

Watch Math Become Easy for Little Learners with Manipulatives

THE BENEFITS OF USING MATH MANIPULATIVES IN EARLY EDUCATION – PRESCHOOL MATH – KINDERGARTEN MATH

When I was a child learning math concepts for the first time, I don't recall ever using math manipulatives as part of the learning process. In fact, the only real memory I have of using a math manipulative was when my parents gave me a multiplication chart. This helped me tremendously in understanding the basic ideas and rules of multiplication.

I haven't always been great at math. In fact, I struggled in math as a child. Through high school, and certainly in college, however, I did very well in mathematics. I believe that much of my personal struggle with math as a child was more a result of motivation. The lack of motivation was due to my lack of understanding of the abstract concepts. This could all have been prevented had my, very well-meaning teachers more avidly supported the use of math manipulatives.

Manipulatives provide a more significant opportunity to experience and discover abstract math concepts. They work to engage students in their learning of such abstract ideas as they become more concrete.



There are a number of benefits to the use of manipulatives in math instruction and practice. This is especially true (but not limited) to early learners (preschool through second grade). In this blog, I discuss four of the primary benefits. I also provide specific examples of how math manipulatives can be implemented, along with related activities for preschoolers and kindergartners.

But first, let's discover exactly what manipulatives are in learning.

WHAT ARE MANIPULATIVES IN LEARNING?

Manipulatives are physical objects, (sometimes single-dimensional objects) that are used as teaching tools. They assist children through the learning process. The National Council of Teachers of Mathematics (NCTM) defines a manipulative as, "...materials [that] are supports for children to explore and make sense of mathematical ideas—but only if the children actually handle and manipulate them. They are often thought of as a representation for a concept."

Manipulatives can be beads, buttons, dominoes, beans, or berries. They can be pipe cleaners, craft sticks, cups, puzzle pieces, blocks, and even the age-old use of our fingers. Really, they can be just about anything. Manipulatives are most commonly used as counters. However, they can also be used in games and activities that build and increase number sense in children.

WHY ARE MANIPULATIVES USED IN MATH?

Manipulatives are highly beneficial in teaching math because they:

1. *Provide tangible and visible structures for learning abstract concepts such as those we learn in mathematics.*

For example, a young child is given a number sentence using addition or subtraction. The child is responsible to complete the sentence by giving the correct answer. Without manipulatives, the child may have a difficult time keeping track of just how many he has already added, or subtracted from the given number.

By providing counters, the child is able to take a relatively difficult and unnatural mental task and train the brain to count using the corresponding number of counters. The counters help the child to track how many he has added or taken away.



In the end, the child is able to find the correct sum total and complete the number sentence.

Try this activity with your preschooler or kindergartner

- Write between five and seven number sentences using addition on a sheet of paper, leaving plenty of space between each one. [EX... $4 + 2 =$].
- Place a box around each number sentence, making sure to leave space for your child to write their answers.
- Provide a bowl filled with counters for your child. These can be buttons, beads, pom poms, or beans. Or use checker pieces, Lego bricks, dot markers, or anything else you have around the home.
- Now ask your child to count the correct number of counters for each number sentence. He then places each group next to the number. Your child can focus on completing one number sentence at a time.

- Finally, once your child has counted and placed all the counters for the number sentence, have him count and write how many in the box.
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2. Allow students to see mathematical ideas represented in multiple ways such as stacking, sorting, moving, filling, highlighting/coloring, etc.



A wonderful example of this is when children are learning the foundations of multiplication.

As children learn difficult mathematical concepts such as addition, take away (subtraction), and multiplication, it helps to provide visual representations of such concepts.

For example, a child sees five groups of stacked blocks. Each stack has ten blocks. The child can more easily grasp the idea of grouping and sorting as a means of counting. If each stack has ten blocks, and there are two stacks, the child can come to the conclusion that two tens equal twenty.



These sorts of grouping and sorting exercises lay an early foundation for multiplication. In short, grouping, stacking, sorting, moving, filling, and other similar exercises help in laying an overall foundation for understanding numbers and counting. These activities also help make clear the relationships between numbers, in addition, subtraction, and higher levels of mathematics as well.

