots of variability in the amount of time that children heard each of the languages that they speak.

So it's rare that bilingual households speak 50 percent in one language and 50 percent in the other. When the researchers brought the children into the lab to test their brain responses to Spanish sounds and to English sounds, they found that children's brain responses were strongest in whatever language that they heard the most at home. So, for example, if a child heard approximately 75 percent Spanish and 25 percent English at home, he showed stronger brain responses to the Spanish sounds than to the English sounds. And when the researchers followed children into their second year of life, they found that children's brain responses in English and Spanish sounds were related to children's developing vocabulary, too. So children who heard more Spanish at home had stronger brain responses to Spanish as infants, and then they also had more Spanish words in their vocabulary as toddlers. The reverse was true for children who were in an English-dominant environment. So the results of the study are probably not surprising to bilingual people or the people who work with them, but it gives us a research-based glimpse into exactly how children's early experiences affect their brain development and their language development. And it isn't only language that babies learn through back and forth interactions.

Children learn best when caregivers and teachers respond in a timely manner to their needs. Whether the child wants to share something exciting, is hungry, or needs emotional support, responsive caregiving gives children the support that they need to build a strong foundation. When the adults in a child's life responds to her, whatever her needs are at the moment, she learns that people will help her to meet her needs. This allows children to focus on learning and exploring, instead of worrying about when their needs might be met. It also helps them learn that other people can be sources of support and comfort in their lives and inherently boosts learning. So we know that responding to a child's coos and babbles with sounds of our own encourages language learning, but the same is true across learning domains.

Responding to a child's gesture helps build motor development, for example, and responding to a child's question about how something works in the world helps them build upon their prior knowledge and continue developing their innate curiosity. Research demonstrates that learning happens best in the context of relationships, as we've been talking about and not just the relationships children have with their primary caregivers. Of course, the relationships children have with their teachers are also fundamental to their learning. Children are learning from the interactions that they have with us all day, every day.

Through these relationships, teachers are providing an environment where they can learn and thrive in the company of a trusted adult. So not only do children pay special attention to the things that they learn through interactions with these trusted adults in their lives, but these relationships also help them to feel safe and confident. So like you take a minute or two and reflect on a couple of questions in the chat box and we'll share out a few with the group. So the first question is, how do the children that you work with demonstrate that they learn from other people? And the other question is, how do you incorporate relations-based, relationship-based learning strategies, like back-and-forth interactions, and responsiveness, in your everyday work? So I'll repeat those again. So how do the children that you work with demonstrate that they learn from other people? And how do you incorporate relationship-based learning strategies, like back-and-forth interactions, and responsiveness, in your everyday work?

Sarah: So a lot of people are immediately responding that children use a lot of imitation to demonstrate that relational quality, but, Jane, somebody asked a question about content that I want to pose to you. So somebody asked whether the percentage of time with respect to being exposed to more of a certain language makes a -- makes a significant difference? I wonder if you might address that while -- while we wait for people to type in some of their answers to the questions?

Jane: Sure, sorry. Can you repeat that again? So the amount of time that a child is exposed to languages, does that make a significant difference?

Sarah: Yes, that's correct. I believe that's the question.

Jane: Gotcha. Yeah, so as we were just talking about, it seems like there's some evidence that, at least in children who are speaking more than one language, that the amount of time that you hear a

language does seem to correspond with how -- what their brain responses are, as well as what their later vocabulary is. So as we were just talking about, how experiences are such an important part of these early years, especially for brain development, the amount that you're hearing language really does affect, you know, comprehension and production of language. I hope that answers that person's question.

Sarah: Thank you. I think so. I hope they'll let us know, if not. So people are talking about using imitation, repetition, open-ended questions, adults repeating the sounds that -- that children are making. Being at the child's level, modeling things for the child, asking open-ended questions, using pretend play. Letting a child talk during reading time to encourage parent-child interaction. So some great ideas.

Jane: Interesting. Yeah. That's great. And we'll -- we'll talk more about tips to support children who are learning more than one language in your classroom and what that might look like, as well. Great, so moving on. Actually, this maybe will help answer that question that I was just discussing. So more recent research has used a new technology that's called magnetoencephalography, or MEG, to study children's brain development and especially looking at bilingual children's brains. So MEG measures the changes in magnetic fields that occur around the skull when neurons fire in the brain and by tracking when and where there are changes in that magnetic field, we can determine what is going on in the brain as a child is doing a specific thing, like listening to speech, for instance.

