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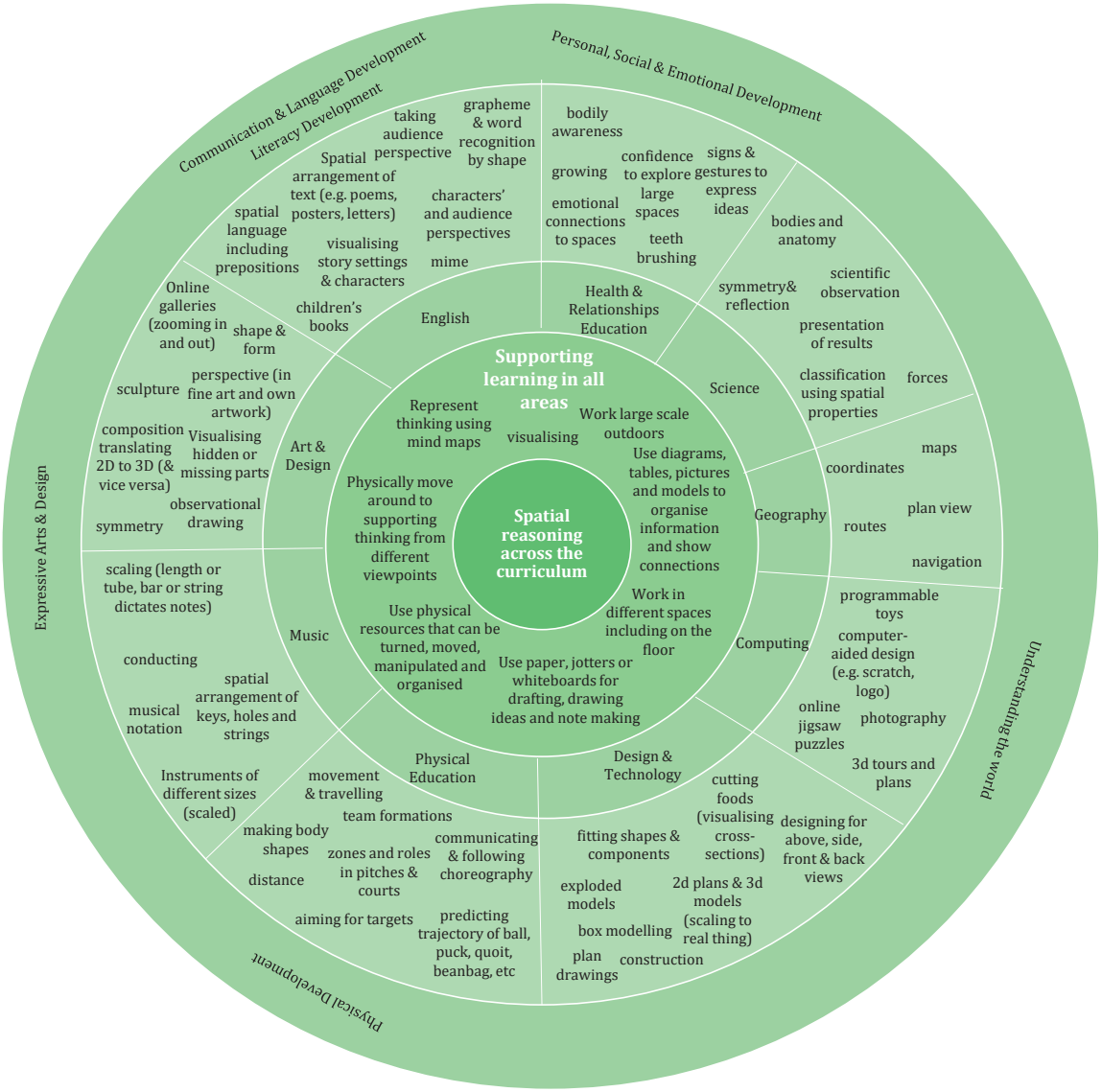
Developing spatial reasoning across the curriculum

Catherine Gripton

considers ways to develop spatial reasoning in the primary school, outside of mathematics lessons.

The link between spatial reasoning and mathematical learning is well established by research (Hawes & Ansari, 2020). It is crucial in geometry but also important in number and statistics, particularly in helping children to visualise and mentally manipulate. Many representations of number are spatial and it is the spatial elements of the representations which help the children to understand the relationships present within the mathematics. Developing children's spatial reasoning is likely, therefore, to be an underutilised route to improving mathematics achievement (Verdine et al., 2017). The challenge is how to prioritise the development of spatial reasoning in the busy primary maths classroom.

