STEM talkABLE #2: Computational Thinking in Early Childhood

Dr. Jessica Amsbary: Hi Lisa.

Dr. Lisa Wadors Verne: Hey Jess, how are you today?

Dr. Jessica Amsbary: I'm doing well, How about you?

Dr. Lisa Wadors Verne: I'm doing great. Thanks for having me today.

Dr. Jessica Amsbary: Thanks for coming. I'm so excited to be here today with you to talk a little about what computational thinking looks like for young children with and without disabilities.

Dr. Lisa Wadors Verne: Yeah, I think a lot of teachers, families, and practitioners are a little intimidated by the concept of computational thinking, when really it's something they can intentionally target every day with young children. And in many cases, they're already doing it.

Dr. Jessica Amsbary: That's so true. Let's talk a little bit more about we can, how we can help them do that.

Dr. Lisa Wadors Verne: Sure. So before we get into the examples, let's talk about some of these foundational terms, concept terms, right?

In computational thinking, we're talking about repetition, looping, causation, debugging, and algorithms, which are really just technical ways to talk about how infants, toddlers and kids learn and play.

Dr. Jessica Amsbary: Yeah, that's really true. And one of the first computational thinking skills that we see in infants and toddlers is repetition. How many times have you seen a young child dropped the same item off of their high chair tray over and over again.

One thing we can do as caregivers and early educators is encourage babies to repeat actions over again, or more specifically, help them understand that they are repeating things over and over again. We all know how babies love to repeats and this repetition eventually leads to this idea of looping, which we see in computational thinking.

Dr. Lisa Wadors Verne: Right, and that looping ideas taking that one action that they're doing over and over and over again and adding another action. So maybe they're doing one action, like dropping it on the floor and then they pick it up and then they drop it on the floor and then they pick it up and as their skills grow and as they learn and get older, you can almost imagine working with the child and teaching them how to set the table., right?

For many children, we don't just hand them one plate at a time and say, Place this plate on the table. Place this plate on the table. Place this plate on the table, Place this plate on the table, right? Because then we move on to glasses and silverware and it just becomes very overwhelming.

Sometimes it's even way too much language than these kids can tolerate. Sometimes we take for granted the ability to instruct someone to repeat an action, right? So could I hand a five-year-old four plates and say, set the table for four. They will essentially take that plate, put it on the table four different times. That's looping one activity over and over and over again so that they're able to complete the task.

Now I understand that there are some kids who will need this 1 step directional every time, and that's okay. But we want to get to a place where we can help them. Maybe not do all four plates, but maybe we give them one plate and then the next time we give them two plates. And then we do the series again. These are all early looping activities that we can use to help kids grow in their skills.

Dr. Jessica Amsbary: Yeah, that's really cool. So eventually they learn that when we say that the table for x, they're going to repeat that activity x amount of times. That's, that's a really cool example I never thought about that before.

Another example of computational thinking is broadly causation and more specifically this idea of conditionals. So in other words, this is when kids understand that one thing needs to happen in order for another thing to occur. Like simple if this, then that statements.

An example that you might see in an early childhood classroom is if we don't water the plants, then they will die.

Dr. Lisa Wadors Verne: Right, and oftentimes we just say water the plants. We don't really give that conditional. What will happen if we don't do that? And oftentimes, kids will come to you and say, why? Right, Why do we need the water, the plants. They're trying to piece together an understanding of both the cause and effect of something that they're trying to figure out. And without having that second piece of, they will die, they don't understand the importance of why we need to water the plants.

Dr. Jessica Amsbary: Yeah, that's really true. I think it'd be really interesting now to move onto algorithm.

Dr. Lisa Wadors Verne: Wait, algorithms? Teachers are in the classroom teaching young kids how to code, are they?

Dr. Jessica Amsbary: Well, not exactly, but in most early childhood classrooms, teachers are teaching precoding skills, but in our everyday activities, so this idea, of a step-by-step sequence, also known as an algorithm, of a series of steps that children need to take in a particular order is something that young children and their caregivers engage in every day.

Dr. Lisa Wadors Verne: So I know a really good example of this, right? So when we think about the sequence of things that need to be done in order to complete a task. Many of us wash our hands. And so a really great example of how to break that down and help kids understand all the steps that go into completing that task would be to help them understand. First you turn on the water, then you put soap on your hands. Then you scrub your hands. Maybe you sing the ABC song, and then you turn off the water, right? Having all of these steps are needed in order to having clean hands. Right?

Dr. Jessica Amsbary: Right. And when we follow and carry out simple recipes with children like putting an ice cream sundae together or assembling a peanut butter and jelly sandwich, we can help them identify and list the steps needed to complete the task in the order that needs to be completed.

Dr. Lisa Wadors Verne: Right, right. And I think that order becomes really important and we work with young kids. But eventually as they get older or start experimenting on their own, they're gonna try to do these sequences and on their own.

And sometimes when kids are completing a sequence of events, things don't work out quite like they think they should, right? So think about when we help the child get dressed in the morning as parents and caregivers, we help our children understand the order that clothes need to go on in order to be successful.

But what happens when a child, a child tries to put on their shoes before their socks, they ran into an issue. So kids will then try to figure out, okay, this didn't turn out the way I wanted it to. What do I need to do? And they may go backwards and say, oh, socks go on before shoes. Then they take off their shoes. They put on their socks, put on the shoes, they're ready to go.

We're helping kids understand that some things need to be done in a specific order to be successful. But when they can go and try to figure out what went wrong, or maybe we can guide them and say, Ooh, you still have your socks to put on. What might we have to do? These are all ways that children problem-solve or debug.