So MEG is particularly good for studying children, because it's safe, it's not invasive, and it's noiseless. So Naja Ferjan Ramirez, a scientist at I-LABS, recently used MEG to look at the brain activity in monolingual and bilingual 11-month-olds' brains. So she was specifically interested in how children's brains become specialized for one language or two languages, which as we were discussing, has a lot to do with experience. So she was playing with both -- she played both Spanish sounds and English sounds for monolingual and bilingual infants. And what she wanted to know was how their brains would respond to sounds that were either familiar or unfamiliar to them. So from everything that we've talked about so far today, you might be able to guess the results of this study. So you can see the results from the monolingual children by following the red line on this graph.

The monolingual English baby showed very little response to the Spanish sounds. In contrast, the monolingual English baby showed a very strong response to the English sounds. These infants' brains responded to the sounds that were familiar to them, which they had experience with. And, in fact, bilingual Spanish-English babies also showed brain responses related to familiarity. And you can see their results on the blue line on the graph. So the brains of bilingual Spanish-English babies were good at processing both Spanish and English. And again, these are the languages that they're hearing and that they have experience with, so it makes sense that their brains have become more specialized to process the sounds of both of those languages. So this here is a MEG brain map that shows the right and left hemispheres, or kind of halves of the brain.

And the portion highlighted in blue is the area of infants' brains that researchers measured as children were listening to that -- those language sounds. So this is the prefrontal cortex of the brain. So beyond finding some evidence that experience really shapes brain responses to each of the languages that children might be learning, another interesting finding from this study is that bilingual infants showed increased activation in this area of the brain, the prefrontal cortex, compared to the monolingual. So the prefrontal cortex is the part of the brain that's responsible for a lot of important cognitive functions, like planning, paying attention, solving problems, and switching between tasks. So these cognitive functions are skills involved in mental flexibility and cognitive control, both of which have something to do with something that, it's a term you might have heard before, cognitive flexibility. So this is the ability of our brains to quickly switch from one task to another, as well as to multitask. So there's a growing number of studies that suggest that being bilingual actually comes with increased cognitive flexibility. So you actually might notice some slight cognitive and social, emotional advantages in the bilingual children that you work with. So let's return to the idea of cognitive flexibility and to give you an idea of what that looks like, I'd like to play a game together. So I'm going to flash a series of words on the screen and I know that I can't hear you, but as you see each word, I'd like you to say out loud the color that that word is written in. So don't say the actual word, just as

aloud what the -- what color it's written in. And so I'm just going to trust that you all are doing this silently to yourself.

[ Laughter ]

All right, ready? And we'll go. All right. So how did you do? What did you notice? I'm sure some of you might be typing your answers too fast, is what I saw. So this test is called the Stroop test and it's a common way that researchers measure cognitive flexibility in adults. So you might have noticed that at first, the written name of the color matched the color that it was written in, but at some point, the written name of the color was different than the color that it was written in. So which was harder to do? Tests like the Stroop task demonstrate that the brain's ability to switch between tasks, it shows that in order to be fast at this task, you have to ignore the word and focus on the color.

And that's really hard to do since we're so used to reading automatically. Your brain actually has to stop its natural tendency to read and focus -- and focus instead on the colors. So because dual language learners have natural practice at switching between languages, they tend to complete Stroop tasks quicker and with more accuracy than monolinguals, which shows some increased mental flexibility. So practicing Stroop tasks and other flexibility games can allow monolinguals to improve their cognitive flexibility, as well. It's not just a skill that bilinguals can build. So how do researchers test this kind of ability in children who can't read? So one method is a similar test called the Sun-Moon game, which I can give you a second to play. So I want to -- I'll be silent for about 20 seconds while you're doing this. So I want you to just go through and look at these shapes line by line and tell me -- say out loud, you know, what you see, a sun or a moon. And try and do this as quickly and as accurately as you can.

