

Spatial skills

ECE resources

Play with objects helps children develop the spatial skills thought to be necessary for mathematical reasoning and problem solving. An understanding of shape helps children develop spatial visualisation (transforming mental images of objects) and visual-spatial working memory skill (remembering and reproducing sequences of locations of objects), which are sophisticated skills strongly associated with concurrent and later mathematical knowledge.

Spatial visualisation

Spatial visualisation is the skill of transforming and reproducing mental images of objects, which children use when thinking about solving problems.

How to spot this skill being applied in free play

You may hear children:

- Talk about recreating an object or scene from memory or from a picture (for example, 'I'm going to build my house with these blocks', or 'Let's build the car from this picture [on the Lego box]').

You may notice children:

- Copying and recreating existing visual models or models from memory using blocks (for example, building a house or a car from memory or a picture in a book) or other construction materials (such as drawing or representing people or other objects with crayons or shape cut-outs).

How to check for understanding

- Show children a model block construction and have them recreate it with their own set of blocks (including arrangements of blocks of the same and alternating colours).
- Show children a version of a model shape that has been decomposed (cut in half) or rotated, and ask them to match the model with its transformed or rotated version. One way to do this is to cut duplicates of various shapes out of paper, and cut one set in half in various ways. Then choose an intact shape and have children match it with the correct cut-up shapes.

Guided activities to support spatial visualisation

- **Copying models with building blocks or Lego:** This activity requires children to mentally imagine and recreate a model. As children try out different combinations and configurations of blocks, they also gain experience rotating and aligning them to fit together their spatial features and properties, such as edges and corners, while maintaining structural integrity and stability.
- **Fixing shapes:** In this activity, children gain experience composing and decomposing shapes. This can be done with magnetic shapes like [Magformers](#) (for example, creating and taking apart rectangles using two squares), [food cutting sets](#) (assembling and cutting food-shaped items), or using cookie cutters and popsicle sticks to create and cut shapes with playdough.
- **Shape sorters, puzzles, and Tetris:** Playing with toys like shape sorters and puzzles (both jigsaws and [Tangram](#)) and games like [Tetris](#) requires children to visualise the orientation of an object that

will allow it to fit into a specific destination. Teachers can guide children to engage in planning before they practise placing the object in its destination. Teachers can use spatial language that emphasises the spatial features, properties, and dimensions of the shape and the destination, as well as whether and in what ways rotation of the shape is needed.

- **Origami and paper folding:** see these [example activities](#).

Form perception and shape knowledge

This skill involves recognising and creating shapes/figures and distinguishing them from other shapes, figures, and symbols.

How to spot this skill being applied in free play

You may hear children:

- Labelling shapes they see in their environment (for example, 'I've got a square block', or 'the roof of the house is a triangle').

You may notice children:

- Attempting to group like items by shape, either for the purpose of sorting them (placing all the square blocks in one pile, and rectangle blocks in another), or when creating a design scheme while building (such as using only square blocks to create a structure).

How to check for understanding

- While playing with shapes, ask children to find a corresponding shape or figure amongst distractors. For example, decide to use squares for your creation, show children a square, and then have them find the corresponding square amongst other non-square shapes such as triangles, circles, and stars.
- Ask children to identify all the triangles, squares, and rhombuses amongst pictures of shapes including distractors. The selection of shapes should include different variants of the same shape (including uncommon forms of shapes such as isosceles, scalene, and right-angled triangles) and non-shapes (such as broken shapes or triangles with curved sides).

Guided activities to support form perception and shape knowledge

- **Pattern blocks:** One way to scaffold children's form perception skills is by using pattern block activities such as [this](#). In this activity, children can be guided to identify shapes in each picture and choose the corresponding shape in block form. Once they have selected a shape, they can place it on the picture to check their accuracy. Upon mastery, they can either advance to more [challenging pattern block sets](#) or recreate their patterns separate from the picture boards themselves (for example, on the table next to them).
- **Shape sorting:** Practise sorting different variants of the same shape (including uncommon forms of shapes such as isosceles, scalene, right-angled triangles) and non-shapes (such as broken shapes or triangles with curved sides). This exercise illustrates that there are many variations of the same shape, and reveals what makes something a particular shape. Try sorting different shapes by common properties, such as the number of sides or angles.
- **Shape identification:** Children can be guided to recognise model shapes as they exist in everyday life. Show children a square during circle time, and then guide them around the room to identify shapes on posters, in play materials, in carpet designs, and on their clothing. They might also be

sent on a scavenger hunt around the classroom or playground to find objects of particular shapes to share with the class.

Visual-spatial working memory

This skill involves the ability to remember and actively reproduce the locations and direction of objects.

How to spot this skill being applied in free play

You may notice children:

- When playing follow-the-leader, actively watching for and copying where the leader goes (for example, jump right, then left).
- When playing *Simon Says*, remembering and reproducing the leader's body movements on the correct side of the body (such as raising your right hand or lifting your left leg). Note that this game also incorporates talk about locations of body movements.

How to check for understanding

- **Pathspan** is an app that can be used to assess children's visual-spatial working memory. Children must watch green buttons light up in different orders and then touch those buttons in the same or opposite order. A variation that can be requested shows a frog face appearing on the green circles or 'lily pads'.
- Another (harder-to-track) method involves arranging blocks in a grid, having children watch you tap different blocks in a specific order, and then repeat your tapping in the same or opposite order.

Guided activities to support visual-spatial working memory

- Playing memory games in which children must remember the order and orientation of a series of objects or pictures has been shown to help with visual-spatial working memory. This activity can be digital (such as [Simon](#)), or use printed pictures of items. As children master remembering the location (first, second, third, and so on) and orientation (such as upside down or right side up) of smaller sets of objects or events, teachers can increase the number of objects and locations children must remember.

PREPARED FOR THE EDUCATION HUB BY



Erica Zippert

Dr. Erica Zippert is a Postdoctoral Research Associate at Purdue University. She studies young children's broad mathematics development and how it is supported during social and playful interactions with parents and peers in a variety of informal contexts. She also examines the roles of context (traditional activities/games as well as digital apps/eBooks, activity goals), and parent and child factors (parental beliefs, child math abilities and interests) in determining the quality of early math experiences and subsequent math learning.