Exploring Engineering with Preschoolers

Treshawn Anderson: Hi, everyone, and welcome to "Teacher Time." I'm Treshawn Anderson, and I'm from the National Center on Early Childhood Development, Teaching, and Learning, and I'm so excited to be here today to talk with you guys about exploring engineering with preschoolers. Joining me today is Judi Stevenson-Garcia. Hey, Judi. How's it going?

Judi Stevenson-Garcia: Hey, Treshawn. Thanks. Everything here is going well, you know, a little bit of a cloudy day today, but I'm really hopeful that spring is on the way soon. So, hi, everyone. I hope spring is on the way where you are, as well. Thanks so much for joining us today.

We are excited to be here with you to talk about engineering with preschoolers, and if you've been with us this season, you know that we are at the “E” in STEAM, so we covered science and technology already with our infants and toddlers and preschoolers. Now we're talking about the “E,” which is engineering, and then our last episode with infants and toddlers and preschoolers will be focused on that.

And we've been using every episode to also include ways that the arts support STEM thinking, so that's how we've gotten the A kind of built into every episode. If you've missed the science and technology episodes, you can find them in the "Teacher Time" community on MyPeers, and then we're also working to get those up on the ECLKC.

Treshawn: Thanks, Judi. So, our "Teacher Time" advisor, Gail Joseph, from the University of on Washington helped us identify some strategies for supporting STEAM thinking with preschoolers, and she gave us some suggestions for today's episode about books that we can use to support engineering thinking and learning, and so, Judi took another trip to her local library, and later in this episode, we'll share with you what she's found. We want you to leave this episode with some helpful resources and some strategies that you can use in your programs right away, so be sure to stay tuned. Also, for today's episode, as usual, we have Jan Greenberg, who'll be our Q&A facilitator. Hey, Jan.

Jan Greenberg: Hi, Treshawn. Hi, Judi. And hi to everyone with us on today's "Teacher Time" episode. I'll be behind the scenes answering the questions you post through the purple Q&A widget about helping preschoolers explore and learn engineering concepts and skills. I look forward to chatting with you.

Treshawn: Thanks, Jan. OK, so now for today's topic, the “E” in STEAM, which is engineering, so engineering helps us understand how and why things work, and so, when children design and build and problem-solve and test out their constructions, they're involved in engineering, and when children use materials in new ways, well, not only is that creative, but it's engineering, too. So, what does engineering look like with preschoolers?

Here is a child building with plastic straws, and she's focused on this task alone, fitting the little straws together at the joints in order to build her tower. And here is a group of children constructing a train set. Children are working together to design and build this track, and this requires planning and testing things out and adjusting the design parts so that the parts of the tracks meet up where they're supposed to. All of this is engineering.

And finally, here is a common scene that we see oftentimes in preschool settings: a child building with wooden blocks. And part of what we'll talk about today is, what is your role in supporting children's engineering thinking? Well, this teacher is providing just the right amount of support by asking questions about the child's plan and what she's learning about how the shapes fit together and using engineering vocabulary as she describes what the child is doing and supporting the child in persisting and to continue trying even if it gets frustrating.

Judi: That's right, Treshawn. All of these children are using their creative thinking, their design thinking, problem-solving, figuring out how things work and maybe even dealing with some frustration but persisting through it, and those are all skills that we hope to support very young children in developing as they explore engineering materials.

So, how do we know what children should know and be able to do? Well, we start with the Early Learning Outcomes Framework, or the ELOF as we like to call it. The ELOF helps teachers and family child care providers understand children's development in all learning domains and helps you know what children should know and be able to do by the time they're finishing preschool and heading off toward kindergarten.

When we give children opportunities to design and build and create and problem-solve, we support their growth and development in all of the ELOF domains. Today we're going to focus specifically on the domains of approaches to learning. Remember we've already talked about persistence and creativity. You'll find that there. Cognition, which is really that spatial thinking, the mathematical thinking and where all of that building structures and problem-solving comes from. And then finally perceptual, motor, and physical development. In all of those images you just saw, children were using all of those skills, developing all of those skills, just by engaging with engineering concepts and materials.

