[Music]

Georgey Sparks: Welcome to the fifth webcast in our six-part series on mathematics and the young child. I'm Georgey Sparks, a tribal education specialist at the Office of Head Start and a proud member of the Rosebud Sioux tribe. Thank you for joining us for today's discussion about patterns. Hopefully, you have seen the first four webcasts in this series on early mathematics. If not, you can watch each one at any time by simply visiting the Early Childhood Learning and Knowledge center, also known as the ECLKC website.

If you have joined us before, you know this webcast is divided into three parts. Just as in previous webcasts, during the final part you will be given the opportunity to ask questions. There are two ways to do this. Throughout the webcast, you may type a question into the "Ask a Question" form on the browser, or you can fax us your questions. Our fax number is also posted on your browser. We strongly encourage you to email or fax us your question about today's content.

You can also download a copy of our viewer's guide by clicking "Download Worksheet" located at the lower portion of the screen. After each webcast, we provide a list of resources for further study, and we invite your feedback on this series. As you may remember, we only have one more webcast in this series, when we will put it all together! However, today's webcast is our last math content topic. Appropriately, the topic of patterns is the most integrated of all.

In fact, we could talk about patterns in number and operations -- our second webcast topic -- or patterns in geometry -- our third webcast topic -- or patterns in measurement -- our fourth webcast topic. In addition, patterns are integrated in other domains as well.

While this presentation is primarily on patterns as demonstrated in mathematics curriculum and experiences, you will see that child outcomes in physical health, science, literacy, language and creative arts involve patterns. To begin our mathematics discussion, please let me introduce our mathematics expert, Juanita Copley. Nita?

Dr. Juanita Copley: Thanks, Georgey. Let's begin by watching a video clip from Head Start's "Creative Adventure" which you may have already seen. I bet after you see it, you're going to know why I selected this clip to introduce the topic of pattern.

[Video] Narrator: The children see all kinds of dances going on and it's important to our culture. And they just love it. [Singing and drumming] Unknown Male: Times like this it brings out a whole personality out of a child other than being in a classroom.

Dr. Copley: Georgey, I bet you can see why I am delighted to have you be part of this webcast. I've always been fascinated by the patterns that there are in the American Indian culture. Could you talk a little bit about that for us?

Georgey: Sure. Pattern or design is not just a mathematical principle, it is not just art or dance. It is actually part of our identity. Because of particular patterns or designs, one can tell where a person comes from, which particular tribe or which particular part of the country one person is from or can actually tell you who that person is. Let me give you an example of that. My daughter's vest here actually identifies who she is.

In this vest is her name. Her name is Flower Woman, so here is a rose. We are from the Rosebud Sioux tribe, so here are the rosebuds. And she loves butterflies, and along the border of this vest is a symbol or something that demonstrates that we're from the Black Hills of South Dakota. So that's the border design on this vest. And this identifies who my daughter is.

Dr. Copley: Really is. Oh, I love the patterns. I see some symmetrical patterns here, actually radial if I look here at patterns everywhere. And here these are like growing patterns and repeating patterns and yet they talk about identity. It's a beautiful vest, just beautiful. I would love to show you some other ones that I found. You can also see some examples of this type of patternwork in a vest that were created by the Cree Indians of northeastern Canada.

The symmetry in this design contains repeated patterns in color as well as design. And these pots are examples of Akamah pottery. The designs are illustrations of repeating patterns in many different sizes. Georgey, do you have some other things to share with us about art and patterns?

Georgey: Sure, yes. Let me show you this piece of pottery and again my daughter loves butterflies. So I thought I would bring this and share it with everybody. This particular piece of pottery comes from North Carolina.

Dr. Copley: Beautiful. Beautiful. The butterflies in the vest that I saw that you had. I'm amazed by how much time that takes to put together. And I'm also very interested in the generation-to-generation types of patterns. Do you have any examples of that?

Georgey: Yes, I do. I'm glad you asked. This particular design is a Sioux star. So this particular design is noted among the Sioux women in South Dakota. A lot of women make blankets, and we adorn this particular pattern on many our outfits. And in this particular...this is a purse but we used this design for many, many things.

Dr. Copley: It's a beautiful pattern. I noticed that probably our audience has, too, that we had a quilt pattern up that maybe they can see. It's the very same pattern, I think, but just different colors. Do the colors have any special meaning?

Georgey: Yes, they do. In our creation story, we talk about how the four winds were created. Part of our creation story is that we do everything in the first direction. For the Lakota people, the Sioux people, the first direction is the west, so the first color is black. That always represents the direction west. The next color or direction is the north.

And white is always attached to the color north. And the next direction is the east. And the color associated with the east is yellow. And then the final fourth wind direction is the south. And red is associated with that direction.

Dr. Copley: Just beautiful. I have to admit I see it as a mathematical pattern. Many times we work with patterns with children where we take the pattern, it's the same pattern, but it's just different colors. You've done that by the star pattern on the quilt. Beautiful. Just beautiful. One more pattern I'd like to talk about. I noticed in the tape the drum beat, the strong rhythmic patterns. Can you talk a little bit about that from your culture?

Georgey: Yes. Among all tribes there are -- something similar and that's the singing and drumming and dancing. So that children learn how to dance as soon as they can walk. They're brought into the dance circle ceremoniously so that they are brought in, and dancing is not just dancing. It's part of being

physical. But it's also part of who we are. And many of our tribes, dancing is part of the religious or spiritual aspects of tribal members.

Dr. Copley: Wonderful. Georgey, thank you so much for adding so much meaning to our discussion today. Now we're going to go and get started on the mathematics part. Georgey's told us how patterns can have so much more meaning than just the basic math concept. I very much appreciate her setting the stage for our topic: patterns. Now, let's change our focus from this broad perspective to a mathematical one. Most early childhood teachers list pattern as an important mathematics topic, but how is a pattern defined?

The most common definition for pattern is a "regular, predictable arrangement of objects, colors, numbers, textures, movements, rhythms, pitches, events, shapes, and even more." Please notice two important words -- "regular", meaning that the arrangement occurs in the same way -- either in a repeating fashion or in a growing manner, and "predictable", meaning that after the pattern is established, the next set of objects, numbers, shapes, or whatever can be predicted.

In this picture young Lydia appears to be building a color pattern that could be called regular and predictable. She is following a purple-purple-green arrangement and the next one in the pattern could be predicted. Young children often seem to like patterned arrangements. Tommy carefully alternated colors and when he ran out of blue, he quickly searched for more. Olivia worked hard on her patterned necklace and was delighted when she could wear the finished project.

Let's look at the two types of patterns that are important for young children to know: repeating patterns and growing patterns. By definition both types are regular and predictable. Look at the example of the repeating pattern shown. The circle-square-square arrangement is repeated in the same way over and over again, so it is regular. And the next shape in the pattern would probably be a square, based on the pattern already shown, so it would be predictable. Growing patterns are also regular and predictable.