One possible solution is to look for opportunities to develop spatial reasoning within the routines of the classroom. The outdoor environment or playground can be developed to provide places to squeeze through, navigate around and experience from different heights, for example. Providing activities that are rich in spatial reasoning for wet/indoor playtimes can be another opportunity to develop spatial reasoning. Jigsaw puzzles, tessellation or kolam tiles, mazes, marble runs, construction kits, pentominoes, paper folding, pattern blocks, barrier games and spatial board games can all be enjoyable ways to develop spatial thinking. Similarly, classroom displays can be used effectively to reinforce spatial vocabulary. Displaying class photographs in a grid can provide interesting identifying children. Without using children's names, we can explain who is 'star of the week' or who is going to read next by giving spatial clues to which child it is based on where they are on the grid, *e.g. "The person who is on the right of the board, above Aroon but not next to Maria-*



Sol" or "The person three squares away from Amma and two squares away from Keira".

Another possible solution is to look for opportunities to develop children's spatial reasoning through the teaching of other subjects or areas. This can have the benefit of improving their learning within another subject as well as their mathematical learning which is enhanced by applying it in a meaningful context provided by that subject. There are many opportunities to develop spatial reasoning across the curriculum. The circular diagram captures some generic as well as some subject specific ones. There will be many more. The subject specific opportunities are divided into the National Curriculum subject areas (for England) with the labels around the outer circle indicating broad connections with the areas of learning from the EYFS in England. Drawing children's attention to the spatial aspects in these activities, modelling spatial language and encouraging children to talk about or consider the spatial features and relationships that they perceive are all ways in which spatial reasoning can be developed across the curriculum.

Hawes, Z. & Ansari, D. (2020) What explains the relationship between spatial and mathematical skills? A review of evidence from brain and behavior. *Psychonomic Bulletin & Review 27*, 465–482.

Verdine, B.N., Golinkoff, R. M., Hirsh-Pasek, K. & Newcombe, N. S. (2017) Links between Spatial and Mathematical Skills across the Preschool Years. *Monographs of the Society for Research in Child Development*, 82(1), 1–150.

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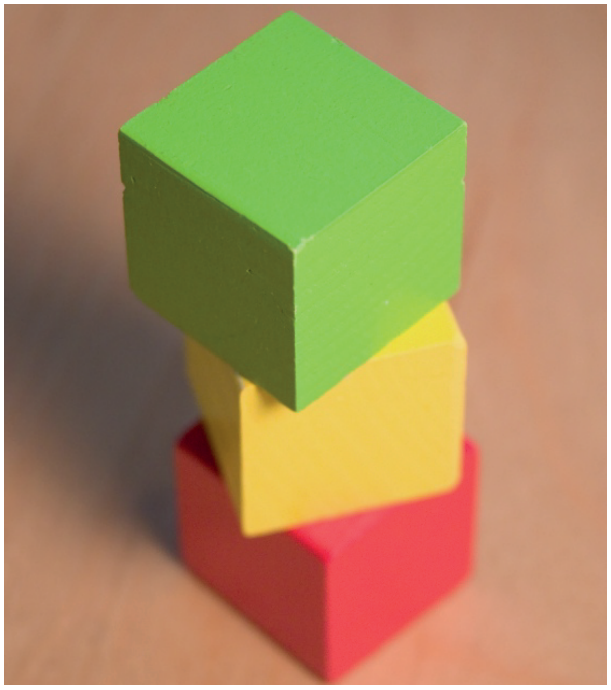
Three Block Towers



How many different towers can you make using one red, one blue and one yellow block?

How many can you make if you have a green block as well?

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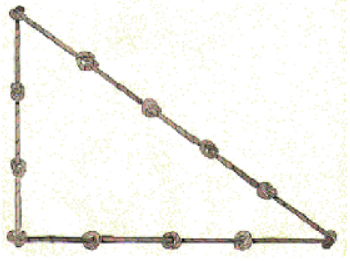
Egyptian Rope

The ancient Egyptians were said to make right-angled triangles using a rope which was knotted to make 12 equal sections.

If you have a rope knotted like this, what other triangles can you make? (You must have a knot at each corner.)



What regular shapes can you make - that is, shapes with equal sides and equal angles?

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