Treshawn: That's right, so let's dive into how the ELOF is connected to engineering. So, when children build, they have to plan ahead, and they have to keep persisting even if their ideas don't work the first try and use creativity to design and build something that works. Well, that's approaches to learning, and when children describe what they're thinking and change up their plans a little based on what they've learned, well, that's cognition, and when children snap together LEGOs or wrap tape around two paper-towel tubes to make binoculars, they're using and developing perception and fine motor skills.

So, as we talk today about engineering in this episode, think about how supporting children's engineering thinking supports their development and learning in these ELOF domains. So, let's start with a frame that will hopefully help you think more systematically about how you support children you work with in approaching engineering concepts and design. So, engineers regularly use a system called engineering design process, or EDP.

It can be very complex for complex engineering tasks, but researchers have developed a simplified version for preschoolers that I think you'll find helpful. You've probably observed different stages of this cycle that your preschool children are using already because they naturally use these different stages of the cycle in their daily work with the engineering materials that you have in your program. As a teacher or family child care provider, it's your role to support children in engaging in the cycle more systematically and intentionally.

So, let's think about how an engineer would approach a problem. First is finding the problem, identifying what the need is, why it's important and maybe even asking, "Has anyone else tried to solve this problem before?"

The second stage is fun: imagining and planning. This is where you could really have fun with children who just don't have any boundaries in what they think is possible. Brainstorm solutions. Maybe even sketch some plans. Your preschoolers can do that.

Third: create. So, take those plans and that imagination and try to build a model or a representation of what you're thinking and see if it'll solve the problem. And then finally, improving, so sometimes what you design and then try to build doesn't quite turn out the way that you expect it, so you might need to improve on that model, so you go back to the drawing board.

Think about what might improve the model that you design. Where does it work? Where does it not work? Where does it need improvement? And maybe redesign if necessary. This cycle keeps going, so maybe next time you're in the classroom with your children, observe how they engage in this cycle kind of naturally, you know, in a block area or maybe in the art area, and see if you can identify the stages of this engineering design process and think about ways that you can support children in identifying these phases and then thinking more systematically about how to use them to accomplish their goals.

Treshawn: Wow, Judi. It's pretty neat to think about this engineering design process with preschoolers. So, sophisticated those little ones are. So, as an example of this, say children want to build a city in the block area, and they have their blocks and people and animals and cars to use and paper on clipboards with pencils and markers available for them to use, as well. Well, in this scenario, there's more of a need than a problem, so what do children need in order to complete their city?

Well, when children begin to imagine and plan, they may use drawings to capture their ideas, or they may use images from books or magazines as well for inspiration. Once they have a plan in place, they begin creating the city, and as often the case with preschoolers, the creation doesn't always go as planned, but that's OK because maybe after their city is done and then the children begin to play with it, they notice they forgot to add a pet store to buy some pet food, and they can't quite drive their cars through all the streets because they're too narrow, so children revise and improve their plans and maybe add a pet store and maybe widen the streets a little bit, and throughout this process, the teacher provides support by asking questions and offering feedback and providing support as the children need it, so today we're going to give you some strategies for supporting preschoolers in using this kind of design thinking each day.

Judi: Yes, strategies, we have strategies for you. So, if you've been with us this season, you know that we've highlighted just a few strategies that you can use to support children's STEAM thinking. The first one is providing engaging environments, so you know that means offering children lots of different materials that are varied and interesting to them and responsive to their needs. Second, making sure that you engage in nurturing and responsive interactions, so providing that safe space for children to explore and then building on what they're exploring

through your interaction. And then third, providing STEAM-related learning opportunities and experiences.

So, in our previous two episodes about science and technology, we took kind of a deeper dive into what those strategies involved. Today, we won't go quite as deep, but that's because we want to spend time showing you lots of videos of these strategies in action and then helping you think about how you can use these strategies to support engineering-design thinking with your children.