Look at the example of the growing pattern. The circle shape is repeated at the beginning of each arrangement, or unit, one circle for each new arrangement. The number of squares grows each time by one. In fact, this could be called a "plus one" pattern. In other words, the circle plus one square arrangement is regular because it grows in the same way for each new arrangement.

It is also predictable because if you analyze the pattern, you could predict the next shape that would be a circle and the beginning of a new unit or arrangement. Before we can discuss the question, "What do young children need to understand about patterns?", we need to first list reasons why they should be part of a young child's experiences. First, patterns are a natural part of the young child's environment. In the child's world, day or light occurs and then night and dark follows.

That sequence is repeated every 24 hours and it is one that is easily recognizable. A young child's puppy plays and sleeps on schedule, children use patterned verses when they jump rope or play a game, and flowers or butterflies are adorned with colorful patterns. In addition, patterns should be a normal part of a child's environment.

As early childhood teachers and parents, we know how important it is to have consistent, planned routines and that children learn best when their environment is predictable. As you can see, patterns serve a very important function for children and for all of us. They are a vehicle for organizing information and for keeping track of and remembering events. Second, the study of patterns is foundational to algebra. Now think back to your study of algebra when you were in middle or high school.

You may remember algebra as a study of symbols, x's and y's, or word problems when you were asked to predict when two trains would meet at a particular station, or you might remember solving or not solving the quadratic equation. The study of algebra is much more than all of those ideas. It is based on a foundation of systematic experience with patterns, the idea of a function, and the generalizations that can occur when patterns are understood and represented symbolically with algebraic expressions.

While we are certainly not going to discuss all of these ideas in this webcast, you should know how important the study of patterns is to a young child's cognitive and mathematical development. To emphasize that last point, let's look again at the graph published by NCTM that shows areas of emphases. Look at the orange section that represents algebra. It is actually quite small at the prekindergarten level and then it enlarges to become the biggest area of all at the high school level.

Yes, at the prekindergarten level, pattern is studied as a precursor to the study of algebra and represents a smaller area of emphasis. However, if you view algebra, or pattern, as a strand in the curriculum from prekindergarten on, early childhood teachers can help build a solid foundation of experiences for understanding more sophisticated work in algebra later. Finally, a third reason to study patterns is that the topic itself integrates all curricular areas.

Georgey illustrated this so well when she brought in all of the cultural artifacts that she showed us. Young children do not view learning as separate discrete topics like literacy, math, or science. And in fact, learning does not occur as disconnected segments. Do you remember the diagram I showed in the first webcast? Children make connections between ideas in a web or net of ideas. The more we can connect concepts using a variety of methods and domains, the better chance we have for children to learn and make important connections.

The concept of pattern can be integrated into almost all curricular areas, thus providing an opportunity for learning. Well, now that we know the definition of patterns and the reasons why we would teach this topic, let's return to the same outline that we have used in each webcast. Part one will answer the "what" question. That is, what do children need to know to understand patterns? Part two will answer the "how" question, that is, how do children learn patterns?

And, finally, part three will answer your questions during "what else?" What do children need to know to understand patterns? There is a series of skills that are required for anyone, the prekindergarten child or the young adult, if patterns are to be completely understood. Each of these skills are important components of a child's cognitive development and when employed, children are beginning to think algebraically. Please do not think that a young child can do all of these easily or without a multitude of experiences.

Also, please know that the development of these skills just begins at the prekindergarten level. Naturally, the ability of children to identify, replicate, complete and predict the next unit in the pattern is dependent on their prior experiences, with patterns as well as the type of pattern they are using. Given many experiences, many young children could identify a blue-red color repeating pattern, like you see in this slide. They also then could replicate it with a different purple-yellow color pattern.

Also, please note that the word "replicate" could be a direct copy or a duplication of a pattern. However, in this list, it means more than that. It requires the child to abstract the pattern and use different colors or shapes or objects; in other words, replicating the pattern but not with objects with identical attributes. Completion means to find the missing or covered piece or pieces as shown in this picture of a pattern. Predict means to use a good guess, or thinking, to decide what would happen next in the pattern.

The child might say if it was a red, then a blue one comes next. If it was a blue, than a red one comes next. "Extend" means to make the pattern go on longer by telling or showing what would happen in the pattern. A four-year-old showed and described it this way, "You just go red, blue, red, blue, red, blue, red, blue, forever and ever." "Describing" is simply talking about the pattern in your own words.

For example, the child said, "It keeps taking turns going blue, red, blue, red." Finally, the action of representing can be done using a variety of symbols. A possible representation might use the initial letters of the color words, "b" for blue and "r" for red. To further define these processes, I have chosen to illustrate them using six different examples of pattern experiences. Five that you will see are appropriate for young children, and then there is one especially for you.

Then, after we have seen each example, we will discuss how and if the skills were developed. As you view each example, please keep in mind that there are many different types of patterns. This list represents some of the most common ones -- color patterns, shape patterns, number patterns, patterns in operations, texture patterns, movement patterns, rhythmic patterns, patterns in pitch, patterns in game strategies, and even patterns in events.

As we have already stated, environments for young children should contain many patterns in the form of planned, organized routines. For our first pattern example, I want you to listen to some teachers discuss the use of patterns and routines in their classes. Pay particular attention to how patterns are represented so that children will be able to predict the next events in their day.

[Video begins] Teacher: Here is my schedule right here. Actually the whole day is about patterns, it's about routines. Every section. And it really helps for the kids to understand especially the beginning of the year when, for most of them, it's the first time coming up with poems. So, I have a helper -- he or she is the one who puts the clip where we are so they can tell where we are and how much longer you have to go until they go home.

Now since we are in the middle of the year, they get really excited about the lab workstations. And they know that after workstations they go to centers. I have another chart where they go and pick three centers each day, and they move it. So, it helps with my classroom management and helps with discipline because they can anticipate what to expect. And even within each subject area there is routine.

For example, during awareness we start out with our songs. We start out with singing the ABC songs and sounds. We out little game with the ABC chart. On their own they have their folders and they follow the song. And then we do--I do questions every day.

Dr. Copley: Okay, so it's really the same routine every day. I noticed, too, you've got pictures. And what are the pictures? Teacher: The pictures are actually -- I change it every year. This year it's the kids that are here so they can relate since they don't know -- they cannot read, they can look at the pictures, and they know, like the example here, the three centers, and then they know -- they can just by looking here.

Dr. Copley: So these are pictures of the actual kids that are here? Teacher: Right. And that helps their self-esteem, too because they love to come and look at themselves. Teacher 2: The one that really surprised me was this little girl that came to the front. She just looked and stood there for a little while quietly. Then she just -- she didn't tell me what her pattern was. She just started calling the names of the students.

And I said "I need, being the teacher, I was looking up and down, you know, what is the pattern?" What is she doing? So I asked her, "What is your pattern? "She says, "I'm doing my pattern by the first name letter." So she had the students -- she was using the J's and the A's because that's what I had the most. That's what most of my students' first names start with.

Dr. Copley: How would they have known that was the name you have the most? I bet you have it somewhere on a word wall... Teacher 2: Yes. I have it on a word wall. It's facing the students as they sit on the rug. But, I mean to... Dr. Copley: Wow.