Okay. So now going to switch it up a little bit. So going to do the exact same thing, but this time when you see a sun, say moon, and when you see a moon, say "sun." I'll give you a little bit of time to do that, as well. [ Laughs ] So, some people are typing in the box saying, that was a little bit difficult, slower... Oh, I'm not sure if that's about Stroop or about the Sun-Moon game. But I know that, for me, at least, near the end of it, I kind of have a pattern, but then at the end, it takes a little bit more effort to -- to stay focused on the task and remember that I have to say the opposite. So yeah, similar to the Stroop task. This game also relies on your ability to inhibit your impulses. So your impulse is to name what you see, a sun or a moon, but when we go through it the second time, you have to stop that response and rely on your working memory ability to remember the new rule that you're actually supposed to say the opposite. So that can be really challenging. And it's a classic test of cognitive flexibility.

So as was the case with the Stroop task, bilingual children actually tend to be faster and more accurate with this game, because they have natural practice switching back and forth between the languages that they speak. So bilingual environments seems to give children this extra experience with skills associated with cognitive flexibility, which allows dual language learners to be faster and more accurate at switching between tasks, paying attention, and inhibiting impulses. So, of course, this is not to say that dual language learners are the only people who can have cognitive flexibility. That's absolutely not true. But anybody can develop cognitive flexibility skills through this kind of practice. So the best kinds of activities to develop those skills are ones that require you to switch between rules, or to inhibit your impulses. So can you think of any examples of children's games that might do this? So like to take a second and see what responses people come up with and we'll share a few with the group.

Sarah: Somebody -- a couple of people are saying, "Simon Says," is a children's game that might -- that might do this. "Red Light, Green Light," is another example. "Bingo." "Duck, Duck, Goose." Patting your belly while rubbing your head. [ Chuckles ] "Head, Shoulders, Knees, and Toes." Someone says they've seen in with different math systems, learning math given to the same child. "Hokey Pokey." So some good examples of some children's games that really motivate cognitive flexibility skills.

Jane: Those are also, you know, fun games for kids to play, in general. Great. All right, so now you've heard a little bit about how babies learn two languages, you might be wondering what dual language learning might look like in the children that you work with. So as a care provider, you might notice

that dual language learners that you work with switch back and forth between their languages. We were just talking about how that is actually what helps children who are learning more than one language be faster at some of these cognitive flexibility skills. And you might notice that they mix languages even within a sentence or a phrase. So for example, a dual language learner of Spanish and English might say "More leche," "more milk," or, "I like to canta y baile every day," "I like to sing and dance every day." Pardon my Spanish. I obviously do not speak Spanish. I am not Spanish-English bilingual. But this is called code-switching. So code-switching is evidence that children are learning to decode multiple languages.

So the strategy that children are using to negotiate or construct meaning within and across the different languages that they speak. So we also talked about sensitive periods from earlier in this webinar. So the sensitive period for language learning specifically is in early childhood, as we were talking about. So you can see the sensitive period represented in this graph. The time under the peak of the curve is the core of the sensitive period, the ramp up and the ramp down represent the time leading into and the time leading out of the sensitive period.

So not all aspects of language learning have the same sensitive period. For example, the best time for recognizing the sounds of our native language, or languages, is during the first year of life, as we were discussing at the beginning. But the best time for learning words occurs a bit later in the second year of life. So because of this, language learning is best in early childhood. And although monolingual and bilingual language development are similar in many ways, the sensitive period from monolingual and bilingual children is one of the few areas where we see a few differences.

So it turns out that dual language learners have a longer sensitive period for language than children who are learning just one. If you think about how the infant brain is using statistics to determine which sounds are important for a child's native language, or languages, this extended sensitive period makes sense. This extra time allows children to have more experience with the languages they are learning and it's important to note that this extended sensitive period is not a delay. Other than this extended sensitive period, children who are learning more than one language follow the same language learning trajectory as monolingual children who are learning just one. So some people believe that bilingualism puts children at risk for language delays, but there's actually no research that suggests that sequential bilingual children face language delays.

And research with simultaneous bilingual children, so remember, children who are learning both languages at the same time, shows that their language growth is very similar to monolingual children. So the graph here shows children's vocabulary over time. So in this study, the bilingual children were all simultaneous bilinguals, learning two languages from birth. Children's age and months is on the bottom of the graph. And on the left is the number of words children say or produce. The yellow line shows the growth of bilingual children's Spanish vocabulary. The red line shows the growth of bilingual children's English vocabulary. The gray line shows monolingual children's vocabulary growth in English. So look at the red and yellow bilingual line. So each line is below the gray monolingual line, but each line only reflects part of that bilingual child's vocabulary knowledge. So what happens if we add their Spanish and English vocabulary knowledge together? Well, the dash green line represents the combined Spanish and English vocabulary size for bilingual children. The green line overlaps almost perfectly with that gray line. When we count a bilingual child's vocabulary in both languages, it is indistinguishable from a monolingual child's vocabulary. So the combined vocabulary for the average bilingual 22-month-old is the same as monolingual 22-month-olds. So bilingual children do not lag behind their monolingual peers when we include growth in both languages.

