Space Lego® session

VISUALISATION

Imagining and manipulating spatial information in the mind's eye, involving memory and prediction.

The child is using trial and improvement (physically placing the brick in one direction, noticing it is incorrect, turning it, then trying again) to determine the correct orientation of a brick.

Adult prompt: *"Stop and think first [you could ask the child to close their eyes]. Can you turn the brick in your head to decide which way it should go?"*

Spatial language
(model the words initially, then use in context):
turn, rotate, next to, closer, further.

SPACE
SPATIAL COGNITION TO ENHANCE MATHEMATICAL LEARNING

Mathematics

VISUALISATION

Imagining and manipulating spatial information in the mind's eye, involving memory and prediction.

Curriculum area: Geometry - Position and Direction.

The child is directing another child or robot through a maze and predicting the turns (half, quarter and three-quarter) needed.

Adult prompt: *"What turns does the robot need to take next, to get to the end? Can you imagine the route in your head?"*

Spatial language
(model the words initially, then use in context):
midpoint, left, right, between, around, near, far.

SPACE
SPATIAL COGNITION TO ENHANCE MATHEMATICAL LEARNING

Space Lego® session

VISUALISATION

Imagining and manipulating spatial information in the mind's eye, involving memory and prediction.

The child is using trial and improvement to determine where to place a brick on a row (perhaps placing on the wrong studs initially then trying again), relative to other bricks.

Adult prompt: *"Before you try, can you see your Lego model in your head [you could ask the child to close their eyes]? Where do you need to move that brick to? Can you 'slide' the brick from one place to another in your imagination? What other brick should it be next to?"*

Spatial language
(model the words initially, then use in context):
turn, rotate, next to, closer, further.

SPACE
SPATIAL COGNITION TO ENHANCE MATHEMATICAL LEARNING

Mathematics

VISUALISATION

Imagining and manipulating spatial information in the mind's eye, involving memory and prediction.

Curriculum area: Number - Number and Place Value.

The child is asked to reason about the location of numbers in the linear number system.

Adult prompt: *"Can you imagine where the number 17 goes on a 0-20 number line? Is it closer to 10 or to 20?"*
"Can you see 15 and 5 in your head? Which is bigger?"

Spatial language
(model the words initially, then use in context):
midpoint, left, right, between, around, near, far.

SPACE
SPATIAL COGNITION TO ENHANCE MATHEMATICAL LEARNING

Space Lego® session

VISUAL AND SPATIAL MEMORY

The ability to maintain an image in memory for a small amount of time.

The child is comparing their part-built model against the picture instructions.

Adult prompt: (point to the child's model and then the picture) *"How is It helpful to compare your Lego to the picture?"*

Spatial language
(model the words initially, then use in context):
same, different, lined up, side, front, back.

SPACE
SPATIAL COGNITION TO ENHANCE MATHEMATICAL LEARNING

Mathematics

VISUAL AND SPATIAL MEMORY

The ability to maintain an image in memory for a small amount of time.

Curriculum area: Statistics.

Children are comparing and interpreting the information in different pictograms and tally charts.

Adult prompt: *"How many tally marks are there? Does the pictogram show the same? How do we need to change the pictogram so it is correct?"*

Spatial language
(model the words initially, then use in context):
same, different, more, less.

SPACE
SPATIAL COGNITION TO ENHANCE MATHEMATICAL LEARNING

Space Lego® session

VISUAL AND SPATIAL MEMORY

The ability to maintain an image in memory for a small amount of time.

The child is not making use of the picture.

Adult prompt: (point to the child's model and then the picture) *"look at the picture and your Lego, what parts are the same and what parts are different? You can look at the picture as many times as you like to try to fix any differences."*

Spatial language
(model the words initially, then use in context):
same, different, lined up, side, front, back.

SPACE
SPATIAL COGNITION TO ENHANCE MATHEMATICAL LEARNING

Mathematics

VISUAL AND SPATIAL MEMORY

The ability to maintain an image in memory for a small amount of time.

Curriculum area: Measurement.

Children are using rulers to measure shapes and objects. They have to write down the lengths of each shape.

Adult prompt: *"Look and remember what number is on the ruler. Write it by the side of the shape. Which is the longest shape?"*

Spatial language
(model the words initially, then use in context):
same, different, more, less.

SPACE
SPATIAL COGNITION TO ENHANCE MATHEMATICAL LEARNING

Space Lego® session

SPATIAL SCALING

Working between different size versions of the same thing. Understanding the spatial relationships represented by diagrams of real objects.

The child is comparing their part-built model against the picture instructions.

Adult prompt: *"Even though the picture is smaller than the real bricks, can you use the picture to work out where each brick goes in your model?"*

Spatial language
(model the words initially, then use in context):
smaller, larger, bigger, zoom in, zoom out.

