Web-Based Radio Show

Series on Learning Differences, Learning Challenges, and Learning Strengths:

Visual-Spatial Thinking Part II

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Good morning. This is Dr. Greenspan coming to you via our web-based radio show. Thank you for joining us this morning. Today we'll be continuing our series on learning challenges, learning strengths, and learning differences. As you recall, we're talking about our image of the tree with the tree trunk as our basic thinking and social capacities; the branches are the academic skills and other specific behaviors; and the root system is our basic processing capacities: auditory processing and language, visual-spatial processing, motor planning and sequencing, and sensory modulation. Last week we talked about visual-spatial processing, Part I, and today we're talking about visual-spatial processing, Part II. As you may recall, we went over the basic stages of visual-spatial processing last time that need to be strengthened in many children who are older, even though these stages are originally mastered when children are infants and toddlers and preschoolers. Today we'll be talking a little bit more about the basics and moving up into the more advanced stages of visual-spatial processing, so we can hopefully finish up the visual-spatial processing component of our root system today.

Last time, one of the components we talked about was when we get into problem solving where children are beginning to recognize patterns. For example, toddlers will recognize not only who their Mommy and Daddy are, but their characteristic patterns. For instance, they'll recognize that Daddy comes home and has his hat on and then he takes off his hat, and maybe he comes in with a briefcase and then puts his briefcase down on the desk. Pretty soon we'll see little Junior – little Sally or little Johnny – put on Daddy's hat and try to pick up his briefcase and copycat Daddy and have a complex social pattern. This involves fairly complicated visual-spatial problem solving when you think about it because they're not only copying Daddy, they're carrying out a multi-step action. So it's not as simple as a baby sticking out his

tongue because Mommy or Daddy is sticking out his or her tongue, which is almost reflexive; now we have a different kind of imitation, which is a complex social imitation involving a number of steps in a row. Imitation is not only one form of flattery, it's also a very useful way that human beings learn – where they can learn complex behavioral patterns, social behaviors, intellectual behaviors, and problem solving strategies – by copying Mommy and Daddy. So it's a chance to learn things instead of one little piece at a time, many pieces at a time, and it's a chance, in a sense, to copy the forest, not just each tree one at a time.

We also see children problem solve in other innovative ways at this time, not only copying Daddy, but little Junior may copy Mommy by pretending to cook with her pots and pans as he gets closer to age two. We also see other forms of pattern recognition. Children are able to figure out how little trucks work or how little pop-up toys work or how other mechanical objects work, and this enables them to master their world. They figure out how to take a chair over to try to climb up and get a toy off a shelf, or they take Mommy by the hand and walk her to the refrigerator to get her to do something. All this requires not only motor planning and sequencing, which we talked about when we talked about motor skills, but also understanding how the world works in terms of sight, where things are, how to get things, and how to find things.

This is a perfect opportunity for facilitating larger pattern recognize, and the key concept here that I'd like to suggest – at any age for a child who's needing some further work on visual-spatial processing, and certainly for all children as they're developing – is to invest their visual-spatial world with meaning and with emotional meaning. So, for example, we have a room and we hide something, which is something that toddlers are able to do, so we can not only hide it, but we can hide something that the child is really interested in, like a cookie or favorite toy. If the child is invested in that cookie or toy or special light-up "gizmo," as the child searches here and there and left and right and up and down, he'll not only be learning to search, but he will be searching because he's invested in different corners of the room or in going upstairs to look in his bedroom or in different parts of house. In other words, he's invested in space because there's something he values that's emotionally meaningful in the different spatial contours of the room or the house, and that's very important because the way we form a roadmap in our minds and begin broadening our spatial awareness is through our emotional investment in space.

Remember, this is just like we talked about how words only have meaning when we invest them with emotions; in other words, “Mommy” or “Daddy” can be a dictionary definition, “someone who takes care of us,” or it can be something we experience and feel as love, devotion, warmth, security, limit-setting, discipline, etc. Similarly, here we can also think about the visual world as being invested with meaning, so the more we invest the left side of the room and the right side of the room and the upper part and the lower part, the floor and the ceiling, and the upstairs and downstairs of the house with emotional meaning because we have one toy in one area and another toy in another area, and our favorite cookie is in the kitchen or our favorite water game is in bathroom, we invest these different areas with emotional meaning and it becomes part of our emotional roadmap in our mind and all of the sudden we’ve got a picture of the whole house because there are different components of it that we’re invested in.

