Preschool Insights & Research

BUILDING EARLY MATH SKILLS

"Math is like ice cream, with more flavors than you can imagine - and if all your children ever do is textbook math, that's like feeding them broccoli-flavored ice cream."
– Denise Gaskins, author of *Let's Play Math*

On a recent visit to a preschool classroom, the teacher pointed to one child and exclaimed proudly, "He's my maths genius." It was apparently no coincidence then, that just before that exchange I had watched as the boy took three equal sized large squares, and wishing to combine them to make an even larger square, spent the next few minutes putting a variety of smaller shapes together to craft his fourth quarter. His attention to the tangram-like puzzle was borne not out of necessity, or instruction, but to satisfy his own curiosity and creativeness. Ultimately, it was a means to an end, to continue his play. In mere minutes, this five-year-old achieved a pleasing square that most of us would have struggled to craft given the same time and resources.

When I talked to the boy, his answer to why he had constructed the large square was simple: "I needed a bigger square." He had a bigger canvas to work on, allowing him to scale up the game he was playing. The mathematical conundrum was not solved for the sake of math alone, but to serve a wider purpose. With our short conversation done, he set about driving his cars around on the bigger area.

This example encapsulates two key points: that visual-spatial skills and mathematics have significant overlap, and children benefit when provided with reasons for applying their mathematical knowledge. These are explored by Verdine et al. in their study Deconstructing Building Blocks (2014), which focuses on preschoolers' spatial assembly and how it relates to early math skills.

The study argues that preschool children develop important early math skills in a playful, hands-on setting. Building with blocks provides opportunities to develop skills including, but not limited to:

- Experimentation – an exploration of a certain space and tools to "see what happens," without preconceived notions of how things should work, and therefore little fear of failure
- Means-ended creativity –an attempt to solve a problem and learning how to work within given constraints to create diverse outcomes
- Developing own voice – being able to express creative accomplishments, providing one's own views and interpretations, rather than simply recounting
- Create a vision – building on pre-existing knowledge to solve a problem, creating new pieces to complete old puzzles

Verdine et al. conclude that using blocks encourages the decomposition of structures into components, helping prepare children to recognize that large objects can be made of smaller parts. Also, when building with these blocks a child begins to compare sizes, figuring out how to build something bigger, and discovering that bigger can be defined by various criteria: length, area, volume, amount of blocks.

Playful Learning

A key aspect of these playful learning experiences is provided in the reasoning for using math in the first place. Like the boy constructing his bigger square, he clearly had a reason for tessellating the shapes in such a manner, to improve his game. The Verdine et al. study discusses the hidden gains made here. The game provided the purpose for building the bigger square, the enthusiasm for creating such a precise mathematical construct, and the motivation for persevering until it was complete. Also, it probably exposed the learner, prompted by the teacher, to further spatial language such as above, below and next to.

The importance and development of these early spatial and building skills is not limited simply to mathematics, of course. Many researchers discuss the positive correlation between a child's spatial skills and ability to solve mathematical word problems, especially when developing visual-schematic representations. Others, including Wolfgang, Stannard and Jones (2001), also conclude that while mentally manipulating information about the shapes and spaces around them, a child is simultaneously developing critical skills for science, technology and engineering. All while playfully exploring math.

References

Verdine, Golinkoff, Hirsh-Pasek, Newcombe, Filipowicz, and Chang (2014) Deconstructing Building Blocks: Preschoolers' Spatial Assembly Performance Relates to Early Mathematical Skills. Child Development, May/June 2014, Vol. 85, Number 3.

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