SPACE
SPATIAL COGNITION TO ENHANCE MATHEMATICAL LEARNING

Mathematics

SPATIAL SCALING

Working between different size versions of the same thing. Understanding the spatial relationships represented by diagrams of real objects.

Curriculum area: Geometry - Properties of Shapes.

The child has pictures of different 2D shapes and is looking for examples of these in the classroom.

Adult prompt: *"Can you see bigger examples of the same shapes around you? For example, the clock is the same shape as the circle even though it is bigger"*

Spatial language
(model the words initially, then use in context):
smaller, larger, bigger, longer, shorter.

SPACE
SPATIAL COGNITION TO ENHANCE MATHEMATICAL LEARNING

Space Lego® session

SPATIAL SCALING

Working between different size versions of the same thing. Understanding the spatial relationships represented by diagrams of real objects.

The child is counting the studs of a brick in the picture to work out which brick they need.
Or
The child is looking for a particular brick.

Adult prompt: *"Even though the picture is smaller than the real bricks, can you use the number of studs to find the right size brick?"*

Spatial language
(model the words initially, then use in context):
smaller, larger, bigger, zoom in, zoom out.

SPACE
SPATIAL COGNITION TO ENHANCE MATHEMATICAL LEARNING

Mathematics

SPATIAL SCALING

Working between different size versions of the same thing. Understanding the spatial relationships represented by diagrams of real objects.

Curriculum area: Number - Multiplication and Division.

Children are solving multiplication problems. Teddy and Bear have some sweets. Teddy has twice as many as Bear. If Bear has 3 sweets how many sweets does Bear have?

Adult prompt: *"Does Bear have more or fewer sweets than Teddy? What does twice mean [two times as many]?"*

Spatial language
(model the words initially, then use in context):
smaller, larger, bigger, longer, shorter.

SPACE
SPATIAL COGNITION TO ENHANCE MATHEMATICAL LEARNING

Space Lego® session

PERSPECTIVE TAKING

Things appear differently depending on where we are (position) and what we can see from where we are (visibility).

The child turns their finished model around to admire their work (this could be suggested by the teacher).

Adult prompt: *"Which part is closest to you now? Which part is closer to me now? How is my view of the model different to yours? Which way around do you like it best?"*

Spatial language
(model the words initially, then use in context):
same view, different views, around, on the corner.

SPACE
SPATIAL COGNITION TO ENHANCE MATHEMATICAL LEARNING

Mathematics

PERSPECTIVE TAKING

Things appear differently depending on where we are (position) and what we can see from where we are (visibility).

Curriculum area: Number - Multiplication and Division.

The child is using a 3 x 4 array to explore the commutative property of multiplication (for example a × b = b × a).

Adult prompt: *"Where can you see 3 groups of 4 in the array? Now can you see 4 groups of 3? Do you notice that these are different ways of seeing the same array."*

Spatial language
(model the words initially, then use in context):
same, different, part, pointy, flat.

SPACE
SPATIAL COGNITION TO ENHANCE MATHEMATICAL LEARNING

Space Lego® session

PERSPECTIVE TAKING

Things appear differently depending on where we are (position) and what we can see from where we are (visibility).

The child has not aligned their model with the pictorial instructions.

Adult prompt: *"Can you line up your model to the picture so that when you look at your model and at the picture you are seeing them from the same viewpoint? When they are aligned it is easier to use the picture to work out what brick you need next and where to put it."*

Spatial language
(model the words initially, then use in context):
same view, different views, around, on the corner.

SPACE
SPATIAL COGNITION TO ENHANCE MATHEMATICAL LEARNING

Mathematics

PERSPECTIVE TAKING

Things appear differently depending on where we are (position) and what we can see from where we are (visibility).

Curriculum area: Geometry - Properties of Shapes.

Children are working in pairs with 3D shapes or are building shapes with multilink cubes and are asked to describe the properties.

Adult prompt: *"What does the shape look like to you? How many sides and corners can you see? What can your partner see? Does the shape look the same to them?"*

Spatial language
(model the words initially, then use in context):
same, different, part, pointy, flat.

SPACE
SPATIAL COGNITION TO ENHANCE MATHEMATICAL LEARNING

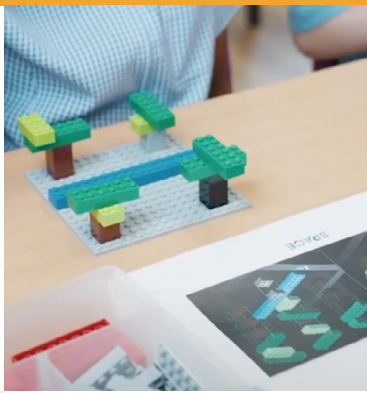
Space Lego® session

COMPOSITION AND DECOMPOSITION

Understanding of structure, parts and wholes.

The child is using the 'exploded' picture of the Lego model.