Teacher:...think to go to from the concrete to the abstract -- for her to be thinking this, even I couldn't figure it out. I was looking for something that they had in common.

Dr. Copley: Wonderful. So this idea of patterns starting from a schedule which you have in your room, and I think all of you do, starting from a schedule and routines that each of the centers, the different routine and then going to the calendar. And then what you did is took that idea of the, pattern even further, and by having them do some of those. Pretty neat connections.

Teacher 3: Part of my routine is every day when the kids come in, to get their journals and write -- until breakfast is served, it's maybe about 10 or 15 minutes. It's not a really long time. But they sit, and still for a lot of them their writing is an actual drawing.

But most of my kids have moved from what some people call "chicken scratch" or just random marks all over the page to actual letters, and some are writing their own names, their friends' names. High frequency words like "mine", "mom", "me". Some are trained to write "dad". I noticed today that one kid had written my name, and nobody had told her how to write it. It's on the word wall, it's in other places just like the kids' names are.

But at this point in the year I noticed today, and Dr. Copely noticed it as well, some of the kids were writing numbers in their journals, so they've come from basically nothing to drawing pictures to actually writing words and letters. Whenever they come in in the morning, some kids still don't want to go get their journals but they know that they should do it, and so it cuts down wandering around the room it cuts down on some of the early morning hassle that goes on with kids.

Dr. Copley: And I also noticed today, I think I asked you about it. I saw somebody had a date on their -- they were trying to make a date. I thought that was interesting in their journal.

Teacher 3: A couple of days ago we talked about how instead of writing the name of the month, we could put a number for it. Instead of writing out the entire year 2008, we could just put an eight. So we talked about it maybe two or three minutes and that's it, no more attention to it. We talked about it yesterday for about the same amount of time and already I have a student who is doing it in his journal.

Dr. Copley: So these routines -- what I love about it, they're helping them look at patterns in everything that they do. And then, of course, I love the transference to math, and as you know, we have done lots of those kinds of things. Anything else you want to mention that you thought of?

Teacher: This is a very hard pattern to follow because it has so many parts to it. We started in the beginning to do a routine but when we were going toward the end of the year, I go back and say, "Look, this is a pattern." And you can see in their face that they're making the connection. It is a pattern because we do the same thing every day. It starts over.

Dr. Copley: It repeats. Teacher: It repeats, always the same, and even if we don't mention that it's a pattern and coming back to the end of the year and seeing that we've been doing patterns all along without you knowing -- that connection.

Dr. Copley: I hope you heard all the language connections to the routine of journal writing, pattern reading, and schedule lists. Well just as classroom routines are patterns in early childhood classrooms, repetitive songs and rhythmic chants, and predictive poems are frequent curricular activities.

In this second pattern example, I want you to observe a wide variety of patterns, songs and verses. Please pay particular attention to the growing movement patterns, the repeating verses that children can easily memorize and the various representations that you will see.

[Video begins]Dr. Copley: Timbuktu... Children: from Timbuktu... Dr. Copley: and brought me back... Children: and brought me back... Dr. Copley: a tapping shoe.

Children: A tapping shoe. Dr. Copley: My aunt came back... Children: My aunt came back... Dr. Copley: from the county fair... Children: from the county fair...

Dr. Copley: Watch me. See if you can do it... and brought me back... Children: and brought me back... Dr. Copley: a rocking chair. Children: a rocking chair.

Dr. Copley: My aunt came back... Children: My aunt came back... Dr. Copley: from old Belgium... Children: from old Belgium...

Dr. Copley: and brought me back... Children: and brought me back... Dr. Copley: some bubble gum. Children: some bubble gum.

Dr. Copley: My aunt came back... Children: My aunt came back... Dr. Copley: from the old Chili... Children: from the old Chili...

Dr. Copley: and brought me back... come on! Children: and brought me back... Dr. Copley: an itchy flea. Children: an itchy flea.

Dr. Copley: My aunt came back... Children: My aunt came back... Dr. Copley: from the county zoo... Children: from the county zoo...

Dr. Copley: and brought me back... Children: and brought me back... Dr. Copley: some nuts like you. Children: some nuts like you.

Dr. Copley: Have a seat. The third thing was the -- Children: Shoe! Dr. Copley: shoe... Child: Tapping shoe.

Dr. Copley: There's a tapping shoe. Very good. And the next thing was the... Children: Rocking chair! Dr. Copley: Rocking chair. But, we still did all those other things too --- Child: Bubble gum!

Dr. Copley: Bubble gum, and then that famous one --- Children: itchy flea! Dr. Copley: Itchy flea!

Children: Girl, girl, how are you? Who's that sitting next to you? Boy, boy, how are you? Who's that sitting next to you? Boy, boy, how are you? Who's that sitting next to you? Girl, girl, how are you? Who's that sitting next to you? Boy, boy, how are you? Who's that sitting next to you? Boy, boy, how are you? Who's that sitting next to you? Boy, boy, how are you? Who's that sitting next to you? Dr. Copley: Oh, it's so good. Very nice. [Clapping] Very nice!

Children: We're going to make a pattern, we're going to make a pattern hi ho the cherry-o, we're going to make a pattern. We're going to make a pattern, we're going to make a pattern hi ho the cherry-o, we're going to make a pattern. We're going to make a pattern, we're going to make a pattern hi ho the cherry-o, we're going to make a pattern.

We're going to make a pattern, we're going to make a pattern hi ho the cherry-o, we're going to make a pattern. We're going to make a pattern, we're going to make a pattern hi ho the cherry-o, we're going to

make a pattern. We're going to make a pattern, we're going to make a pattern hi ho the cherry-o, we're going to make a pattern. We're going to make a pattern, we're going to make a pattern..

Teacher: Ssshhhh. We have made a pattern using the colors? Children: Red, green. Yellow. Blue. Teacher: Angela... Dr. Copley: Here it is. Here it is. Green. Children: Green. Yellow.

Dr. Copley: Oh! Wonderful. Wonderful. Give a hand. Very nice.

Teacher: Bah, bah, bah. Bah, bah, bah. Bah, bah, bah. Bah, bah, bah. Bah, bah, bah. Bah, bah, bah. Bah, bah, bah. Bah, bah, bah. The wheels on the bus go round and round, round and round, round and round. You sing. Bah, bah, bah. Bah, bah, bah. [Video ends]

Did you notice that even the very young child shown at the end of the clip repeats a pattern both auditorily and physically? Young children often repeat clapping and moving patterns that they copy from adults. And they enjoy it when they do. Did you also see how one song could be represented using symbols? Note the way the growing pattern is illustrated with these symbols, symbols that are specifically arranged to show a growing staircase type pattern.

This quote from the National Council Teachers of Mathematics discusses the use of symbols to represent patterns. They say, "Students should develop an increased ability to use symbols as a means of recording their thinking. In the earliest years, teachers may provide scaffolding for students by writing for them until they have the ability to record their ideas." Did you notice my scaffolding procedures after we completed our verse?