So in order to help your child become a visual-spatial thinker, have your child play search games, but with strong emotional investment in the different parts of their spatial world. Good games for this are treasure hunt games where, for a toddler or a child who’s just beginning to master the visual-spatial world, even if he’s a four- or five- or eight-year old, we make it a very easy treasure hunt game. So the treasure might be making a noise, or you might be providing clues by pointing at different areas to look, or the treasure might be sticking out showing itself so the child can spot it as he gazes around the room. Then we make it more difficult and we might provide clues as to where it is with pointing or with words – if the child is verbal – or the “hot-cold” game, where we say, “You’re getting hot,” or “You’re getting cold” as the child gets nearer to or farther from the treasure. Then, eventually, we won’t provide any help at all but we’ll just tell the child the treasure is somewhere and we’ll let the child look for it or, better yet, he has to close his eyes and we hide it somewhere in the house and he has to search all over the house for the treasure. But the key concept here is to invest space with emotional meaning.

Even before the child gets verbal, we want to invest the different dimensions in space with meaning and we want to do it in relation to the child’s body so he can use his own body as a reference point to other objects. Then we want to transfer that reference point to other objects. So, initially, we learn that something is behind us or in front of us or to our left or to our right or above us or below us or next to us, it’s in relationship to our own body plane. So initially we’ll put things that we’re hiding in all different dimensions even before the child understands the words “above,” “below,” “behind,”

"next to"; we'll do it so the child just experiences it. So we do something where he has to turn and find something behind him or next to him or above him or below him, and we'll do it with Mommy or Daddy hiding it behind them, in front of them, in their shirt, next to them, beside them, under them, and above them, and the child experiences this in relationship to himself, to Mommy or Daddy, and in relationship to the cookie or the car or the truck he really desires so, again, it's invested with emotional meaning.

Then as the child becomes verbal, we give those dimensions words: "above," "below," "next to," "behind," and now the child not only has a picture of space and it's not only invested with emotional meaning, but it also has words that go along with it that describe it. This way the child is developing two things at once: a sense of space that's emotionally relevant and meaningful and the descriptive terminology to describe space in relationship to himself, to Mom and Dad, and in relationship to other objects in space. So something will be hidden above something else. The cookie will be behind the car, inside the truck, next to the little toy stove, inside the blue box, behind the pretty little dolly, and so forth and so on. So here we can play treasure hunt games, initially experientially with our pre-verbal children and then with words with our verbal children. We come back to the key concept, again, of investing space with a very meaningful object the child wants so the child is eager to participate in our visual-spatial games that teach him to conceptualize space.

Once we have that well established so the child is experiencing space and invested in space and (as we talked about last time) once the child is moving his body in relationship to other things and getting a sense of space and the dimensions of space, then we're ready, as we pointed out last time, to manipulate space more and understand space in a more conceptual or ideational way. There are a number of steps to this. If we think about the stage of creating ideas, when we're creating ideas verbally, and we're doing pretend play we can be creating spatial ideas, as well, at the same time. The way we create spatial ideas, for example, is we might have a number of blocks – three or four or five blocks, let's say – and we might make things. We might make something simple with three blocks and make a little car. We might make a little house. We might make just a tower. We might lay the tower on its side or make it straight up. We might go to four blocks or five blocks and make different things. So we can get quite creative. So now we'll be creating different designs in space out of blocks. Or it could be other toys – simple little Legos that fit together. The idea here is to be creative with space. During this stage, too, the child is learning to use words, so this is the time we're

labeling space in terms of its dimensions, of things that are above or beyond or that we want a little more or a little less of something, so we'll experiment with quantity. Again, we'll use things a child values so we'll have two cookies versus one cookie and ask him, "Do you want more or less?" We're not trying to teach a child to count yet, but we'll see if he wants the bigger one or the little pile or the bigger glass of juice or the smaller glass of juice, so we'll give the child choices and we'll see if the child can be creative in terms of their little blocks or their other things that build, or whether he can make things. We'll pretend that something is a house because the blocks are made in a little triangular way to look like a house or are made to look like a car or a truck.

