

Promoting Spatial Orientation

A Math Activity for Teachers and Families

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Spatial reasoning—the ability to interact with, navigate in, and understand your environment—is a foundational and critical concept for early childhood mathematics. In fact, evidence suggests that spatial reasoning skills support the development of overall mathematics knowledge and specific math concepts such as place value, relationships between numbers, and operations. Spatial reasoning skills are also important to learning in the other STEM (science, technology, engineering, and mathematics) areas during childhood and beyond.

One of the key components of spatial reasoning is *spatial orientation*, or the ability to recognize your position in space while viewing surroundings from different perspectives. In preschool and extending into elementary school, children practice spatial orientation when they draw maps from a “birds-eye” view, use directional language (*behind*, *above*, *beside*, *under*), and imagine locations from different perspectives. Spatial orientation is a particularly important early learning skill because it helps children learn how to navigate within their environments and represent those environments with maps. This also lays the groundwork for the knowledge and skills used in STEM careers in fields such as architecture and aviation, to name a few.

As former teachers and early mathematics researchers, we have seen the benefits of engaging, playful spatial orientation learning experiences that provide opportunities to take different perspectives while simultaneously using spatial language. Sharing spatial orientation activities with families reinforces the concepts learned at school and helps children remember and use what they are learning.

The following classroom activity and its home extension include step-by-step instructions and sample questions to promote conversations about spatial orientation. During these, both educators and families should use spatial language as much as possible to describe situations and to build children’s reasoning processes and spatial terminology.



I Spy from This Perspective!

To encourage children to visualize their environments from different perspectives, teachers give children a photo of a location, then challenge them to take the same picture. To do so, children must examine the spatial relationships in the photo, mentally picture what they might see from different places in the environment, and predict where they should take their picture. Teachers guide children through this process by asking questions and offering both assistance and challenges to foster spatial reasoning.

This activity is very flexible and can be used in whole-group, small-group, or one-on-one formats. It can be completed

in about 30 minutes or broken down so that each step is explored on different days and in shorter periods of time.

To prepare, teachers will need the following materials:

- › printed photos of a familiar location, such as a classroom or playground, taken from different perspectives
- › digital cameras, classroom tablets, or cellular phones, if available (If these tools are not available, children can pretend to take photos using a handmade prop: teachers can cut a camera shape out of cardboard and cut a small hole or square to look through.)

Steps	Questions to Promote Spatial Reasoning
Take children to a familiar location, such as a playground or their classroom. Give children a photo taken from somewhere at that location. Using spatial language, ask them to describe the environment in the photo.	<ul style="list-style-type: none"> • What is on top of the (chair)? • What is in front of the (sandbox)? • What do you notice in the photo? • What is close up (or far away) in this photo? • Where is the (slide) in relation to the (swing)? • What can you <i>not</i> see in the (classroom)? • Does the (desk) look closer to the (door) or the (whiteboard)?
Challenge children to predict where they would need to stand to take the same photo.	<ul style="list-style-type: none"> • Where do you think you should stand to take the same picture? Why do you think that? • What clues are you using to help you make your prediction? • Does the photo look like it was taken by someone who is very tall or very short? Why do you think that? • How would the height of the person change what the photo looks like? • Where would you need to stand to take the same picture? Why do you think that?
Ask children to stand in the location they predicted, then ask them to evaluate their choice. If digital cameras, tablets, or cell phones are available, the children can now take a digital photo to compare to the printed photo.	<ul style="list-style-type: none"> • Compare what you see to the picture. What is the same? What is different? • How would you need to change your position to make what you see the same as in the photo? • How would the photo change if you took five steps forward? Ten steps to the side?
Give groups of children a few different photos. Ask them to predict the route they would need to take around the location in order to take the same photos.	<ul style="list-style-type: none"> • Which photo is taken from somewhere closest to you? • If you were going this way, which photo would you be able to take next? • How did you decide this photo was taken from this perspective?

What Do You See?

When teachers offer home-based learning activities that are connected to the curriculum, they extend children's learning and deepen the connection between the two environments. With math in particular, linking these contexts helps young learners see that math is all around them and gives options for families to inspire and support doing mathematics with their children.

Home-extension activities should be easy for families to do and require little to no specialized materials or equipment. Step-by-step instructions, translated into a family's home language, can be accompanied by photographs or a brief video introducing the activity. Families can choose to do a few steps of the activity, complete all of the steps in about 30 minutes, or space out the activity across multiple days or weeks.

As part of developmentally appropriate practice, teachers continuously look for ways to integrate children's knowledge, interests, and backgrounds from their homes and

communities into meaningful classroom experiences. With this activity, teachers can encourage families to document their experiences by writing or drawing in a small journal, printing their photos, or creating a small poster to share with the class. Children and families can share their photos digitally, so teachers can display them on classroom bulletin boards or virtual whiteboards. Children can share their experiences, discuss what part of the activity was most interesting or challenging, and describe the spatial language they used with their families. Doing this showcases children's experiences outside of the early childhood setting and helps to continue the classroom conversation on spatial reasoning.

This activity requires the following materials:

- › paper and pencils for drawing
- › digital cameras or cellular phones, if available (If not, teachers can provide families with a cardboard camera.)

Steps	Questions to Promote Spatial Reasoning
Invite your child to choose a location that interests them, such as a neighborhood playground or a room in your home. Describe the location using language like <i>in front of</i> , <i>behind</i> , or <i>closer to</i> .	<ul style="list-style-type: none"> • What is beside you? • Imagine standing over there. What would be closest to you? • Let's stand in different places. How is what you see different from what I see?
Walk around the location and encourage your child to take photos or create drawings from different perspectives.	<ul style="list-style-type: none"> • What is behind the (slide)? • Describe the location of the (television). • If both of us are standing in the same place, how different do you think our photos or drawings will look?
Challenge each other to find where different photos were taken or drawings were made.	<ul style="list-style-type: none"> • Which photo or drawing was created closest to the (swings)? • How did you decide to stand there instead of (in front of the couch)?
Ask each other to put the photos or drawings in order based on a specified route.	<ul style="list-style-type: none"> • Let's pretend you walked that way to take photos. Which photo or drawing would you have created first? Next? Last? • What did you notice in the photos or drawings that helped you decide to put them in this order? • How might you prove that the photos or drawings are in the right order?
Give your child the set of photos or drawings in a specific order. Ask them to guess the route taken to create the photos or drawings.	<ul style="list-style-type: none"> • Describe the route you would take to create these photos or drawings. • Where would you need to stand first? • What direction would you need to walk next? • What clues in the pictures tell you how far to walk?



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