Although the symbols were only representations of the movements, children saw the picture, and often referred to their meaning during our many, future performances. Our past two video clips have been examples of patterns that are typically used in all early childhood classroom settings. Now, let's look at a pattern problem that is appropriate for a beginning algebra student. Do you remember this quote from the second web cast? "Who dares to teach must never cease to learn."

Please know that this next problem is not for young children. Rather, I want you to see how the pattern foundation that can be started in prekindergarten can lead to algebraic thinking later in the upper grades. So, are you ready? Let's do some algebra. First, we are going to watch a pattern develop using

small squashed marbles or jewels, as my children call them. As the pattern develops, we will complete this chart using numbers so that we can analyze the resulting pattern.

We will record the step of the pattern, the number of jewels added at each step, and the total number of jewels that result. This recording is the first to help us identify the patterns so that we will be able to extend it, make a generalization and represent the generalization as an algebraic expression. In step one, one jewel is added to the work space, resulting in a total number of jewels as one. Simple. In step two, three jewels are added resulting in four as a total number of jewels.

In step three, five jewels are added, resulting in a total number of nine jewels. Are you beginning to see a pattern in the picture? Step four continues by adding seven jewels that result in a total number of 16 jewels. Again, the "building of the square" visual helps you begin to see the pattern. In step five, nine jewels are added, which results in a total number of 25 jewels, all in a five by five square.

Now, let's look at a more abstract version of the pattern that has been developing. By placing the numbers all together on a chart, we can begin to see any patterns that may result. This is the stage where we must identify the pattern, so that we will be able to predict the next step and extend the pattern. In fact, eventually we will want to know how many jewels would be added and the total number of jewels on the tenth step, the hundredth step, or even the thousandth step.

And we wouldn't want to do it all 1,000 steps with jewels or by writing numbers on a very long chart, so we need to do some algebraic thinking. Well, first, let's look at the column entitled "number added". If we start at step one and go down, we see that the number patterns are one, three, five, seven, nine. If it sounds like the odd numbers, you are correct. If I ask you what number would be added on the sixth step, that would be quite easy. 11. Or even the tenthth step you could figure it out, it would be 19.

You can easily complete the pattern by counting on by odd numbers. However, what would happen if I asked you how many jewels there would be on the hundredth step or even the thousandth step? To extend the pattern, you would need to identify another pattern or complete a rather long chart. Well, let's look at the relationship between the step numbers and the number of jewels added.

Look at the number added in the second step, three. If you added the step number to the step number in the one right before it, you would get the number three. Or in other words, one plus two is three. Look at five. Two plus three is five. Three plus four is seven. Four plus five is nine. Five plus six is 11. Do

you see the pattern? So for the hundredth step, the number of jewels added would be 100 plus 99 or 199. And for the thousandth step, the number of jewels added would be 1,999.

We are simply taking the step number and adding it to the step number that comes right before it to get the total number added. As one fourth grader told me, "It's much easier this way and you don't waste so much paper." Now let's look at the total number column. Again, if we can figure out the pattern, we don't need to have any more jewels or more chart paper. Look at the first step. It resulted in a total number of one. The second step resulted in a total number of four. Three resulted in a total number of nine.

Do you see a relationship between the picture the jewels created, and the total number of jewels? Remember, the picture was a square, and the numbers are squares of the steps. In other words, on step three, the total number of jewels is three times three, or three squared, so if we complete the pattern for six, we would have 36 total jewels. For ten, we would have ten times ten or 100 total jewels. For 100, we would have 100 times 100 or 10,000 jewels.

And for the thousandth step, we would need 1,000 times 1,000 or one million jewels. Aren't you glad we can multiply and that we can think algebraically? I would not want to get one million jewels. The completed chart would look like this with 11 jewels added on the sixth step for a total of 36, and a chart showing the tenth and one-hundredth step would look like this. At this point, a generalization could be made in the form of an algebraic expression. "n" represents any step.

In the number added column, it just states that a way to describe the numbers in the number added column is to add the step n to the step before it, which we could call n minus one. Another way to write that expression is to combine the two n's by writing 2n minus one. The expression 2n minus one is often used to describe odd numbers. In a similar way, the total number of jewels is written generally as n times n, indicating that if you multiply the step number by itself you get the total number.

Another way to write that expression is to write n squared. Well, congratulations. We have just done an algebra problem. We have identified a pattern first using manipulatives and then number, completed it, predicted the next steps, and extended it to the hundredth and even the thousandth step. Then we have written a generalization that would work for any step in the pattern, and written it using an algebraic expression.

Let me remind you that while this activity would not be appropriate for young children, the skills of identification, completion, prediction and extension certainly would be. I want you to see how strong foundation in the understanding of patterns can continue to help children develop their algebraic thinking.

These third graders solved a problem similar to our jewel problem using colored tiles. They thought algebraically and were able to do all the steps, including the generalization statement, with just a little scaffolding by their teacher. In fact, they were so proud of their solution that they sent it in to the Guinness book of world records because they were sure they were the only ones who had ever solved it.

Now, let's look at another example, one that uses the same skills as the jewel problem but appropriately in the four-year-old class. This pattern example is a pattern that is a red, blue, blue pattern or a-b-b as we may call it. Please pay particular attention to the variety of materials that I use and the many different representations that occur for the same red, blue, blue pattern.

[Video begins] Dr. Copley: Stick, slap, clap. Stick, slap, clap. Stick, slap, clap. Stick, slap, clap. Stick, slap, clap. Hold your sticks up. Just one time do that with me? Just one time -- here we go. All right, now play the drum. Ohh, that's good. Okay, let's try it again. Ready? Try it one more time.

Go one, two, two, one, two, two. Oh, good. Oh, good, Natalie, that's cool. Oh, good, look at what you've got. You've got one of these and two of those, don't you? One blue, two yellow, very nice. Why don't you smooth it down again and then try it again. Repeat it again for me. And this one, Claudia, can you read what this one is? This is your red block, and then square, square.

Jump, kick, kick. Jump, kick, kick. Jump, kick, kick. Jump, kick, kick. Oh, okay, I'm already tired. Okay, let's see -- what should we do for the first one now -- for this one? Instead of jump. Anybody have an idea of what you would like for us to do? What would you like for us to do?

Okay, maybe do you want to do, like, oh, look at what he's doing. I like what you're doing. I like that. Could you want to go, like, slide? okay. Okay. Let's do slide. What should we do for the red? Oh, I'm going to call on somebody. Yes, what should we do? Child: Kick.

Dr. Copley: You want to do kick, kick again? Let's try it. Everybody stay where you are. Now we're going to go slide, kick, kick. Slide, kick, kick. Slide, kick, kick. Slide, kick, kick. Oh, that's good.

What are you going to do? Circle.. uh, rectan... Mrs. Copley, did you hear what she almost did? Rectangle, circle, circle. Child: Rectangle. Dr. Copley: Now what's going to go next? Child: Circle.