So here we want the child to create space, to create – in a sense – just like they create pretend play scenarios and how they have the dolls hug, now they're creating their own little car out of blocks and they're also learning to label space, things they've already experienced, though, as above or beyond or below or next to. This should be a very creative time and if this goes well and the child is actually beginning to create in space, the next stage is to make our treasure hunt games more complicated by giving the child verbal clues. "You better look higher, you better look lower," so it's no longer just "hot" and "cold." Now we give the child a clue and say, "It's not downstairs, it's . . ." and the child may say, "Upstairs?" and the child will look upstairs somewhere. So we can give the child verbal clues about where to search to conceptualize his house as he's playing treasure hunt games, and also, as we get into games that require throwing and catching, we can make the games more complicated with verbal directions and some verbal sequences, "Can you throw to Mommy, Daddy, and *then* to little sister?" or "Now throw to sister, to Daddy, and *then* to Mommy?" So we're playing throw and catch games, but with sequences, not just back-and-forth with Mommy or Daddy, and we're using verbal directions so we're combining the spatial with the verbal a little bit and making the spatial learning a little more conceptual in the sense that it's joining with ideas and they're becoming spatial ideas. So now "above" is a verbal concept, but it's also a spatial idea: "next to," "behind," "more," "less," "a lot," "less," "a lot," "a little" – these are all spatial ideas because you picture them and you experience them in spatial relationships, but at the same time you have ways of representing them in words and we can do it now. The child is not yet ready to draw, but soon he will be, and when he is we can do it with drawings, as well, so that will be a real advance for the child – to be able to do it with drawings, as well.

Now if that goes well, then we get to the stage of connecting ideas together – making sense of one's world. Here we talked a little bit about this last time. In our spatial world we can get to a little bit of higher-level concepts. The child can now experiment and develop his sense of what Piaget called "conservation" and realize that three blocks stacked straight up in a tower is the same as three blocks lying flat on its side like a little train or a little snake. He can realize that you can have a piece of clay and make it into a round ball or stretch it out into a snake or make it into a tower and it'll be the same amount of clay. He can eventually recognize when he gets a little older that you can put liquid in a short, fat glass and a big, tall glass, so he grasps concepts of quantity that are constant, no matter how you lay them out – concepts of mass, like the amount of clay you have, or concepts of volume, like the amount of liquid you put into a container.

Now, here, too, as you're experimenting with this during the preschool to early school years – from kindergarten to early school years – the best way to teach a child these concepts and have fun with them is to do them with objects the child is very invested in, so it has emotional meaning. So, for example, if you have three cookies like a tower or three cookies lying side-by-side, which does the child want to choose? Or if the child seems to prefer towers or the trains, give the form he doesn't prefer four cookies and put three cookies in the less desired format and that will motivate the child to get the concept because the child, on the one hand, will be attracted just to looking at how high they go, but on the other hand will eventually see that he gets more cookies by learning that it's not how they're stacked – side by side or up on top of each other – but how many there actually are.

Eventually, as the child becomes more verbal at this stage of connecting ideas together, we'll be teaching the child to count: 1, 2, 3, 4 and he can count 1, 2, 3, 4 up high on a stack or 1, 2, 3, 4, laying side by side. Now, we'll do the same thing with quantity: If he has a favorite food that he can mush up into a ball or make into a snake, and we can have one a little more than the other, again always taking the shape he prefers and having that be the lesser to see if he gets the hang of it, eventually, and to see how long it takes him to get the hang of it. We can do the same thing with volume – a favorite drink or juice or soda in different containers – the short, fat one, the tall, thin one – and this way, by investing the concept with emotional meaning – something highly desirable, the child is "getting it." So now we're teaching the child conservation

and that is part of connecting ideas together. The child is seeing that the spatial world has relationships.