Treshawn: Thanks, Judi. So, let's talk first about this engaging environment. So, engaging environments are stimulating, and interesting, and encourage experimentation through the use of materials that are open-ended, varied and accessible to all children, and to support this engineering design process that we talked about earlier, you'll need to provide materials that allow children to use them in lots of different ways. That's called open-ended, and we like to say that, for open-ended materials, the materials don't tell the children what to do, but the children tell the materials what to do. So, you'll want to support children in thinking creatively about design and finding solutions to problems, so they'll need to work with materials that don't give them all the answers right up front.

Judi: That's right, and sometimes it's challenging as an adult to resist the urge to use the right materials or solve the problem for children, but try to resist that urge and allow them to just freely explore to find out what things do and maybe what they don't do. You can also get at this by providing a wide variety of materials so lots of different interesting things for children to design and build with. If you provide straws or tubes, provide lots of different kinds, really skinny, tiny ones or really fat, wide ones, different lengths and widths. They can do lots of different things with them.

Also, you can provide some familiar materials to children that will encourage them to explore, but unfamiliar materials are great too, things that will make children just kind of play around or tinker just to figure out how to use them. Finally, the last thing want to make sure in an engaging environment is that your materials are accessible to all of the children that you work with. We want to make sure that even children with special needs have access to these materials and can use them as independently as possible. So, if you need to, you might have to provide some adapted materials or adapted opportunities or learning spaces so that children can access and use the materials.

So, for example, you might have to provide a beanbag or cube chairs so that children who use wheelchairs can sit comfortably or at least close to the floor, or you might want to consider using Velcro on the table to hold down materials to make it easier for children to design and build if they have a motor delay.

Treshawn: These are all great points, and we hope you got some ideas about open-ended, varied and accessible materials. So, now we're going to watch a video of children working in an engaging environment. Listen as this teacher explains her use of open-ended, varied and accessible materials and how she built an engaging environment based on the children's interest. Let's watch.

[Video clip begins]

Woman No. 1: The topic we're doing right now is recycling, so the kids started bringing items in to recycle and to use in projects, so we had a collection of different types of material, but before that, we had builds up of different ... the areas in Sacramento like the Tower Bridge and Downtown Sacramento, so the children were building with blocks those different structures, and they were using the different color blocks to correlate with the building colors, so it started with that, and then it moved into them building in the art area different structures with the recycled material, and they've been doing that for, like, a week, just different buildings, and just it was just kind of evolved into that.

One of my main goals was the cause and effect because we're trying to figure out how to keep the walls up to keep them strong to keep them from falling, so that was my main goal, so they tried different things on how to keep it up. Some of them succeeded. Some of them fell. Well, I ask questions like, "How can we keep it up? What can we do to keep it up?" Some, like Jacob, said, "Can you hold these with your two fingers?" so he can get the tape around, so I guess they finally realized that it had to be held up to tape it around before it fell.

Boy No. 1: I think I have to hold it with two fingers.

Woman No. 1: Oh, do I have to hold it with two fingers?

Boy No. 1: Yeah.

Girl No. 1: I got one right here.

Boy No. 1: And it has to put it on here so it'll stay, so it won't tip.

Woman No. 1: About a week ago when we were building, they started talking about the three little pigs' house and how it fell over because one of their structures fell over, so that's when I brought the story, and we've been reading "The Three Little Pigs" and talking about why their house fell over and why the brick house did not fall over. What could the first little pig and the second little pig have done differently with their house, when they built their house?

Boy No. 2: It wasn't strong enough.

Woman No. 1: So, what could they have done to make it stronger?

Boy No. 2: Bricks!

[End video clip]

Treshawn: That was such a great video of children constructing buildings using open-ended materials. The teacher used cardboard boxes and tubes and color tape and blocks for the children to design and build with, and the children even brought in items from their homes and constructed buildings like the ones found in their neighborhoods. This really brings in children's backgrounds and cultures into the learning environment.