Regardless of how many languages they're learning, children usually say their first words around 12 months of age. A bilingual's first words might be in one or both languages and it depends on the child's experiences with each language. Bilingual vocabulary and grammar development show the same pattern as monolingual language development. So monolingual and bilingual children begin to combine words around 18 months and by age 3-to-4, children are producing more complex sentences. Just like monolinguals, bilingual children show variability in the ages at which they reach each of these milestones. Simultaneous bilingual children might reach these milestones at the same time in both languages while sequential bilingual children might reach these milestones at staggered times,

months or even years apart. So it's important to consider that bilingual children have different language experiences at home, depending on whether the children that you work with are simultaneous or sequential bilinguals, the amount of each language they hear at home, you might expect to observe different language behaviors based on that. So, for example, you might notice that the bilingual children that you work with are more comfortable speaking one language than the other or that they switch between languages or code-switch, as we were just talking about. And regardless of these children's individual language experiences and developmental trajectories, there are ways that you can support dual language learning in the classroom or through home visits. So due, in part, to updated research on dual language learning and the many benefits of learning more than one language, the Head Start Program Performance Standards highlight the importance of developing one's home language.

The standards indicate that for all dual language learners, a program must recognize bilingualism and biliteracy as strengths and that language development should be assessed in each of the languages spoken by a child. So there are several things you can do to support the dual language learners you work with. One is talk with bilingual families to learn which languages children hear and speak at home. This allows you to better understand and support children's language development and learning. And so if you are looking for a good resource on this, you can see "Gathering and using language information that families share." It's available on ECLKC and it's also available on the handout, which is available for download here in the file section. So another is to create a welcoming environment for children and try and incorporate their home language whenever possible. Individualizing support for them whenever possible is also a good goal to strive for. And that includes using the Head Start Planned Language Approach.

So the PLA is a comprehensive, systematic and research-based way for Head Start and Early Head Start programs to ensure optimal language and literacy services for children who speak English and for those who are dual language learners. And it has a lot of helpful resources to support you and your work with children and families. It's important to assess dual language learners' development and learning using all of their languages and ECLKC provides a resource for dual language learner assessments in the dual language learner toolkit. And you can find links to all of these, again, in the handout that is available for download in the file section here. So finally, if you happen to be bilingual, read aloud to children in each of their languages if the language that you speak happens to correspond with theirs. For example, you might read one book in English, you might read another book in Spanish. And reading aloud gives children more opportunities to become familiar the sounds of language and sets the stage for biliteracy later on. And you can also encourage early biliteracy by labeling items in your learning environment in multiple languages, like you see in this photo on the slide.

You might find that the dual language learning children that you work with are more comfortable in one language than the other, or switch back and forth, as we were just talking about and that's okay. We know that that is not necessarily evidence for delay. Their brains are just working really hard to understand and learn twice the language information as their monolingual peers. Research tells us that bilingualism is an asset for children and children who grow up speaking more than one language develop language at a similar rate to children who grow up speaking one language. And through the experience of hearing multiple languages, bilingual children's brains become specialized for both of those languages and prepare children to learn words in both languages. So bilingualism may look different in different children, depending on the language experiences that they have at home, as we were just talking about. Some children are speaking two languages simultaneously, while others learn two languages sequentially. And dual language learning children have unique experiences.

They have unique learning styles and preferences and for those reasons, it's really necessary to individualize support for dual languages learners in order to help them thrive in the classroom. So as we were just talking about, one thing you might try and do is talking with their families to understand what kind of language environment they experience at home. So what are some of the questions that we might ask parents to learn about their children's past language experiences? And why do you think this information might be important to support the dual language learners that you work with? So I'd like you to take a moment and reflect on that in the chat box and we'll share a few of those responses with the group. So again, that question was, what are some questions that you might ask the families

that you work with about their child's past language experience and why do you think that information might be important, how might you use that information to support the dual language learners that you work with?