Now as do this we're also inviting the child to build more complicated designs. So we're not going to make it easy for the child and just have a house and a corral and a garage, but the child will build his own creations with blocks and we'll challenge him to make sense by asking, "Well, how are we going to get from the upstairs to the downstairs? Where are the stairs? Where are we going to put the car? Where are we going to cook?" So the child is now building the garage onto the house, putting the stairs into the house, putting the kitchen into the house, putting the bedroom into the house. So the house, now, is inter-connected where all the spatial components are connected one to the other.

Now as we begin playing organized games we can have rules and points and the players win rewards. The child can invent the rules, but then everyone has to follow them, so maybe it's throwing the ball to Mommy and Daddy and little sister and *then* little brother, or throwing the ball to the brother or sister first, then to Mommy and Daddy, so we throw it to the big people first, or the little people first, etc., etc. So the child can set the rules and we can challenge the child with creating the rules for the game. For example, the child can make up his own version of throwing the ball, his own version of soccer or baseball. So now it's more fun not teaching the child so much existing games, although we can do some of that, too, which have sequences and rules to them that involve spatial relationships, like soccer or baseball or musical chairs; but we can also have the child invent games, and it's more fun to have the child invent games. I would say at least half the time have the child invent games, but have him create the rules that he and everyone else has to follow, and the rules have to make sense so that there's a logical sequence of spatial activities that involve motor and space but that are verbally mediated. Here we're doing more than simply mastering space; we're also, at the same time, having the child use all his different sensory channels together: he's verbally describing it, he's spatially experiencing it, he's picturing it in space, he's acting out with his motor system, and a lot of his senses are involved – touch and smell and movement. So we have motor, sensory, verbal, and spatial all coming together in a conceptual way as the child is connecting his ideas together.

Now here's where we can get more elaborate in our games. We can play Simon Says games where the child has to do more than just copycat, putting his "hands up, hands down, hands at your side," but where he's actually putting objects in different

places – “Put the cookie above Daddy, below Mommy, next to Sally.” So we might have, “Simon Says do this and Simon Says do that,” and we can make it involve more complex spatial relationships that Simon Says to do.

We can create obstacle courses with different ways of solving the obstacle course and with more verbal directions to solve them. We have to go above, below, inside, outside, catch a ball, stand on one leg. This is a good opportunity to combine some of the motor tasks we talked about before – balance and coordination exercises; left-right exercises where you go from the left side to the right side of your body; complex sequencing exercises where you have to sequence many steps in a row rapidly, together with lots of spatial directions and spatial words. So the child has to do things rapidly in space with his body, involving balance and coordination, left-ride integration, and multi-step movement, all with spatial directions. So they’re integrating, again, verbal, spatial, and motor capacities as they’re learning to connect ideas together and, obviously, the key here is to make it simple, to have the child be successful 75 to 80% of the time, to have it be fun, to have prizes or points associated with victory, and to make it more complex very slowly so the child has a sense of mastery – that’s what’s critical.

Now, as we’re learning to combine ideas together and make sense of the world and do causal thinking, we can also further help children understand concepts that require a lot of vision, like shapes, but not only sizes and more or less, but also beginning conservation tasks like those we talked about, including different kinds of quantity, but also shapes and colors and textures and different qualities of things they see. So, for example, we can have them experiment as they build their houses with not just blocks, but with triangles and rectangles and square blocks and circular, spherical objects. So as they make interesting kinds of houses and interesting kinds of cars, we can ask them to explain how it works, why this would make it go faster or why this would make it more interesting or prettier or nicer. As they get more verbal, they’ll be able to do tell us more fully.