And did you notice all the materials were on low tables, and the pictures of the buildings were hung at the children's eye level, all for accessibility? So, now in box one of your viewer's guide, write down some of your favorite open-ended engineering materials. Then think about the variety of materials that you have. Do you have different sizes and shape materials, and do you have materials that support children's home cultures and languages? Also, write down some

areas in your learning environment where you'd like to add some varied materials that represent the children in your group.

Finally, how accessible are the materials in your learning environments? Are you doing well? Is there areas that you want to improve? Go ahead, take a minute, and let's write down your ideas.

Judi: OK. Welcome back. I hope you had the chance to jot down a couple of your favorite engineering materials that are open-ended and varied. Now is your chance to share your great ideas with your colleagues who are viewing this episode with you.

So, look at the bottom of your screen and open up that orange ideas widget, and in there, you're going to have the chance to share with us and with your colleagues what your favorite open-ended engineering materials are that you like to use with the children that you work with. You'll see in the ideas widget that you can give thumbs-up to other colleagues who are responding. You can even respond to what they say with your own comment.

So, go ahead and share, and hopefully you'll get some new ideas about resources that you can include so that your children can continue to explore engineering concepts each day.

Treshawn: All right. So, the second strategy you can use to support engineering thinking is to provide nurturing, responsive and effective interactions throughout each day, both indoors and outdoors and during routines and activities. So, nurturing means showing interest in and supporting children's curiosity while responsive means using that back-and-forth conversation in response to children's questions and ideas, and you know they have lots of them. Finally, interactions are effective when they support children's development and learning across all of the ELOF domains. So, we're going to watch another video of a teacher and a preschooler engaged in building a project. As you watch, look for the ways in which this teacher engages in nurturing, responsive and effective interactions. Go ahead. Let's watch.

[Video clip begins]

Woman No. 2: Oh.

Ooh. Hayden: Lay it down.

Woman No. 2: You want to lay it down? OK. We're going to lay it down.

Woman No. 3: Oh, my goodness, Justice. You're doing a great job sorting your goldfish.

Woman No. 2: You need another heavy block?

Hayden: [Speaks indistinctly]

Woman No. 2: Just like that piece. All right. Here we go.

Woman No. 3: You're welcome.

Woman No. 2: There it is. Now where we going to put it, right beside it? Ta-da.

Hayden: The same.

Woman No. 2: It is the same, isn't it? They're both long blocks. They are exactly the same. You're absolutely right, Hayden. Now what else do we need?

Hayden: And now let's get little piece of wood.

Woman No. 2: Let's get a little piece? OK. Let's see. Ooh, let's sit up, try and hold our head up a little bit. All right. Do we want one of these pieces ...

Woman No. 2: Which one? There's little squares ... OK. [End video clip]

Judi: I like that video. I saw some nurturing and responsive and effective interactions just in that short little clip, and I hope you did, too. So, in terms of nurturing, she really showed that she was interested in what he was building, and she was right there on the floor with him to show that she was there to support his goals and helping him build the structure that he had envisioned.

Responsive: You see her helping him to choose the blocks that he wants to use to build. She gives him choices. She helps him to get the block that he's looking for. And then in terms of effectiveness, she was supporting his learning and development in the ELOF domains. You'll notice that she was helping to support his physical and gross motor skills in picking up and moving the blocks as he was able, and then also she was supporting his cognitive growth by using terminology to compare and contrast the blocks, so she was using words like, "They're the same length." She said, "Which block do you want? Do you want a smaller block or a larger block?" So, all of those interactions are effective because they're going to support his cognitive development.