Sarah: We've got a lot of rich discussions going on in the chat box today with this -- with this topic, which is fantastic. So in response to your questions, Jane, people are suggesting asking parents and caregivers what language the child prefers, what the primary language is that they speak at home, how old was the child when they spoke their first word? Creative Curriculum has a language survey that you can give to -- to families. Asking how often a second language is spoken at home? In what language do you read to your child? What's your child's favorite thing to talk about?

Jane: Great.

Sarah: So yeah, lots of -- lots of great questions to ask parents and families.

Jane: Excellent. I'm now reading a few myself. Yeah, so I hope this has spurred a few ideas if you're not already, I know many of you are likely in close touch with families, talking about what experiences the child is having at home, thinking about how that might help you better understand what the child is experiencing in the classroom, as well. So to wrap up, we've talked about lots of things over the last hour. So we know now that the brain is prepared to learn two languages at the same time. And an enormous amount of brain development occurs in the first five years and that supports dual language learning. So whether children are learning one or more languages in the first years of life, we know it's important for them to have high-quality language interactions with the adults in their life, right from the start. So these interactions fill the child's brain, which forms a strong foundation for language learning. And lots of early experience builds children's language skills in each of their languages. And finally, we talked about how bilingual language development is similar to monolingual language development, as well, and it's even associated with cognitive advantages, like cognitive flexibility. So thank you so much for listening. We hope this information will be valuable to you, as you help programs consider ways to enrich the experiences for children and families that they serve. So in a moment, you'll receive an e-mail with a link to an evaluation of this webinar and we really would love it if you took a few minutes to share your feedback so we can improve future Baby Talks. And if you have any thoughts that you'd like to share about how this information relates to your work or any questions about the content that we covered today, I think we have approximately three minutes to open it up to your comments and questions.

Sarah: Well, thank you, Jane, very much. And certainly, if people have some questions, please go ahead and type them into the chat window, and we'll take some questions for the next couple of minutes. People are asking about downloading a copy of the webinar. So the PowerPoint files are available for download in the file box in the window that you see. And then a copy of the webinar, a recording of the webinar will be posted to ECLKC in the coming weeks. So both of those resources are available to you. Somebody's asking if some languages are harder to learn, for example, Chinese?

Jane: So, while children are learning as a native language, I don't think that there's any evidence that there are specific languages that are harder to learn natively. I think it also depends, in part, if you're learning it as a second language or even a third language. There seems to be a growing consensus that there could be differences based on whatever your native or home language is and how closely related it is to the second language you're learning. For instance, if your first language is English and you're trying to learn Chinese, that might be slightly more difficult since there are some features of Chinese, like the different tones, for instance, that don't exist in English at all and are more difficult for a native English speaker to pick up, since they've not had exposure to that before. But long story short, I think the jury is still out on exactly what differences there are, depending on what languages you are learning at early ages.

Sarah: And somebody asked if you could say a little bit more about how this information relates to the ELOF?

Jane: Yes. So all of these studies are part of the body of research that really informs the ELOF. So if you look in the ELOF, of course, they have the whole language and communication section, a lot of the goals and indicators are based on research that we've talked about today or that the research

we've talked about today are continuations of that -- those lines of research.

Sarah: And one very last quick question before we end here and wrap up. Is there research that it takes different parts of the brain to learn languages like Chinese?

Jane: Ah. I don't know about Chinese, in particular, but it certainly is true that there are many -- like, your entire brain is required to learn anything. So you can imagine that for something like language, it's not necessarily just a language part of your brain, as we were talking about. It also involves some amount of inhibition and cognitive flexibility, that's the prefrontal cortex. Also in terms of, you know, just listening to language that requires the auditory part of your brain. Being able to speak the language often requires the motor part of your brain. So, really, language learning, I assume, Chinese included, requires, you know, many, many parts of the brain.

Sarah: And I think the question might have been specifically, if you're learning, you know, English -- if you learn English, does that take different parts of the brain than Chinese uses?

Jane: You know, I am not sure. I am not familiar with any research that would suggest that different languages require different parts of the brain, but we are learning new things all the time, about how the brain processes language, so...

Sarah: All right, well, thank you so much, Jane, and thank you all for attending this webinar. We hope this has been a useful experience for you and we hope that you will attend the next Baby Talks webinar. Thanks so much. Goodbye.