We can also play the equivalent of card games with different objects and different shapes. To give the shapes meaning and to make the game fun we can play a game, where, for example, there’s a bunch of shapes in the middle and everyone gets a turn, where each child’s goal is to get all the same shapes in his pile. So everyone gets a turn and they each have to decide which shapes they’re going to choose. There may be a few more of one than another, but the first one to get all the squares or all the diamonds or all the triangles wins. Then it could be getting all of a certain color in each

child's pile and each child gets a turn; or the children throw dice and depending what the dice show they may get two turns; or we can have a little thing that cardboard square with a "1, 2, 3" on it and the children rotate an arrow and may get either three turns or two turns or one turn, depending to which number the arrow points. Then it could get more complicated where the child needs all the red triangles or all the blue squares; then it could be all different ones shapes and colors, so the first one to get all different shapes in his pile is the winner – in other words, the child who has no similar shapes but one of each, so to speak – wins. Then the first one to get two of each shape wins. So we can make games where understanding shapes becomes part of the game and the child has fun with it and is learning to classify at the same time because he's getting all the blues or all the reds or all the triangles or all the different shapes and colors. So he's learning about "same" and "different" and different dimensions – all the big ones, all the little ones, all the reds, all the blues – all through having fun.

Another variation of that game we call the "Give Me" game where you get to take one from the other guy's pile until you get all the same or all the different ones, or all the similar colors or all the triangles that are blue, etc. So the game can have different rules and the children borrow from each other's piles and see who's the first one to reach his goal. All this helps with classifying and also helps with labeling and helps with understanding in a meaningful way all about how the spatial world is configured. Another version of this game where we're connecting ideas together is to see how many different designs a child can make that are meaningful and logical from five blocks or six blocks or 10 blocks or from triangles, squares, and rectangles in block form. They can be real designs, like houses and cars and trucks, or just very creative designs.

Now as we do this and we get into making different designs and different shapes, we're actually getting into what we call "multi-causal thinking," where we're not just having connections between ideas that are simple – like the equivalent of asking a child, "Why do you want to go outside?" "Because I want to play" – but now we want to get into the equivalent of the child giving you many reasons: "I want to go outside because it's sunny and it's healthy." So when we make many designs from the shapes, in a sense we're getting into many causal relationships between the same shapes. We have our five blocks and we can say, "How many ways can you lay them out? As a tower, as a snake, as a snake that goes to the left, to the right, or a tower that sort of

leans to the left or leans to the right, but putting the blocks off-center?" You can show the child one or two variations and see how many he can invent.

Again, too, this encourages the creative use of ideas, what we call multi-causal thinking – in spatial dimensions. As we get into multi-causal thinking the child can create games with the soccer ball or with the baseball and with the bat that have more complex rules to them and that involve many causal relationships. We can, again, combine our balance and our left-right and our multi-step motor planning activities that we talked about in the motor skills segments into these games and the child can make up the rules. The child can also create his own obstacle courses now with multi-causal thinking and he and his brother and sister and Mommy and Daddy have to go through his obstacle course, and he leads the way, and you can time different people as they go through the obstacle course. So all these are wonderful variations on connecting ideas together, only doing it now in a multi-causal way.

Then, as we get into comparative thinking and gray-area thinking – higher levels – and these are not seen typically until the child is seven or 8 or 9 years old, we can get into even more complicated relationships. Harry Wachs has a number of games where he has children copy given designs – but they're rotations – so he might show a design and the child has to copy it, not as it looks to the child, but as it looks to Harry from his perspective, or they might create the mirror image of the design. So now the child has to transform what he sees in his mind and picture it as the other person would picture it, not just copying exactly what he sees. That requires more complicated architectural skills, but when you think about it, that's a form of comparative thinking: we're comparing the way I see it to the way you see it but we're doing it not just with words, i.e., "Which do you like better, apples or cake, and why?" But we're doing it with spatial designs. It's not just, "Which design do you like better?" but first you have to be able to see the design. It's easy to see a piece of cake or a piece of broccoli and compare the two, but it's not as easy to picture the houses from the point of view of the person who's in the back of the house as it is from the point of view of the person who's in front of the house. But this spatial perspective-taking is interestingly occurring at the same time that we're doing comparative thinking and gray-area thinking from a verbal point of view. So now we have all the different kinds of designs and we're looking at them from multiple perspectives and seeing if the child can replicate them. Then we should empower the child to create a design and challenge us to replicate it from his perspective, but with us sitting across the table, and we can make that into a nice game.