Treshawn: Yeah, I just love how nurturing and responsive this teacher is with the child. I mean, she just follows his lead and asks questions to support his curiosity. It's just a great video to watch. So, along with this, there's a few additional strategies that you can use to support engineering thinking, and one is to use scaffolds, so we talked about scaffolds a few times in other episodes, but scaffold really means just offering just the right amount of support and structuring the environment and your interactions with children so that they can be successful at something they're not able to do on their own just yet but also giving them that freedom to explore and figure things out on their own. It's important to first watch and listen. That's how you scaffold effectively because you want to see what children are able to do on their own because research shows that when we allow time for children to explore on their own, this really promotes their curiosity and keeps them engaged even longer than when adults just give directions.

Judi: The second strategy to use when interacting with young children is to speak the language of engineering, so you don't have to be an engineer to do this. You can use words like you'll see here in these images. Take a minute and look at what these teachers are saying to their children. It's not super complex language: structure, stacking, balancing, connecting.

Those are all words that are accessible to children and to us and are really appropriate for these circumstances, and we're giving them new ways to describe what they're doing and what they're thinking. If you work with dual language learners, if you share their home language, definitely have these interactions and conversations with them in their home language. It's a wonderful opportunity for them to learn complex words in their home language, but if you don't share the home language, there are other opportunities for you to engage with them around this kind of thinking. Maybe consider learning to say or ask a few questions in their

home language, for example, "What do you think will happen next?" or, "Tell me about what you made," so even if you can't always understand their response, you're giving them the opportunity to share with you what they're thinking. You can have them share with a peer who speaks the same language, or you could even take a video to use and translate later to understand what they're thinking.

Children can even draw their ideas on paper. That doesn't require language. Or if you have children who need to, they can express their ideas and thoughts through using sign language to communicate. Now research shows that the types of interactions we have with children are important. The way that we respond to their questions has meaning. So, there's some research that shows that children who are 4 and 5 years old will learn more about a concept when they get a complex explanation rather than a simple one. The complex explanation has a term. It's called mechanistic language, and so, this means that you're describing how something works, not just what it does; so, a simple example is here, so this child wants to know what the battery does for the CD player.

The simple explanation is, "Oh, it makes the CD player work." A mechanistic response would be something to say, "This battery gives the CD power, and when the batteries are connected to these buttons, the CD player works because it has power." Can you hear the difference between those two different explanations? I want to challenge you to think the next time you're working with young children and providing an explanation. Think about how you can shift toward more mechanistic responses and see what kind of a difference it makes in your interactions with your children.

Treshawn: I can definitely hear the difference between those two sentences, and I have a new word to add to my vocabulary: mechanistic language. That's pretty awesome. So, finally we want to encourage children to use the engineering design process, so take the time to listen to children's conversations as they work and wonder with children and ask for their ideas. They really have some great ones. Also, help them brainstorm as they plan what they want to build and think what materials they may need. Try things together. Be curious and explore together. This is your time to take off your teacher hat and put on your explorer hat.

Judi: You're so right, Treshawn. Getting down with the children and exploring along with them is so important, and I would argue that maybe teaching and exploring hats are one and the same. That's what we need to support children's thinking and learning is to really come alongside them and explore and learn together. So, let's watch a video of a teacher doing just that. She's working with preschoolers as they're engaging in an engineering experience. Pay close attention to the way that she's scaffolding, that she's supporting inquiry skills and how she's speaking engineering and encouraging the children to speak engineering, and look out for those stages of the engineering design process.

[Video clip begins]

Woman No. 4: Why do you think right here there's three, and it's holding it, and this one... This one is far.

Girl No. 3: Because that one is like that.

Girl No. 2: I think it's like that, too.

Woman No. 4: Oh, so you're saying because this is what's helping it stay still and balanced, and this one...

Girl No. 2: I need more of ...

Woman No. 4: ... has four, and it has this one right on top to keep it balanced.

Girl No. 3: And it's in the middle!

Girl No. 2: I'll fix this one.

Girl No. 3: And it's inside the middle.

Woman No. 4: And it's inside the middle. Yeah, maybe the ones in the middle right here are really helping it to stay still. Oh, look it.

Girl No. 2: Another one here on the left.

