

MASTER BUILDER

GEOMETRY • LOGIC

- Spatial visualization
- Following directions
- Congruence
- Visual perception

Getting Ready

What You'll Need

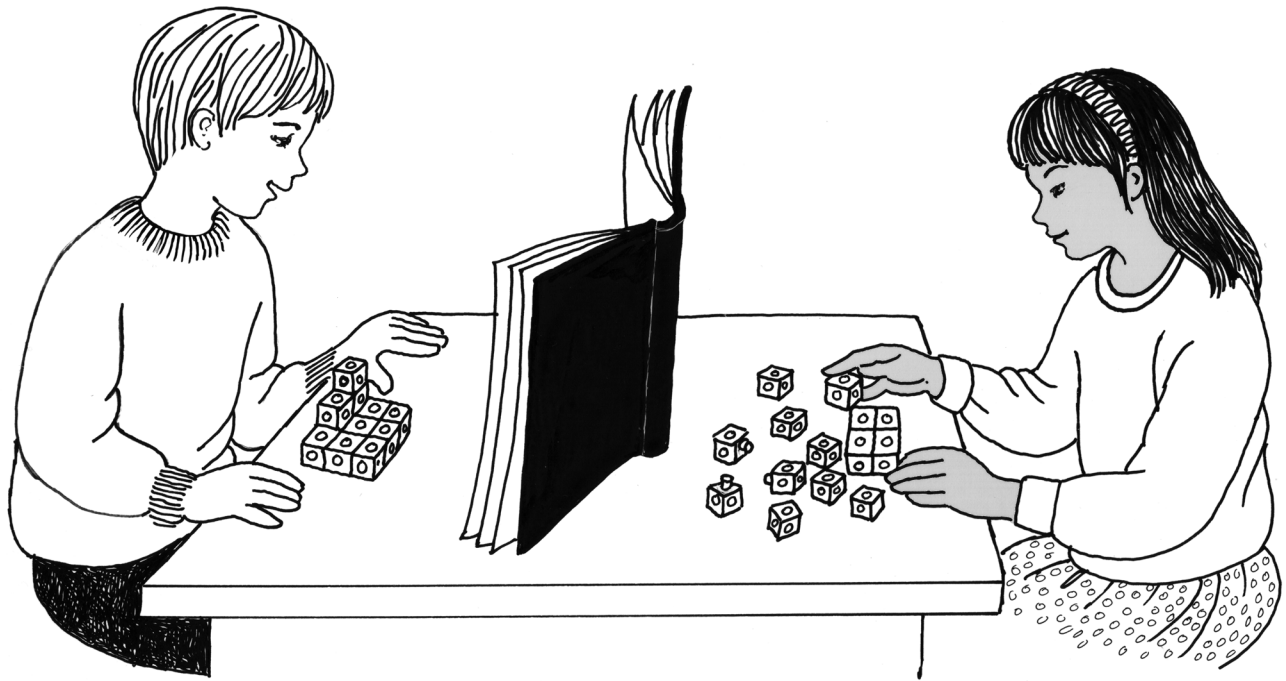
Snap Cubes, 12 of 1 color per child

Books or heavy folders to use as barriers

Overview

Children build a structure with Snap Cubes, keep it hidden from view, and then describe the structure in such a way that their partner will be able to build an identical structure. In this activity, children have the opportunity to:

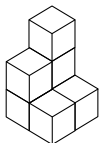
- ♦ use precise language to describe geometric attributes and spatial relationships
- ♦ improve their listening and visualization skills
- ♦ practice using effective questioning techniques



The Activity

Introducing

- ♦ Build a Snap Cube structure similar to the one shown at the right.
- ♦ Ask children to imagine that they are on the telephone with their best friend and they are trying to instruct their friend on how to build an identical structure. Ask volunteers for some helpful ways to describe this structure so that the friend at the other end of the telephone would be able to build the structure.
- ♦ List the descriptions on the chalkboard. Accept all reasonable descriptions. Encourage class discussion of descriptions that children find questionable.



On Their Own

Can you describe your Snap Cube structure so that someone else could build a structure that is exactly the same as yours?