We can do this with different kinds of rotations and Harry, in his book *Thinking Goes to School* (Furth and Wachs), and in his new manual coming out soon, has a number of these perspective-taking games that fit in with what we're talking about when we talk about comparative thinking and gray-area thinking.

Also gray-area thinking invites looking at things in relative proportions, lining up cars or lining up sticks from smaller to larger, but we can do this now really seeing the gradualness of the world in multiple dimensions, not just with sticks from smaller to larger, but with quantities from less to more; also with mass, like balls of clay, from smaller to larger; but what's interesting here is to come back to our conservation task and to do it with multiple shapes so that the same mass or slightly larger masses may take multiple forms. We start simply, so that we're lining up the balls from smaller to larger, but then one can be in a snake form, one can be in a ball form, one can be in a rectangle, and one can be in a square form and the child has to figure out which is the smaller mass, which is the slightly bigger mass, and which is the biggest mass. The child does that, let's say, by experimenting – by putting them into different forms and then learning how to seriate them or put them from smaller to bigger. Or we can make the rules more complicated where the child has to go from small to big and then from big to small again. So now we can play with sequences of visual images and put them in various relationships to each other; we can look at different perspectives as we do comparative thinking; we can look at them in relationship to one another as we do more relativistic thinking or as we do what Piaget called "seriation tasks," and with this we can have lots of fun while the child is learning about spatial dimensions. This is helping the child to get into the notion of graphs – "Will it be like a bar graph showing the smaller and the larger?" and it will help him with his mathematical reasoning.

Here we can begin, obviously, and have already begun, giving symbolic meaning to these quantities, so we're not only teaching the child to count and add and subtract, but also, as we get into comparative thinking and gray-area thinking, we're getting into simple multiplication. If we have two children and they each want two cookies, how many cookies do we need? So very basic levels of multiplication can be understood here. We want the child understanding and picturing these and experimenting with these, not simply memorizing them. So as the child is getting into, for example, multiplication or division – we've got four apples and we've got two children, how many does each one get? – we want to make it simple and verbal with real objects so that the child is now using his capacity for comparative thinking and gray-area thinking to solve

these kinds of questions. So, first it should just be common sense without calling it "multiplication" or "division" or even "addition" or "subtraction," but more, "Each one gets one cookie, so how many do we need? One, two, three, four. These two don't want any. How many do we give back? Okay – one, two." Later on we can call this "adding" and "subtracting." Again, find objects the child values, let him experience addition, subtraction, multiplication and division, then you can give it the proper label and make it more systematic, and then you can also show him how to represent it with numbers. First it has to have meaning, then you can put numbers to it, and then the child can be shown the rules of adding, subtracting, multiplying, and dividing – but first develop the feel for it with the real entities. Obviously, if the child is negotiating for a cookie and a cookie has different amounts of mass to it, he's going to be very invested in picking the mass that has more cookie in it than the one with less cookie in it.

Around this time, too, that the child is getting into more symbolic thinking verbally and getting to higher levels of multi-causal thinking, gray-area thinking, and comparative thinking we're getting more and more into symbolic or representational expressions. This means the child can express his ideas about space in many ways. We already talked about expressing it verbally by giving it labels, but he can also do it, as his motor control is getting better, with pictures. So the child can actually draw people, draw relationships among people, draw the design he's then going to create with his blocks, or create it with blocks and then draw it. He can also act it out with actions, like create a dance or, again, create sports activities. So now we want the child – as the child gets more complicated, starting with connecting ideas together and starting with the very simplest form of organizing and developing connections between ideas – we want the child using multiple forms of expressing those ideas. Technically, we'll call those "representing ideas" but the little stick figures are an early form of drawing them. While acting them out, the child can become the car and pretend to be a car going somewhere and then actually have a car or draw a car.