Dr. Copley: Circle. We're going to have rectangle, circle, circle, rectangle, circle. Sorry. Circle. Rectangle, circle. Go ahead and glue that. We got to go in order to make it right. Okay, Perry. You're next. Can you glue that one on for us? Can you glue this one on? Rectangle, circle, circle, rectangle, circle, very good. Circle.

Oh. Perry, next. And then rectangle, circle. Now, I bet you in just a minute you're going to get to do a rectangle. Okay. So what should it be? Okay. You ready? Let's read it because we got to figure out what to do next. Help me read it. Rectangle, circle, circle. Rectangle, circle, circle. Rectangle, circle, what's going to be next? [Video ends]

Did you notice that in this video clip, children were encouraged to recognize that the color pattern red, blue, blue is in the same form as clap, kick, kick, or block, stick, stick, or rectangle, circle, circle? This recognition lays the foundation for the idea that two very different situations can have the same mathematical features, and thus are the same in some important ways. That's a very important algebraic concept and is important with pattern. Did you hear me ask the children to read their patterns?

To help children develop the ability to form generalizations about patterns, it is important that you ask a variety of focused questions. Like, "How could you describe this pattern?" "How can the pattern unit be repeated or extended?" Or even, "How are these patterns alike and how is this one different?" Our fifth pattern example today integrates both growing patterns in mathematics and creative dramatics.

I want you to watch children act out Karma Wilson and Jane Chapman's delightful story "Bear Snores On." You will not be able to probably hear it, but you're going to see that there is a bear in the corner snoring very loudly, and especially note how the teacher represents the many characters that come in as a growing pattern to disturb the sleeping bear.

[Video begins] Dr. Copley: Look how many animals we have here. Are you ready? okay, you're going to help me. Here we go. Oh, suddenly the gopher came in and he made the noise like a cat. Make your noise. [meowing] Child: [meowing] Dr. Copley: Okay. And when the mouse heard that, the mouse made his sound. What's your sound, Luis?

Child: Ee, ee, ee. ee! Dr. Copley: ...and the rabbit made his sound. Child: rabbit, rabbit. Dr. Copley: Okay, good. And the badger made his sound. Child: Err.

Dr. Copley: Very good. And the raven made his sound. Child: Reek, reek! Dr. Copley: Oh, good. And the badger said hello in his sound. Child: [makes sound]

Dr. Copley: They got so excited. But you know what they did? They started dancing and playing and making their sounds. Who was on the scene the very first time?

Child: The bear. Dr. Copley: The bear. Then who came? Child: The mouse. Dr. Copley: But the bear was still there, wasn't he? Child: Yeah.

Dr. Copley: And then who came next? Child: The rabbit. Dr. Copley: The rabbit. Ronald the rabbit. He did a good job with that. There were three and then who came next? Child: The badger.

Dr. Copley: That was the badger. The badger is a hard animal to know about. Don't know much about, but the badger came next -- he's in the book. Then who comes next? That's a bird -- it's a noisy, noisy bird. It's called a raven. Let me finish my pattern up here. Yeah, he did. You were that, Sebastian, weren't you?

Now, who was the raven? Oh, Erin. Oh, make that sound again for us? Erin: [meowing] Dr. Copley: [raven noise] Kind of like a noisy, noisy. Yeah, yeah. And then the last one was the gopher. Who did the gopher for us? Stephanie. Could you remind us what that sounded like again? Child: [makes sound]

Dr. Copley: Oh, very good. Very good. Did the bear wake up? Child: Yeah. Dr. Copley: Finally he did. Let me go ahead and put the pictures up here. Watch. Because the last time we had all the animals and I don't think we could have fit many more in that cave. We had all the animals.

And the bear woke up and then all the animals went to sleep. Let me make sure I put all of them up there. I want to make sure and get them all. Which ones am I missing? Child: The rabbit. Dr. Copley: The rabbit. Let's see. Child: And the raven.

Dr. Copley: And the raven. I'm so glad you remembered that name. The rabbit and the raven. Here's the raven. That raven is a -- makes lots of noise. Going to put him here. And the rabbit. And the rabbit is the only one that doesn't make much noise, but they sometimes can get very noisy. What do you notice about my pattern on the board? What does it look like? What does this look like? Children: Animals.

Dr. Copley: It's animals. But what do you see? It's kind of like a ladder, isn't it? Or kind of like stairs? Can you see? It looks like stairs, doesn't it? And each time we grew, the first time we just had one animal. The second time we had -- Child: Two animals. Dr. Copley: Two animals. The third time we had? Child: Three animals.

Dr. Copley: The fourth time we had four animals. The next time we had five animals. And the last time we had six animals.

First there's one. Oh, yeah, one. Good. Then two. Put that one right here. Very nice. Now put three. We need three. Three. Oh, you guys are going to build taller than me. Look at yours, Luis. One, two, three. Now you need four. Better get more blocks, huh, Luis?

There you go. Okay. There you go. One. Where's your two? Let's get a two. Can you put a two one together? Put two, just two. One, two, three. Good. Oh, Ronald, we need a four there, don't we? One, two, three, four. The next one would be five, right? We need more? Child: One, two, three, four.

All right. Good. One, two, three, four. Now you need five. Okay. Now you need one, two -- look at you, Luis. You're up to five. I bet you need some more blocks, don't you? You need more blocks. Thank you for saying please, Ronald. That's so nice. One, two, three, four, five. What would come next, Luis? What will come next? What's going to come next? One, two, three, four, five, six. You are right. You are right.

Okay. One. Oh, that's four. Put that one right there. Can I put this one right here for you? Would that be okay?

Dr. Copley and Child: one, two, three, four, five. Dr. Copley: wonderful. What would come next, Ronald? Ronald: the bear. Dr. Copley: You're going to have one, two, three, four, five -- Child: six.

Dr. Copley: Six. You got to have six. You need more blocks, don't you? Luis, you are running out of blocks. How many do you have? You have one, two, three, four, five, six. How many are you going to make next time? Oh, you are right. Child: One, two, three, four, five, six. Child: Thank you, Mrs. Copley. [Video ends]

as you can see, with just this one example, a growing pattern is evident in a simple story. This story was not even written with mathematics in mind. In fact, I doubt that the authors even thought of this story as a plus one pattern. Many of the books that are typically read in early childhood classrooms contain this type of pattern.

Identifying growing patterns in stories is a wonderful way to integrate literacy and mathematics and can be an especially dramatic one. Counting patterns can involve both visual and spatial patterns. In this next example, you will see different types of visual and spatial patterns that help children understand numbers. Notice the emphasis on the one-hand number, five, and the two-hand number, ten.

[Video begins] Dr. Copley: Remember how you did with the dice? Children: Yes. Dr. Copley: ...and you could just look at it. I think somebody just said they used their eyes. Isn't that what you said, River, or Malachi, I'm sorry, Dante? Isn't that what you said? Okay. Watch me carefully. Watch. Here we go. When I hold it up, I want you to see how many it is and not count. You ready? Can you show me your fingers, here we go.

Children: Ten! Dr. Copley: Oh. Let me try one more time. Children: Ten. Dr. Copley: Oh. You are good. You are good. Okay. Now let me do this. Now watch. I'm going to take off -- Children: One, two, three, four, five.