Woman No. 4: See? Now I see you're putting one. Now I see you're putting two, three and four.

Girl No. 2: Yeah.

Woman No. 4: Do you think it matters if you put them all together or not? So, I can stay on top with the triangular prism.

Girl No. 2: Perfect. Our house is going to be great.

Woman No. 4: What do you think? You think together on any?

Girl No. 4: I don't want it!

Girl No. 2: Yeah, but ...

Woman No. 4: That will help it balance if the four of them are—next to each other?

Girl No. 2: Hey, I see one.

Woman No. 4: Yeah? That's a good—good investigation. Let's try. Let's see if it does help.

Girl No. 2: OK. Then where does this go?

[End video clip]

Treshawn: Such a great video. So, now we're going to give you another "Teacher Time" minute to write down in Box 2 of your viewer's guide your thoughts on the way this teacher supported the children's engineering skills. Go ahead. Take a minute.

Judi: Welcome back. So, what did you write down? What did you notice about this interaction that supported engineering thinking? Well, we definitely saw some scaffolding, right? So, she was helping the children think about how the structures were built or designed and how the design impacted whether or not the structures would stand up. She said, "Here there are three sticks holding this one up, and over here there are four sticks holding this one up." Did you see that as scaffolding? She was helping them just about where they needed to be helped but not overstepping what they could do on their own. She used engineering language like stacked, balance and investigation. She used some mechanistic language by describing how things

worked and not just what they did. And she encouraged the children to explain their engineering thinking.

She asked questions about their design decisions and helped them to explore and problem-solve. She asked, "Why do you think one tower is balancing better than the other, and do you think it matters if you put them all together?" She supported the use of the engineering design process by helping the children identify their problems, brainstorm solutions, create and make improvements. I hope that through this video and the videos that you've seen previously are helping you to start to think about how this engineering design process works and how you can support children in engineering in it on a daily basis.

Treshawn: The last step in supporting children's engineering thinking is to provide engineering-related experiences and learning opportunities. We know that reading books together can be a great opportunity to support children's learning, vocabulary and understanding of the world outside of the learning environment, and there are so many wonderful children's books that can be used to support young children in learning about engineering.

Judi: Yes, so our "Teacher Time" advisor, Gail Joseph, sent me a list of books that will help to support children's engineering design thinking, so I took a trip to my local library, and if you'll remember last time, all of the books that Gail recommended were not actually in my local library. Some of them were, but some of them I had to request through my interlibrary loan, so make sure to ask at your library if interlibrary loan is a possibility because that will allow you to access a whole range of books that maybe aren't available in your specific library.

Also, just a fair warning: You might need to turn the volume up a little bit. I was in a library, so I had to speak a little bit quietly. Use box three in your viewer's guide to take some notes, and you can find a list of all of the books that I mention in the green resources widget. OK. Let's take a look at what I found. OK. Hi, everyone. I'm back at my local library today, and I brought Gail's list of books with me, and I found a bunch of books that I'm excited to share with you. Remember before we get started when you're looking at your books to support STEAM thinking, you want to remember your LAB notes. So, the first thing is the "L." What your children going to be learning?

What concepts will they be learning? And in these books, it's all going to be engineering. The "A" is for advanced vocabulary. It's really important to go through your books before you read them with your kids to highlight places where there's some interesting and new vocabulary. There's going to be some new vocabulary for you in these books, as well. And then the "B" is for beyond the book, so remember to think about how you can take the concepts and idea that you explore in these books and use them beyond the book inside your classroom and outdoors.

OK, so let's get started. The first one we have, I love this book. It's called "The Little Red Fort," and if you know the story of the little red hen, you'll recognize the story line here. So, instead of making bread, this little girl is trying to make a fort, and none of the kids in her neighborhood want to help her; so even while she's measuring and planning and starting to build, they say, "You don't know how to build anything," but what they find out is, after all of this time of not helping her, she actually built a really great fort, and eventually the kids end up helping her as

well; so really uses design engineering here to help her to design and build her fort, and in the end, she built something fantastic along with her friends.