Dr. Jessica Amsbary: Yeah, that's a really good point. We can help them break down the steps, figure out went wrong, what went wrong and fix it.

Dr. Lisa Wadors Verne: Yeah. Yeah.

Dr. Jessica Amsbary: So another thought, another concept we wanted to discuss in regard to children and computational thinking is this idea of symbolic play. And an example I have of children using symbols and play, another food one, I must be pretty hungry myself right now. But children and playing in a housekeeping area in a preschool classroom, they might be pretending to cook dinner, right? And they have some pretend play food. But they really want to make spaghetti, but there's no pretend spaghetti. So one child might get the idea to tear up some white paper and make it into spaghetti noodle. So they're using a symbol to represent something else in that place theme.

Dr. Lisa Wadors Verne: And I'm really glad you brought up symbolic play because I wanted to talk a little bit today about a series of activities that we're putting together at STEMIE to help educators really kinda work through some of these computational thinking skills with sequencing and looping and a lot of these things we've talked about already using symbolic representations.

So if you look around your classroom or your home, there's certain objects that you have or can use. But I'm going to talk about using blocks today. And my blocks are going to stand for an action, a sound or movement. And in this case, actually my blocks are going to stand for both an action and a word. If I put a series of blocks together, we could have a dance, a song, or a silly sequence of activities. So in my example, I want to talk about three different ways we can kind of play with these blocks. One, if my red block represents a clapping sound, clap, my blue block represents a snap, snap, and my yellow block represents a stomp. Stomp. I can have the children lay out the blocks in random order and see what we get. So we may get a red, blue, red, yellow, right? If we put down four blocks, it could be anything, right? And or you can go red, red, yellow, red, blue, right there.

It depends on how or we can be a little bit more intentional and how we lay out those blocks. Maybe we want to talk about sequencing. So we can do ABC sequencing or ABAB sequencing. But again, in this case, maybe we'll do red, blue, yellow, red blue, yellow. And then the kids would look at the blocks laid out red blue, yellow, red blue, yellow, and go red, blue, yellow, red, blue, yellow. Okay, So they're, they're associating an action and a word with that colored block. And then as they get used to this and they have a little bit more fun with it. You can actually turn it into a fun song.

So I was thinking of a song like red blue, red, red red blue, red red blue, red red blue, yellow. So in that case it would go red, red blue, red, red blue, Or you could be fun. And do Mary Had a Little Lamb if you want, right? So there's a lot of different ways that you can take this symbolic representations of the blocks and assign them to something else. And again, these are all skills that are precoding skills.

Dr. Jessica Amsbary: It's almost like a little secret code in order to make a song or a series of actions or movements. I love this. And I think the children would have fun with that activity too. So I'm curious about ways to make this activity and all the activities we've sort of talked about today accessible to all children.

Dr. Lisa Wadors Verne: Well, the best part of this is that any of these can be adapted for all ability and interest levels and ability obviously we have ages, but we also have cognitive abilities and interest becomes important too, because maybe you have kids that aren't very interested in blocks, but maybe they're interested in trains.

Could you do that same activity with the sound and the action using different colored trains? Sure. Green train might mean this. A purple train might mean that, an orange train might mean this, right? So there's a lot of different ways that you can actually have fun with these basic skills and adapt them to the kids' needs.

So another example, and I wanna go back to the handwashing example. If you have a child who has trouble staying on task, or maybe doesn't remember what comes next, right? So needs a little bit of help with that sequencing. What if you put a picture of that child doing the activity? So when they go up to the sink, they see a picture of themselves turning on the water. Then they see a picture of themselves putting soap on their hands. Then they say a picture of themselves rubbing their hands. And then they see a picture of themselves turning off the water.

These adaptations in aids can help students stay on task and continue to do the task and complete it to be successful. But with the skills that are needed to help them reach their potential.

Dr. Jessica Amsbary: Yeah, I think that's a great adaptation. I think visuals come in handy. I've always, I've always heard the justification of visuals because they don't go away. So any child that needs a little extra time to understand and process the steps, those visual can be so helpful.

Dr. Lisa Wadors Verne: Right, and there's a number of other ways that you can do that as well. And so with the activity that we described at the top, we'll make sure we include some adaptations that can be done to really meet the needs of the students in your particular environment.

Dr. Jessica Amsbary: Yeah, that is so great. I think it's just so important that we work hard to engage all young children, babies, infants, toddlers, preschoolers in early computational thinking learning opportunities.

Dr. Lisa Wadors Verne: Yeah, so thanks so much for having me here because I really feel like, not only is it important to have us understand how these different skills and talents or are built, the child so the child understands, well, I know how to sequence, I know how to loop, I know how to do these complex coding things that maybe they wouldn't have that vocabulary for without us kind of associate associating it with it.

Dr. Jessica Amsbary: Yeah, that's a really good. It's a really good point. We said we can empower our children, can become future scientists and coders, and hopefully increase access to stem careers for all.

Dr. Lisa Wadors Verne: Absolutely, it would be great if all the kids in our classroom had equal access, access to these stem opportunities.

Dr. Jessica Amsbary: Well, thanks so much for coming here today, Lisa, I had a great time learning about computational thinking for young children and how we might be able to target those skills in early childhood settings.

Dr. Lisa Wadors Verne: Great, and thank you so much. This has been really fun to talk about.

Dr. Jessica Amsbary: Yeah. Well, great. Thank you.