As the child gets into letters and shapes and begins labeling shapes as letters and learning to read, Pat Lindamood likes to have the children actually become a "B" and walk a B out on the floor. So you can draw the B, you can walk the B out, and you can actually walk out your letters so you can spell the word "dog" by walking it out or by dancing it out, walking around, making a D, then an O, then a G as you take steps. You can draw it on the floor. You then can draw a picture of a dog. You can build a dog from your blocks or from your triangles and squares. So as the child is learning to symbolize

his world, we want him to symbolize it, i.e., not just use words, but use movement and drawing so that there are multiple ways for the child to create his/her ideas. This gives more saliency to the ideas and also helps him connect more of his sensory world and his motor world to what he sees. So basically what we see is we act it out, we draw it out, we speak it out, and we picture it, and we picture it through doing different things and through its having many, many different forms.

Now, also, as we get to the next stage – what we call creating new ideas off a sense of ourselves or the reflective stage of verbal reasoning – we have an opportunity to make more elaborate spatial designs. Here's where we now can not only build a new house, but we can evaluate how we think it compares with Buckminster Fuller's designs or how it compares with the great architects of history. So here we're getting into more elaborate designs and here we can use our creative imagination and create hypothetical airplanes or buildings; here's where kids are drawing new spaceships or new rocket ships and creating new power engines and becoming futuristic. To do that in the spatial world we want to encourage kids to be artists, to be designers, to be architects and to experiment and, again, to do this in a way that makes sense, though, so they also explain the rationale behind their new, creative designs, and they evaluate them and constantly improve them. They can create new games, and this is where kids can improvise and not only master the rules of soccer and baseball and basketball, but they can read a book about it and then once they've mastered what the great coaches in history of said about basketball, they can put their own twist on the "pick and roll" or some other maneuver. Now we'll see as they get into their teen years they'll get better and better at this and some will become coaches or some will become choreographers or some will become great musicians. We're creating now, verbally and spatially with music and with movement – the idea is to do this in many dimensions at the same time. The more dimensions we can expose the child to and the stronger the foundations we've just described, the better the child will be at it. The key here is to expose the child to creative hypothetical inferential and deductive reasoning in different dimensions of life, including spatial dimensions, which means drawing, building, and moving, and also games and sports and dance and music.

So we see here that our visual-spatial world is quite complex and can have many, many different dimensions to it. The key concepts are, just to review: invest space with emotional meaning by helping the child find all parts of his spatial world emotionally very, very meaningful. If the children have visual deficits, I should add, we still want to

create a visual-spatial world but it will be through sound and touch and movement that the child will create his visual roadmap. So the child will find the objects in the treasure hunt game through the objects making noise or through moving around in different areas until they find the thing with the texture that they want. So create affect, create emotional meaning in space through the child's exploring space for emotionally meaningful reasons – finding something he wants is one example. Then have the child learn all about the dimensions of space, then be creative in using the dimensions of space, and then create logical connections between different spatial entities. Then move up the ladder to multi-causal thinking with space, then gray-area thinking and comparative thinking with space – like perspective taking and seeing things from other people's perspective – and then learn the relationships of objects in space, like mathematical concepts, and then move on to higher-level scientific and mathematical, as well as creative arts, use of space. The foundations for understanding our world lie not just in our verbal understanding, but also in our spatial understanding. We rely on it and it helps us become big-picture thinkers and also helps us develop confidence in our bodies and in our world, so it's a very important dimension to develop and it's a very, very important part of our root system.

Now, next week we will not be meeting on Thursday, but we will be meeting on Tuesday night, and this will be archived so those of us not joining us on Tuesday night can have a copy of it, but next week there's a special event and on May 9 we'll meet on Tuesday evening from 5:30 to 6:30 pm and we'll be doing a show with Temple University graduate students in special education. It will be Dr. Kenneth Thurmond's class and we'll have students' questions and we'll be discussing interesting topics, so I think you should tune in if you can on Tuesday evening from 5:30 to 6:30; if not, it will be archived so you can listen to it at the regular Thursday morning time or any time you choose. Then we'll resume again in two weeks – a week from next Thursday – and then we'll talk about the last part of our root system – executive functioning, sequencing, and attention – which is a very, very important part of the root system. It overlaps with our visual and our verbal parts, but I want to give it separate treatment, and then we'll move into the actual branches and trees.

Thank you.