Dr. Copley: Now, that's a one-hand number, right? Are you ready? You going to show me, going to say it? Children: Five! Dr. Copley: Oh, my goodness. You did it again. Oh, my goodness. Let me try it again.

Children: Five. Dr. Copley: Oh, and nobody had to count. All right. Now I'm going to be tricky. You see what it's got on there now.

Children: Six. Dr. Copley: No, it's just five. Now watch and listen. You ready? This is tricky. Children: Ten. Dr. Copley: Oh, my goodness. You got it again. I just can't believe it. All right. I got to try again.

Dr. Copley: Are you ready? This is tricky. Child: Five!

Teacher: Do you all remember how many it is when you fill out the bottom row? Child: Ten. Teacher: Just the bottom row.

Child: Five. Teacher: Five. And the whole thing? Malachi: Ten. Teacher: Ten. Okay. So here's what we're going to do. What's your name? Malachi: Malachi.

Teacher: Malachi and Cody. Cody: Cody Scott Washington. Teacher: Cody Scott Washington? Hi, Cody Scott Washington. All right. Now, Malachi, you can go first. Roll the dice. You got a one. So take one and put it -- there you go. That's perfect. All right, Cody. It's your turn. How many?

Cody: Three. Three. One, two, three. Teacher: Three. So take three. Take them apart. And you're going to do one -- count with me. Cody: One. Teacher: One. Cody: One. Two..

Teacher: Two. Cody: Three. Teacher: Three. All right. Now, Malachi, your turn. Come on, can't do that one yet. Malachi: Two. Teacher: Right here.

Cody: I beat you, Malachi. I beat you. I beat you. Teacher: All right, look. Look what just happened. Y'all filled up the bottom row. How many is that? Children: Five! Teacher: Five! That's right. Okay. Your turn, Cody. Cody's turn. How many? Cody: Two.

Teacher: okay. Take two. Good job. All right, Malachi. Malachi: One again. I want two. Teacher: One. Hey, look, how many do you need? To fill it up, how many? Malachi: One, one, one, one. Teacher: One. Okay.

Cody: Three. Teacher: You got three. Malachi: My turn. Teacher: All right. Get your one. Cody: Three.

Teacher: Now look, the whole thing is filled up, so how many is that? Malachi: Ten.

Teacher: Ten. Do you agree, Cody? [Cody nods] Do you agree? Is it ten? okay. So here's what you're going to do. We're going to take all the green ones, we're going to put them together. And then we're going to take all the brown ones and we're going to stick them together. And we're going to stick the whole thing together. Oh, look, Malachi, y'all count with me. Malachi and Cody: One, two, three, four, five, six, seven, eight, nine, ten.

Teacher: What do I need to get? Yeah, do you think I'll get one? You do? Let's see. Wow, I did. All right. Look. You'll take yours and put yours together. I'll take mine and put mine together and we'll have a chain of how many? Child: Ten. Teacher: We'll have a chain of ten. You're right.

Teacher: We're going to put all the green ones together and then all the yellow together. Child: I'm having fun with this game! Teacher: Are you? Good! We'll play it again later, too. How about that? Great. How many do you have? Child: Five.

Teacher: You want me to hold it and you count it? okay, count. Child: One, two, three, four, five, six. Teacher: Six. And I have? Child: Three. One, two, three, four.

Teacher: Great. So if we put these together, your six and my four, how many do we have? Child: Ten. Teacher: We have ten. Good. Good job. [Video ends]

Dr. Copley: The ten-frame pattern is one that is an excellent visual model for our base ten system. Because of the opportunity for both auditory and visual pattern identification, it's an especially good number model. Please look at my model that I have here. This is simply a cookie sheet and by the way, it

needs to be a cheap one, because what you do is you make the chart and you need to be able to have magnets that will actually adhere to the cookie sheet.

By having it be an auditory model -- because when it makes that noise, you definitely can hear it -- by having it be an auditory model as well as a visual one, children soon identify that this whole thing right here, has ten or two hands. If I take off one of the rows, there's only five or one hand. It's a model they can see, a pattern they understand. The spatial patterns that they were doing, if you noticed, we had spatial patterns that were on the die. And when they rolled the die, they could see those particular patterns.

The patterns that you see on die or on dominos can be particularly good number patterns. Children's description of spatial patterns often involve their concepts of number. For example, when pointing to the five representation, Koby said "It's got four corners and one more in the middle." Johanna described the six representations as "three on one side and three on the other." And Jeffrey said the two representations "didn't even need to be counted, I just opened my eyes and know it's two."

In this game, children used a die with spatial patterns for one, two, and three. And their job was to completely fill two ten frames. In a similar way, these children used the unifix cubes to complete the ten-frame. Alvin wanted to fill it all up. Unfortunately, he only rolled a two. The kindergartens in this picture are representing finger patterns for six. As they cross their arms and again count their fingers, they discover that both one plus five and five plus one result in a sum of six.

A pattern in addition that children can discover that changing the order in which two numbers are added does not change the result. As children bring and make this type of generalization from their observations, they are forming the basis of algebraic thinking. Do you remember the hoop game from web cast number one when the children threw pompoms inside and outside of the hoop?

Please note that in that picture you just saw, those were kindergartens, and that they have had many other number experiences before, and so that they are able to do this and make the generalization that the number order does not change the sum. Well, now let's review. What do children need to know to understand patterns?

We have used six examples of pattern types, and we illustrated these six important -- or these skills -- identification, replication, completion, prediction, extension, description, or generalization and

representation. There are many methods, many types, many different curricular topics, and many possible pattern experiences. Well, it's now time for a break. This is a great time for you to send us your questions.

Remember, you may type a question into the "ask a question" form on the browser, or you can fax us your questions. Our fax number is also posted on your browser. We will be back in a few minutes to find out how we can best facilitate children's learning of patterns.

Welcome back. We are now ready to talk about how we can best facilitate the learning of patterns. Let's first talk about what we want children to learn. As you saw in each of the previous webcasts, the Head Start Outcomes are consistent with the National Council Teachers of Mathematics Prekindergarten Focal Points. Both the Head Start Child Outcomes Framework and the Prekindergarten Focal Points by the National Council Teachers of Mathematics focus on recognizing and duplicating patterns.

The Outcomes Framework also includes the importance of using a variety of materials. In addition, the relationship between number concepts and understanding is emphasized in both the Outcomes Framework and NCTM's focal points. As we have seen, identifying number patterns is an important aspect to number understanding. This beginning graphic indicates that the foundation of mathematics is patterns. Please note that as they have been in each web cast, the approaches to learning are listed for patterns.

Solving problems and applying reasoning is always an important outcome in mathematics. The variety of examples and the reasoning required to identify and extend patterns is certainly evident in this web cast. This graphic illustrates the strong relationship between mathematics and approaches to learning. Pattern also includes the domain of language development. When the children acted out their songs and poems and identified the patterns, they were involved in listening and understanding the meaning of the words.

