

Adapting Manipulatives to Foster the Thinking of Young Children

I frequently use pattern blocks in my kindergarten classroom to help students investigate and predict the results of combining shapes. Because I have a magnetic chalkboard, I decided to put pieces of self-adhesive magnet strips on the backs of some of my pattern blocks. Magnet strips can be purchased inexpensively at most craft stores or from school supply catalogs.

Using these magnetic pattern blocks made it easier for me to demonstrate ideas to my class, such as how to use different combinations of pattern blocks to fill in outlines with the same area, or how to use the blocks to make beautiful tessellating designs. Everyone could see what I was doing on the chalkboard, and my work did not shift as I was demonstrating. The magnet strips worked so well for me that I decided to back even more blocks with magnet strips for the children to use. Now my chalkboard has become another mathematics center for my students, who love to make beautiful linear patterns, geometric pictures, designs, and tessellations with these magnetic blocks. Another unexpected benefit of the blocks was that the children often used chalk to name their designs right there on the board.

Later, I purchased inexpensive metal cookie sheets to use with the blocks. These worked very well. Children who had been frustrated by their own emerging fine motor skills found that the designs they built on the cookie sheets stayed in place. This allowed them to concentrate their thinking on the design elements and the effects of combining shapes, instead of having to continuously straighten the pattern-block pieces. They liked the ability to hold up their designs for inspection and save their work from one day to the next, something that could not be done when they built pattern-block designs on the floor or on tables.

Since creating these magnetic pattern blocks for my class, I have found that the children build more complex designs, spend a greater amount of time working with these materials, and are more willing



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to work with another person on a design because another person cannot easily “bump” the design.

A delightful episode occurred as a direct result of modifying the patterns blocks in this way. Two children were using the magnetic pattern blocks, a paper activity page (see **figs. 1** and **2**), and a cookie

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Figure 1

"Geome-tree" game

Suggested grade level: K-5

Materials needed: Pattern blocks
"Geome-tree" game board

Prerequisite: Ample time to free-explore pattern blocks

Key ideas: Exploration of congruence of pattern-block shapes
Increase in knowledge of plane figures
Development of spatial visualization and problem-solving skills
Development of strategic-planning skills



Procedure:

Place the game board in sight of all students. Have the students work with a partner and take turns choosing a pattern block and placing it anywhere on the "Geome-tree" game board. (A block can take up 1, 2, 3, or 6 triangles. No block can partially cover a triangle.) The player to put the last pattern block on the game board is the winner.

Because this game is designed to develop strategy and spatial problem solving, do not talk much about how to play the game. Listen to the children as they discuss their strategies with one another. More advanced students will develop more sophisticated strategies for winning, but all students can learn from the game.

Extensions:

After the students have had many opportunities to play the game, ask the following questions: What did you discover about the pattern blocks

as you played this game? What was the hardest part about the game? What would happen if you could use only one color of block when it was your turn? What would you change about this game?

Have children write strategies for winning in their journals. For a more difficult game, remove the interior lines. Change the shape of the game board according to the season or unit of study. Or change the rule for winning: The player to put the last block on the board is the loser. Play both ways and develop strategies for both games. For a more difficult game, eliminate the interior lines.

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sheet. They were working to fill in a large triangular area with pattern blocks when one of them called me over to explain that they had invented a new game: “See, we take turns putting a pattern block on the ‘tree.’ It can’t cross any of these lines. The last one to put a shape on is the winner.” This game, which the class finally dubbed “Geome-tree,” became a class favorite. It gave the students many opportunities to use visualization, spatial reasoning, and geometric problem solving as they tried to outwit their partners and place the last block down. I am certain that supplying the students with magnetic pattern blocks helped them “bypass” the frustration of shifting pattern-block pieces and concentrate on the flips, slides, turns, and shape substitutions they needed to make in order to play thoughtfully.

To extend this idea, teachers of older learners or students with limited motor skills may find that adding magnets to tangrams or other manipulatives and models, such as fraction circles or base-ten blocks, will eliminate frustration, improve focus, and foster a deeper level of thinking in their students. ▲

Figure 2

“Geome-tree” game board (enlarge for classroom use)