Try this activity with your kindergartener once they can count to 100

Count-by-Tens-Watermelons [Download](#)

- Download this *Count by Tens* activity sheet.
- Use *Lego* bricks, beans, beads, or buttons for this activity. Ask your child to count ten and place them in a pile. You can use small dixie cups or similar items for this. If using *Lego* bricks, your child can simply stack them into a tower.
- Repeat the steps until there are a total of ten piles.
- Now, starting with one pile at a time, have your child count each pile and write the numbers by ten. In the first pile he will count 1, 2, 3, 4...and up to 10. Then he will write 10 on the *Count by Tens* activity sheet. In the second pile he will count 11, 12, 13, 14...and up to 20. Then he will write 20 on the *Count by Tens* activity sheet.
- Continue the previous step until your child has counted each pile and reached 100.
- Next, have your child read each number he wrote on the activity sheet. Practice this a few times and listen to him count by tens all the way up to one hundred.

3. Support learning through observation, experimentation, and deductive reasoning.

I mean lifting abstract ideas such as those found in mathematics up and off the pages, so that they are tangible for problem-solving. This applies to math from as young as preschool. It also applies in the more complex mathematics learned and practiced in college and in many fields within the sciences.

In math, words, numbers, and symbols are used to represent ideas. Manipulatives help children construct a more concrete understanding of those ideas. Then, those ideas can more clearly be connected to their words, numbers, and symbols through experiential observation and discovery.

For example, a child is learning to add two numbers together. There are two groups of buttons and she is asked to write and tell how many. In the first group, she counts ten buttons. In the second group, she counts four buttons. Next, she writes out a ten and a four on each side of an addition sign. After she combines the buttons, she counts them

to find the sum of both groups is fourteen. Finally, she writes a fourteen and discovers that $10 + 4 = 14$.



By doing the above task with various problems and solutions, the child begins to understand the concept of addition. That is, the child knows that addition is finding the sum (or total) number when multiple groups of numbers are combined. The child learns that Group A combined with Group B will always equal the sum number of Groups A and B combined. This is how she uses deductive reasoning to solve other math addition problems.

Try this activity with your preschooler or kindergartner

- For this activity, a tabletop chalkboard is ideal. If you do not have a chalkboard, you can use sheets of paper.
- Place a random handful of buttons, pom poms, or any other relatively large manipulative onto the table.
- Now place another random handful in a separate pile in front of your child.

- Ask your child to count each pile separately, tell, and write how many.
 - On the chalkboard or sheet of paper, have her write how many in a number sentence format [$7 + 4 = ?$]. You can use boxes to indicate where she can write each number.
 - Now, ask her to count all (both piles) together. Tell and write how many.
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4. Encourage student engagement, and ownership of the learning process, and increases self-efficacy as students master the skills.

If learning is just about completing a bunch of worksheets and mundane rote memorization of things that seem useless, students may often lack interest and passion. I believe many students feel this way. They have difficulty imagining a future for themselves that includes any of the math concepts they are learning. When given a sheet of paper with several math addition problems and asked to solve the problems, many students perform the task with little to no ambition. This is true even of the most avid math learners.

Students tend to enjoy the learning process more when they can take control of their own learning. Also, taking control of their learning increases their self-efficacy. Finally, when students can visualize how what they're learning can be useful to them in their futures, motivation, and enjoyment of the learning process increase.

When asked to *demonstrate* a math concept, these students will eagerly find ways to solve the problems. I should state that demonstrating a math concept differs largely from just completing a math worksheet.

Whether it is drawing, color coding, using counters, using their fingers, dice, or dominoes. Or whether it is any other type of manipulative, students are much more eager to learn and master the skills.



Try this activity with your preschooler or kindergartner

- Let's continue now with the previous activity. Ask your child to come up with his own number sentences using numbers from 1-10 for preschoolers. For kindergartners, use numbers 1-20. Your child will enjoy writing and solving his own number sentences.
- After he writes a number sentence, allow him to use his counters (buttons or any other counter you have available) to count and tell how many.
- Then, have him write the answer on his chalkboard or sheet of paper.
- Repeat this exercise as desired.

To conclude, manipulatives are highly effective when teaching number sense and abstract math concepts to learners. Manipulatives provide tangible and visible structures for learning math. Students can see, observe, and experiment with abstract and complex ideas in a variety of ways. As manipulatives serve to increase number sense and build solid foundations in math, students gain a greater ability to use deductive reasoning to

navigate and solve problems. Finally, manipulatives also serve as a method of motivating students' desire to take ownership of their own learning. This, then, increases self-efficacy concerning the learning process and their mastery of the skills and concepts.

For further information on the use of manipulatives in math, check out this blog post from Scholastic Parents on [How Math Manipulatives Can Help Kids Learn](#). You can also read this essay published by Northwestern College, Iowa, [The Importance of Using Manipulatives in Math Class](#).

MATH MANIPULATIVES IN PRESCHOOL AND KINDERGARTEN