As shown in this addition to the graphic, language is strongly connected to the study of math patterns. The patterned rhymes used in their songs and poems emphasize a literacy outcome, and the representations of the patterns serve as the precursor to early writing. The connection to literacy is evident. Science outcomes are also part of pattern, as children describe their pattern predictions, explain their reasoning and make generalizations -- another addition to the graphic.

The music that you heard in the patterned songs along with the rhythmic patterns are an important connection to mathematics. The movements that you observed as children dance and march were patterns, and the roles children play in the patterned stories connecting dramatic play to the study of patterns. Music, movement, and dramatic play all combine to add the creative arts domain to this graphic, and it shows the connection to patterns.

In addition, all the movement patterns that were made emphasize the gross motor skills and the physical health and development domain in the Head Start Outcomes Framework. Now, the physical health and development is added to the graphic -- yet another connection! Routines and the consistent patterns used in early childhood settings help children develop independence and a strong self-concept. Isn't this an amazing graphic?

Imagine. In all of our examples in this web cast, we focused on patterns in mathematics, and yet, we also integrated Child Outcomes in language, literacy, creative arts, science, social and emotional development, physical health and development and approaches to learning -- a powerful topic, and one that we can't forget. Well, now where do children learn patterns? I'm sure my answer won't surprise you: "Everywhere." Children place paper pattern blocks around their finished pictures in a repeating pattern.

Their finished pages can then be combined to make a class book for everyone to see and enjoy. The "plus one" pattern is an integral part of all counting books. That is, as each page is turned, one more item or object or character is added to the total number. These are all growing patterns. The books shown are representative of counting books that are accurate. That is, the number of objects pictured are consistent with the number shown.

They contain pictures of common objects that children know, and they have groups or sets that are clearly differentiated. Both "Ten Little Lady Bugs" and "Five Live Bongos" contain excellent growing patterns with clearly defined objects. Children love to predict the number of bugs and people they will see on the next page. "Moja Means One" written by Muriel Feelings is a Swahili counting book that illustrates in a beautiful way the counting sequence.

Demi's "Count the Animals 1, 2, 3" introduces children to a variety of counters for each page in a very artistic manner. Now, look at the journal of four-year-old William. He is practicing making a repeating pattern by drawing and writing the numerals and shapes he sees displayed in his classroom. This picture

was a four-year-old's representation of her favorite counting game. In this game, children select a number smaller than ten and count around the circle with each child saying one number.

In Daphne's picture, she was showing a counting pattern of three. The counting sequence was one, two, three, and the third person stood. One, two, three, and the third person stood. One, two, three, and the third person stood. Can you see her pattern? When asked to describe it, she said, "I'm here," and she pointed to the blue child with eyes at the bottom of the picture. "Sitting, sitting, standing. Sitting, sitting, standing. Sitting, sitting and now we're back with me."

Dalia made a beautiful drawing by making a people pattern with facial expressions. Dalia is the little girl in my class that had dark beautiful hair -- curly hair and a big smile. When I asked her who she was in that picture, she pointed to the girl in the very end that had straight hair. I said, "I thought you would pick the other little girl, Dahlia." She said, "That's the kind of hair I want, teacher." This four-year-old picture was quite proud of her block pattern, and she was happy to read it for me.

Let me tell you how she read it. She said, "Down up, down up, down up, down up." And when she came to the block that was still up when it should have been down, she went, "Hum up." When I asked her about it, she complained about a little boy named Jeffrey who had taken the block she wanted and wrecked her pattern. Outdoor scavenger hunts can help children find patterns in nature. Tanya Hobin's book "Look Again" provides beautiful pictures of patterns in nature and that match what we find outside.

Aimee replicated our snake pattern on a paper plate that we hung from the ceiling. There's many, many more, but now how does a teacher plan intentionally to teach patterns? As I hope is evident, pattern development takes many forms and occurs in many different places and contexts. I would like to illustrate this with two lessons. One that is on a video clip and the other that is an extension of something you have already seen.

"Mrs. McTats and Her Household of Cats" is a book written by Alisa Capaculli. In this video clip, you will see the children acting out the story as a growing pattern. First there is just one cat, then there are two more, and then three more and then four more and so on. Watch as we act out the story and then follow it up with an intentional lesson on number counting using the word "more."

[Video begins] Dr. Copley: In a small, cozy cottage -- that's like a house -- lived Mrs. McTats. She lived all alone, except for one cat. So how many cats do I need? Children: One. Dr. Copley: I just need one. Would you come on up and be a cat? okay, now, cat. Here's your face. Okay. You stand right over here. This is your face -- hold it here. Now, what sound does a cat make? And they make a really loud -- meow! This is -- Go ahead.

Child: Meow. Dr. Copley: Meow. Very good. Now you sit down by Mrs. McTats -- you know, she's living all alone. Do you want to sit on the ground? You can sit right by her. Say meow. Child: Meow.

Dr. Copley: Meow, all right. Now I better go to the next page, okay? Every morning, Mrs. McTats left as the clock struck eight, to market, to market, I mustn't be late. She went over to the market to get some fish for her cat. Mrs. McTats, you better go get a fish for your cat. Go over and get a fish. You better go get some fish. Better go get some fish. Oh, my goodness. You better get a lot, not just a couple. [meowing]

All right, Mrs. McTats. I'm glad you gave her money. Start--as soon as she feeds you -- keep meowing. Keep meowing 'til she gives you some fish. Oh, my goodness. My goodness. Well, guess what? Mrs. McTats said, "I used to have one cat, then I got two more and I had three. Then I got three more." Mrs. McTats, would you count your cats? You've got a lot of cats. Go over and count them.

There's one all alone. He's back there. And now we're going to take two cats. Everybody get two cats. Get two cats. Remember, there, Katy, two scratching at the door. Two. You got two? And now you put it in her house, and now how many cats does she have? She's got -- there was one first and now there are two more. How many is that? Children: Three.

Dr. Copley: Good. Would you count them with me? Count your cats. See how many you have. Children and Dr. Copley: One, two, three. Dr. Copley: Oh, boy. I've got some pretty cats. Do you have some pretty cats? Are they meowing. Child: I'm going to have a puppy.

Dr. Copley: Oh, not a puppy yet. You first of all have to have cats. Like we're doing our story. We have one cat. And now Mrs. McTats has how many cats? Children: Three. Dr. Copley: Three. Now what happens is, here comes a scratch at the door, and there are three cats, so you have to get three. Get out three. Everybody show me that you've got three. [Video ends]

Dr. Copley: Now let's talk about another pattern activity that is intentionally extended throughout the year. As you saw in one of the pattern video clips, young children were making link chains for ten by playing a game and completing the ten frame. When their 10 frame was completed, the children made chains that were then added to a hanger. This is a picture of the one we made for five. It is hung and displayed on the bulletin board with the hanger for one, two, and three and four. The hanger for ten will be added to the display.

These hangers can be taken down from the display and later used for discussion purposes. They remain up for the rest of the year, and children often comment on the patterns they see. In fact, Jorge was walking by the list, or the whole hanger display one day and as he walked by, he said, "That looks like my grandma's blanket." And sure enough, it had that kind of diagonal pattern.