Adult prompt: *"This picture pulls the model apart. The lines show you how the parts connect together to make a big model. Can you tell me how that is helpful? Can you tell me how many pieces you need for this part?"*



Spatial language
(model the words initially, then use in context):
symmetrical, part, whole, on top, under.

SPACE
SPATIAL COGNITION TO ENHANCE MATHEMATICAL LEARNING

Mathematics

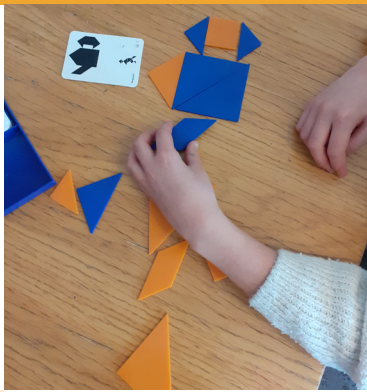
COMPOSITION AND DECOMPOSITION

Understanding of structure, parts and wholes.

Curriculum area: Number – Multiplication and Division.

The child has 25 counters.

Adult prompt: *"Can you separate your counters into 5 groups? How many are in each group? How else can you partition the counters?"*



Spatial language
(model the words initially, then use in context):
part, whole, combine, separate.

SPACE
SPATIAL COGNITION TO ENHANCE MATHEMATICAL LEARNING

Space Lego® session

COMPOSITION AND DECOMPOSITION

Understanding of structure, parts and wholes.

The child is building a model that has some symmetry (either the whole model is symmetrical or a row is symmetrical).

Adult prompt: *"What do you notice about the picture for this Lego model? [symmetry] Is your [row / model] symmetrical? Let's compare the left part and the right part."*

Spatial language
(model the words initially, then use in context):
symmetrical, part, whole, on top, under.

SPACE
SPATIAL COGNITION TO ENHANCE MATHEMATICAL LEARNING

Mathematics

COMPOSITION AND DECOMPOSITION

Understanding of structure, parts and wholes.

Curriculum area: Number - Number and Place Value.

The child has two digit cards, a 2 and a 3.

Adult prompt: *"Can you make two different numbers? What numbers could you make? Which number is bigger?"*

Spatial language
(model the words initially, then use in context):
part, whole, combine, separate.

SPACE
SPATIAL COGNITION TO ENHANCE MATHEMATICAL LEARNING

Space Lego® session

REPRESENTATION

Representations help children to make sense of spatial and mathematical structures and relationships, for problem solving. Examples include gesture, language, physical manipulatives, graphs and diagrams.

The child is counting the studs of a brick in the picture to work out which brick they need.
Or
The child is looking for a particular brick.

Adult prompt: (encourage use of spatial language and distinguishing between bricks) *"This is a [2 by 3] brick. It is longer than the [2 by 2] brick. What do you notice about these two bricks [point to two different size bricks]? Can you find any doubles?"*

Spatial language
(model the words initially, then use in context):
longer, shorter, wider, narrower.

SPACE
SPATIAL COGNITION TO ENHANCE MATHEMATICAL LEARNING

Mathematics

REPRESENTATION

Representations help children to make sense of spatial and mathematical structures and relationships, for problem solving. Examples include gesture, language, physical manipulatives, graphs and diagrams.

Curriculum area: Number – Fractions.

Children have a set of different shapes and are shading in half of each shape.

Adult prompt: *"How many different ways can you shade half of the shape? How will you know that you have shaded half of the shape?"*

Spatial language
(model the words initially, then use in context):
horizontal, vertical, half, part.

SPACE
SPATIAL COGNITION TO ENHANCE MATHEMATICAL LEARNING

Space Lego® session

REPRESENTATION

Representations help children to make sense of spatial and mathematical structures and relationships, for problem solving. Examples include gesture, language, physical manipulatives, graphs and diagrams.

The child is struggling to place a brick or is comparing bricks.

Adult prompt: *"How will you know which brick is the one you need? How are they different? How are they the same?" [compare by length, width, studs]*

Spatial language
(model the words initially, then use in context):
longer, shorter, wider, narrower.

SPACE
SPATIAL COGNITION TO ENHANCE MATHEMATICAL LEARNING

Mathematics

REPRESENTATION

Representations help children to make sense of spatial and mathematical structures and relationships, for problem solving. Examples include gesture, language, physical manipulatives, graphs and diagrams.

Curriculum area: Number – Number and Place Value.

Children are working in pairs to fill in an empty hundred square as quickly as possible.

Adult prompt: *"Where will you start to fill in the hundred square? What do you think might be a good way to do this to make sure you get all the numbers in the right place? Will you focus on the rows or the columns or both? Do you have to begin at the start?"*

Spatial language
(model the words initially, then use in context):
horizontal, vertical, half, part.

SPACE
SPATIAL COGNITION TO ENHANCE MATHEMATICAL LEARNING