Manipulatives: A Hands-on Approach to Math

Many of us can remember back to a time in America when all that teachers expected us to do with our hands in the classroom was to fold them. But now that the power and effectiveness of hands-on instruction has been proven in a wide range of subject areas—particularly math—those days are over. Whether using traditional activities, such as counting with beans or coins, or more sophisticated manipulatives (*e.g.,* geo-boards, tangrams, and pattern blocks), hands-on learning helps students to more readily understand concepts and boosts their self-confidence.

Harnessing the power of manipulatives has proven invaluable in the teaching of mathematics. Students are better able to visualize math concepts and gain insights into necessary fundamentals when they use rods, cubes, and other tools. There are many simple hands-on projects that make math fun and educational for children. Stick bundles, flipbooks, flash cards, and puzzles can be effective tools for teaching number facts. A scale for measuring mass and volume can be built using clay, pencils, Styrofoam cups, and string. Tangrams and fraction pieces can be cut from foam or construction paper.

Mixing paint colors brings the concept of ratio alive. For example, one part yellow to two parts blue makes a different green than two parts blue to one part yellow. These results can be charted so other students can get the same results. Children also can make probability games by coloring different shapes on cards and then charting how often a particular shape comes up. Learning becomes interactive and engaging as students become comfortable with their unique learning styles through these active learning experiences.

Principal Thomas Pesce of Stratfield Elementary School in Fairfield, Connecticut, taught math and science before becoming an administrator. He feels that utilizing a multisensory approach targets the strongest learning channels of individual students. "This is beneficial for all children regardless of their abilities," he says, and cites the value of pizza fractions, inchworms, geometric shapes, tiles, Cuisenaire rods, dice, and other manipulative materials in helping students visualize concepts, construct meaning, and integrate a more tangible understanding of abstract facts.

Principals have a key role to play in helping teachers feel confident about using manipulatives in math and other subject areas. It is important to provide them with encouragement, pedagogical support, and professional development workshops.

A new large-scale study confirms what most principals and teachers have long believed. Active learning experiences using manipulatives appear to function as learning anchors that organize and integrate classroom learning, helping make aspects of what students need to learn more visible than abstract, conceptual instruction.

The study, *The Academic Value of Hands-on Craft Projects in Elementary Schools*, prepared by an independent educational research organization at the request of the Hobby Industry Association, reports findings from its survey of teachers:

- A substantial majority (90 percent) said that hands-on projects help students understand basic ideas, and 82 percent said that handcrafted projects help their students apply information in new situations. 85 percent of the teachers also agreed that long-term hands-on projects give students a greater depth of understanding than more conventional instructional methods.
- While 46 percent of teachers viewed hands-on projects as an effective learning technique for all students, 54 percent said that this approach is particularly well-suited for students who learn more effectively in non-traditional approaches, particularly visual or kinesthetic learners, slow readers, and students with limited English-language skills.
- The teachers noted significant differences in learning behaviors when students are involved in hands-on projects. They reported increases in student motivation, willingness to ask questions and volunteer information, enthusiasm, and attention to assigned tasks.

Hands-on educational experiences move students beyond the traditional and passive practices of teaching and learning by incorporating creation, expression, and the presentation of ideas. Spectacular results can be achieved when learning is taken off the chalkboard and literally put into the hands of the learners themselves.

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FOR MORE INFORMATION

For the full report of *The Academic Value of Hands-on Craft Projects in Elementary Schools*, go to **www.teacherplace.org**.