There are patterns all over the place, and it's nice to see it in those numbers. Well, we are now ready for the third part of the session, "What else?" Remember, this is your opportunity to ask questions. Please consider submitting your questions by email or fax as indicated on your screen. Now it's your turn. What questions do you have for us? Back again to help us with today's Q and A session is Georgey Sparks. Welcome back, Georgey.

Georgey: Thank you, Juanita. Remember, it's not too late to send you question in. Remember you can type your question into the "Ask a Question" form on the browser, or you can fax us your question. Our fax number is also posted on your browser. Now, our first question is from Robin from Tennessee. And she asks, "Are there any particular strategies for teaching patterns that are the most effective for children who are English language learners -- for example, in a situation where the teacher does not speak the child's home language?

Dr. Copley: That's a very good question, Robin. In fact, one that all of us probably have to answer some time. Most of the children that I work with are children -- English is not their first language. Let me give you an example of a way that I've done it that I think works pretty well. I was having trouble really communicating even though I used manipulatives and I did everything possible that I could to get them to see it, they still didn't get it.

These two little guys were just having a lot of difficulty with it, so I took a pile of blue cubes and a pile of red cubes. And I simply pointed to them and said, "We're going to take turns," and I used that phrase. I

knew one that was similar in Spanish with these two boys so I could say that. But I simply said, "Yours first, your turn, your turn next. Your turn next." And we just -- we physically, they could only use the cubes they had to do it. And I was going -- I was very much modeling that.

But I was making it something that was theirs. I also had used a lot, every time they have any particular clothing on or any pattern that I see, I was -- I'm always relating it to them. Now, especially true with children with English as the first language -- or English that is not the first language, one of the things I try very hard to do is involve their culture.

Just as Georgey showed you with the American Indian culture, there are so many patterns in so many things that we do traditionally, or as part of culture and clothing, or even food, and so any time I can directly relate to it that, I do. It's an excellent question. One thing that's wonderful about math is that you have the manipulative. You do it that way. You just do it with many, many examples, and that seems to be helpful.

Georgey: Thank you, Juanita. Our next question comes from Michelle from California. What type of grouping or classroom configuration works best to facilitate learning about patterns, small groups, large groups or individual?

Dr. Copley: Another good question. One of the things that I hope you noticed is in this particular webcast as in all of them, sometimes I work with individual children, sometimes as a whole group, sometimes as a small group. It just depends on what you're doing. For instance, when you're making physical movement patterns, the whole group makes sense. When I'm trying to really have them build growing patterns, I worked with a very small group of children.

And then when I have someone who has great difficulty, I may work with one or two children individually. The bottom line is you teach patterns every way you can, and I can think of one more example. We were walking out to the bus stop as we do or where the little buses come to pick up the kids. As we walked by in Texas -- sometimes we have snakes.

And sometimes the patterns on a snake is very important. And we walked by and there was a little garter snake, nothing that would harm anyone and someone says, "There's a snake, Mrs. Copley, and I see a pattern." So you can even do it as you walk out to the bus line. I'm just glad it was a nonpoisonous one.

Georgey: Thanks. Our next question comes from Paula in New York, and she asks, "Is there a correct sequence that we should use when we work with children on patterns? What should they learn first?"

Dr. Copley: You know, I listed those words as patterns -- if you remember the words, there was identification, then there was replication, prediction and so on. And really those are words that yes, you would first of all start by identifying patterns and duplication. But the real bottom line is they all kind of overlap. Sometimes you may be completing a pattern as you saw me do with the growing pattern.

Sometimes you may be on predicting or extending patterns. Those are just important words for you to know. But probably the part that comes most is sequence is that you would start with simple patterns. The simple red, blue, red, blue pattern, of course, is the simplest and children do color first. That doesn't mean that's all you do, but again, that would probably be the best way to think of it when you think about sequence.

Georgey: Thank you. Mary from Florida asks, "What is the best -- what is best to use with children to describe a pattern? The actual words, for instance clap, snap, clap, snap, or use letters to represent the words? C, s, c, s?"

Dr. Copley: This is a good question as well. Because what this does is it reminds me of something I really did very incorrectly when I was first beginning. I just had been through math courses, and I knew algebraically that the pattern I was using was an a-b-a-b pattern or an a-b-b pattern. And I was working with a small group of children and I said today we're going to make a-b patterns.

One of the little boys looked at me and said aa, aa, aa, bu, bu, and it hit me that they were learning the letter and sounds of the letters at that time, and I was mixing them up by making them letters. So instead what I do is I simply name the pattern by what's happening. You heard some of the kids talk about we did stick, stick, stick or we did slap whatever -- whatever we did. So up, down, up, down, that kind of thing works. I always refer them to read it by describing what is happening.

Georgey: okay. Thank you. And the next question is for me, Juanita. Dr. Copley: Okay. Georgey: Nancy from New Mexico asks, "Thank you, Georgey, for sharing your beautiful artifacts with us. Are there general patterns that are common to all American Indians, are or they very tribal specific?"

So, Nancy, the patterns are pretty much tribal specific. For instance, in the first video clip, I could definitely tell that the children that were dancing were from the pueblos in New Mexico just by the patterns that they had on their clothing as well as their footwork, as well as the drum that they were using. So it's very tribal specific, so there isn't something that goes across all tribes. Dr. Copley: Very interesting. I'm glad you answered that one, Georgey.

Georgey: And the last question, folks, comes from Jean in Texas, and she asks, "We did not hear the word mathematize in this webcast. How do you mathematize patterns?"

Dr. Copley: I know you didn't hear that and the reason for that is that the entire webcast was about mathematizing everything you do. And when I think about the language, when I think about poems in classes, songs that you sing, the calendar, everything else, when you say boys and girls, this is a pattern. You are mathematizing.

Georgey: Thank you, Juanita. And thanks to all of you for your thoughtful questions. Now, let's recap what we have discussed related to patterns. In part one, we discussed the skills involved in understanding patterns. In part two, we observed many different methods for facilitating the learning of patterns, and the importance of integration. Then we began to discover what else we could learn in part three. This concludes the fifth of six webcasts emphasizing mathematics in Head Start and other prekindergarten settings.

Our final web cast is April seventeenth. Please mark your calendars. When we will put it all together. We hope you will join us for our final web cast in our series when we will hear from children, their teachers, and their trainers as we analyze effective mathematics teaching and review what we have learned in this series.

Some questions you may want to think about before the next session are, "What vocabulary did you hear used during this session? What materials would facilitate learning about patterns? How intentional are your teachers about teaching patterns? What one thing could you do tomorrow to help teachers facilitate the learning of patterns?" Please visit the Head Start ECLKC for additional information concerning patterns, measurement, numbers and operations, and geometry and much, much more.

And please feel free to send any successes or suggestions you have about these web casts by faxing us or sending an email to the address at the bottom of your screen. Once again, thank you for taking the time to be with us today for the fifth web cast in our six-part series on early childhood math. Juanita will see you next time. Thank you.

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