The second one I have for you is also a really fun book. This one is called "Gus's Garage." This is an imaginative story about this pig who is a little bit of a hoarder, and so, he has lots of junk hanging out in his garage, and one of his friends or a couple of his friends come along with a problem, and he uses his little bits and bobs to help his friends solve those problems. He says, "Let's see. I have some bits and bobs. They are just the job," and he fixes his friend's vehicle. So, he goes through and he uses all of his tools to come up with some really creative ways to solve problems. Once again, this is using tools and design engineering to solve problems and what a fun way to think of using some bits and bobs in your classroom maybe in the art area or in the block area to be creative and solve some problems.

OK. Another good thing always to have is to bring some books into your environment that are based on true stories. So, this book is called "Papa's Mechanical Fish," and it's about a scientist or an engineer who actually was very interested in creating a submarine, and what I love about this story is that he fails several times while he's trying to create this what he calls a mechanical fish; and so, what I love about it is that he says, "It almost worked," and he says that many, many times, and at the end of the story, what I also love is, it gives you a historical context. So, this story is fictional. It is based on this true event, Lodner Phillips, who he really did take his wife and children into Lake Michigan on a mechanical fish. This is a fun story to read and then a little historical context at the end.

Next, I have ... This is one of my favorites, "Rosie Revere, Engineer," and this is about a little girl who loves to build, but she gets discouraged and making something that maybe she shouldn't be building, but her aunt comes along who used to build airplanes and encourages her to try. And again, what I love in this one is that she fails. Her first attempt flops, and she feels like she fails at it, and then her aunt tells her, "This is OK. Like, failing is part of the process," and so, she said, "You actually did do a great job. Even though it seems like a failure, you did a great job, and let's try again;" so, even though she wants to give up, she persists, and again, in this book, there's lots of really fun vocabulary. It's a rhyming book, which is fun to read, and in the end, they work together to build a flying object.

And then, last this is a very simple book, but it's one of my favorites. This is a great way of connecting the arts with engineering called "When I Build With Blocks," and it's just a very imaginative book, very colorful pictures, and again, it's a rhyming book, which is a lot of fun to read, and it just shows all of the different ways that this little boy can be creative in the block area with his friends using his imagination and his artistic thinking to use blocks in lots of different ways. It's just a really fun book to read, really imaginative, and if you think about going beyond the book, how much fun can you have in the block area after reading this book? Well, those are just a couple of ideas. Take these ideas, but then also go to your local library. See if you have some books that will encourage your children to think like engineers.

Treshawn: Wow, those were such great suggestions. I mean, I love books, and I love books even more when they come from the library because what better way to pull the community into your learning environment? I hope you guys got some inspiration for using books in your program to support engineering thinking for the preschoolers you work with. I know I sure did.

So, finally today we're going to talk about the arts and engineering. The arts engage children's senses and offer opportunities for creativity, reasoning and problem-solving. The arts and engineering are so closely tied together, especially when you're thinking about designing and building. You can also explore sound engineering by helping children design and build maybe music instruments that create different sounds.

Judi: Wait a minute, Treshawn. Sound engineering? That's a new term that some of us might need to look up, but thanks for sharing that idea about using or designing instruments to make specific sounds. It's a type of engineering. I love that. OK, so let's take one last minute to watch a video of a teacher supporting a child in using design-engineering thinking. She is supporting a preschooler in building a car by using a picture of a car as a guide. Now, remember I found at the library the book "The Little Red Fort." In that book, the girl uses blueprints to guide her building of the little fort. This is a great example here of taking that engineering concept beyond the book. So, let's watch as this teacher supports the child as she's engineering her version of the car.

[Video clip begins]

Woman No. 5: OK. So, you said you have the door.

Girl No. 5: Yes.

Woman No. 5: And you said you have the curved part of the car right there. What else do you need for your car?

Girl No. 5: Forgot the seat.

