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Please enjoy this complimentary excerpt from *Mastering Math Manipulatives, Grades K-3*, by Sara Delano Moore and Kimberly Rimbey.

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Materials

- Virtual linking cubes (or physical linking cubes and work mats)
- Blank paper for recording thinking if not using an annotation tool

Organization (virtual)

- **Getting Started:** Ensure students know how to use the virtual linking cubes. Review annotation tools, taking screenshots, and so on.
- **Winding Down:** Take screenshots to save student work.

Mathematical Purpose

Students will connect physical and visual representations as they use linking cubes and number lines to represent addition problems.

Manipulative Illustrated

Unifix® Cubes app from Didax:
www.didax.com/apps/unifix

Steps

1. Write the **expression** $3 + 4$ for all to see.

$$3 + 4$$

Ask students to describe what it means with a partner. Encourage them to use linking cubes to help them in their explanations.

2. Introduce the notion of a number line, comparing and contrasting it to a “number track” made from linking cubes. Specifically, point out that the tick marks on the number line correspond to the grooves between each linking cube and represent the distance between the tick marks, not just the tick marks themselves.
3. Ask students to use virtual annotation tools (blank paper or whiteboards for physical linking cubes) to record a number line that corresponds to the number track they created in Step 1.



4. Repeat this process once or twice on the first day and then a few times per week for four weeks.
5. *Extension:* Students may use a similar process for solving subtraction, multiplication, and division problems. In addition, students may solve two-digit addition problems by snapping together groups of ten to have several tens and ones or by using the rods and units from base-ten blocks. This method may also be used to support students with skip counting, repeated addition, or multiplication by creating linking cube trains of a designated unit.

Why This Manipulative?

Because of the ability for linking cubes to fit together into trains, towers, or tracks, they have a linear attribute that resembles that of a number line. This provides an opportunity for making concrete connections to number line diagrams. Furthermore, the

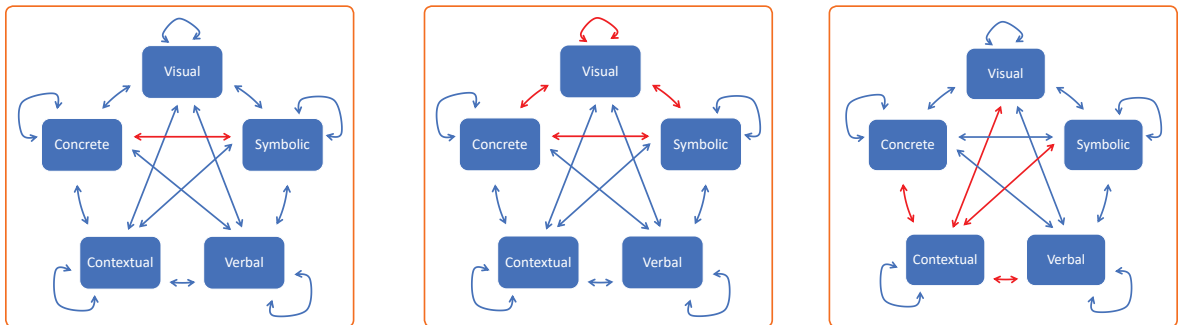
attribute of snapping provides a concrete and visual way to show the actions of joining and separating that are prevalent in context problems in the primary grades. Whether adding and subtracting single units or working with joining or separating equal groups, the action of physically snapping the cubes together and apart to indicate joining and separating is a worthy feature.

Developing Understanding

Working with number lines proves to be quite difficult for many young learners. Seeing quantity as linear as indicated by the distance between the number line tick marks often eludes understanding. Therefore, using a tool like linking cubes can help fill in this gap. Often referred to as number tracks, linked cubes can be substituted for number lines, allowing the students to count the number of cubes that run the length of the number track.

When helping students make the connection between linked cubes, or “number tracks,” and number lines, explicitly point out that each space on the number line represents one cube. The tick marks, usually enumerated, show the end points of each cube. As seen in the photo to the left, the tick marks align with the spaces between each cube. Once again, it’s important to point this out to young learners as they often think of the tick mark itself, rather than the space between tick marks, as the object of the count. Repeat similar activities frequently, helping students make these connections.

Featured Connection



Source: Lesh, Post, & Behr (1987).

This activity begins with the Build the Equation strategy as students connect symbolic to concrete representations by building the given equation with linking cubes. The next connection is made by using the Create a Diagram strategy as students create, examine, and discuss the relationships between the linked cubes, or “number tracks,” and number lines. This connection is deeply critical in helping students understand how a number line works, as described earlier. Finally, it is optional for students to Write a Word Problem to show how the symbolic, concrete, and visual representations connect to a contextual situation. Because this activity is intended to be repeated multiple times, you may choose to scaffold these strategies over time rather than doing them all at once.