Woman No. 5: Oh, no. What can we use for the seat?

Girl No. 5: A square just like this.

Woman No. 5: Another square just like that seat. OK.

Girl No. 5: It fits.

Woman No. 5: It's looking just like a car. What else do we need?

Girl No. 5: I know. We forgot the whole engine.

Woman No. 5: The engine, that's what makes our car go. That's an important part to have.

Girl No. 5: We did it!

Woman No. 5: We did it! It looks just like the picture. You followed the directions, and you made the car. [End video clip]

Treshawn: See what I mean? This is a great example of design and the arts working together. As you think about your learning environments, think about how you might connect the arts and engineering. What are some ways you might be able to add materials or different learning opportunities in order to use that engineering design process in your music, art and dramatic-play experiences? Use box four of your viewer's guide to write down the ways you'd like to connect the arts and engineering in your learning environments.

Judi: I love ending on a note that has to do with connecting the arts and engineering. It's just a fun way to think about really emphasizing engineering design skills but also using children's natural interests in the arts. So, we've covered a lot today. Thank you for hanging with us. Let's just revisit those three main strategies that we've talked about today. First, you want to create those engaging, interactive and accessible learning environments so children have lots of opportunities to explore and tinker and play with interesting materials. Second, sit along beside them just like we saw so many teachers doing today and engage in that process with them. Offer some nurturing support.

Let them know that you're interested in what they're thinking and then explore along with them. Finally, make sure that you focus those learning opportunities you provide on engineering concepts. Take a book. Read it. Explore the engineering concepts and then take those concepts beyond the book, and remember to take the vocabulary with you as well. So, let's think as we move forward about ways that we can use the things, the strategies that you've learned today on a daily basis with the children that you work with. When you do this, you'll be supporting children's development in all of the ELOF domains, and you'll build a foundation for a lifetime of engineering design and learning.

So, thank you so much for joining us today. Before we go, we want to leave you with a couple of really helpful resources that will support you in engaging in design engineering with your children on a daily basis.

Treshawn: OK, so on the ECLKC, there's a resource page that we like to highlight. It's called "Promoting Adult-Child Interactions That Support Higher-Order Thinking and Learning." On this page, you're going to find lots of videos from our STEAM series as well as links to resources that will support you in exploring STEAM concepts with the children you work with each day.

Judi: And don't forget about MyPeers. If you haven't joined already, you can via the ECLKC. MyPeers is available to you at all times if you want to extend your learning and talk with others about your work. It's a virtual and formal social community where you can exchange ideas and share resources and support the early-childhood community. You'll also find us there in the "Teacher Time" community. We love to be in there and share other videos and other strategies related to supporting STEAM thinking. Right now, there are 58 open communities on MyPeers with over 10,000 members, so in addition to the "Teacher Time" community, you might find some other interesting communities that you want to join and participate in. We've created a handout for you in the green resources widget that highlights some of the relevant communities that you might want to join.

Treshawn: Next, there are some resources that you can use right on your mobile device. So, first there is Text4Teachers, and that program sends you two free text messages per month with information and tips and research and resources to strengthen and support your teaching practices. Next, is the ELOF2GO app, and this app helps you learn more about the ELOF, and it gives you on-the-go access to the ELOF goals for children and provides you with effective teaching practices to support children's growth and development.

Lastly, is our Ready DLL app, and if you work with children who are dual language learners, in this app, you can access resources and learn key words and phrases and discover implementation strategies all from your smartphone.

Judi: Thanks, Treshawn. It was so much fun exploring engineering-design thinking with you today, and we hope all of you who are watching really are walking away with some useful strategies that you can use right away to support engineering-design thinking with the children that you work with.

Our next "Teacher Time" episode is going to be focused on supporting infants and toddlers and their mathematical thinking, and then definitely mark your calendars for May where we'll be back to talk to you about supporting preschoolers and their mathematical thinking, so thank you once again for being with us today, and we'll see you next time.