- Work with a partner. Decide who will be the Architect and who will be the Master Builder. Set up a barrier so neither of you can see the other's workspace.
- The Architect uses 8 to 12 Snap Cubes to build a structure. Then the Architect describes the structure to the Master Builder.
- The Master Builder listens to the description and tries to build a structure that exactly matches the Architect's. The Master Builder may not ask any questions.
- When the Master Builder is finished, remove the barrier. Decide if the structures are exactly the same. If they are not, discuss why.
- Repeat the activity, but this time, the Master Builder may ask questions.
- Switch roles and try the activity again.

The Bigger Picture

Thinking and Sharing

After partners have each had at least two turns at being the Master Builder, ask children to describe what happened during the activity. Invite volunteers to discuss how successful they were in building matching structures.

Use prompts such as these to promote class discussion:

- ◆ Was it easier to be the Master Builder or the Architect? Why?
- ◆ Did it make a difference when the Master Builder was allowed to ask questions? Explain.
- ◆ What kinds of things were hardest to describe? What kinds of things were easiest to describe?
- ◆ Were there any mathematical words that you found to be useful in your descriptions or questions? Which ones?
- ◆ What tips would you give to an Architect? to a Master Builder?
- ◆ If you did the activity again, what would you do differently?

Writing

Ask children to tell about which they would rather be—the Architect or the Master Builder—and to explain their choice.

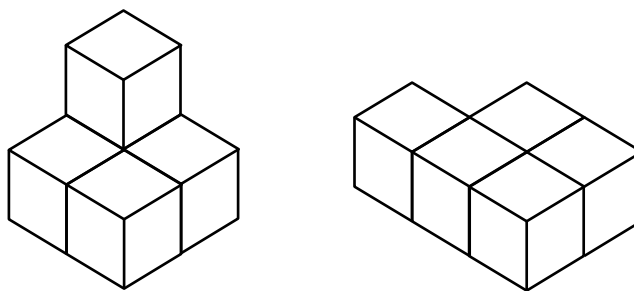
Extending the Activity

1. Ask children to repeat the activity with this change: The Master Builder may ask only *yes* or *no* questions.

Teacher Talk

Where's the Mathematics?

This activity of creating precise descriptions can help children strengthen their spatial reasoning skills as they convey information about a three-dimensional object through a verbal description. Children frequently find that a word or phrase can mean different things to different people. For example, when directed to place a cube “on top of” an existing 2-by-2 square, some children may build upward into a third dimension while others may extend the structure by adding to its length or width.



As children work through this activity, they gain an awareness of the necessity of establishing a common understanding to clarify terms that may be open to interpretation—terms such as *above*, *left*, *below*, *next to*, *between*, and *adjacent*.

The opportunity to use mathematical language in context is crucial in the construction of mathematical understanding. Mathematical terms such as *face*, *edge*, *adjacent*, *parallel*, *perpendicular*, *between*, and *diagonal* provide children with the means to give a more precise description of the structure. It is a good idea to keep a running list of mathematical terms on a large chart for all to see and refer to. This list should be compiled as the terms emerge in context and become part of the dialogue. In this way, a word is connected to an experience, helping to make discussion of the term meaningful. In addition, a picture or diagram drawn next to some terms on the list provides a good visual reference.

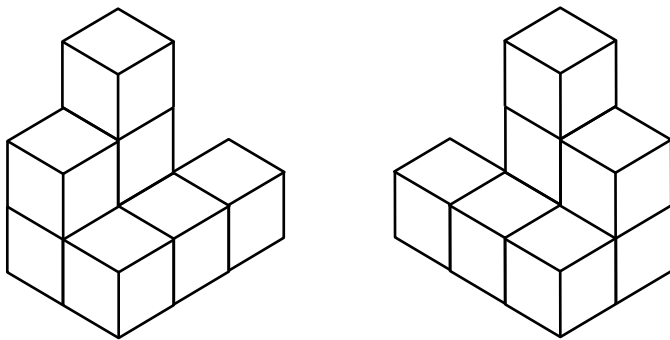
Children should recognize that the goal of the Architect is not to try to trick the Master Builder, but rather to provide useful descriptions that will enable the Master Builder to build an exact replica of the structure. *Master Builder* is not a competitive game. The importance of the skills brought to the task by *both* partners—describing, listening, visualizing, and later, questioning—

You may want to have children write their own definitions of the terms. This process can give insight into the level of understanding that children have attained. It also provides children with the opportunity to clarify and develop their thinking through the process of writing.

2. Have children work with their partners to build a structure and write a set of directions that could be used to build it. Have children exchange directions with another team and try to build each other's structures.

becomes more and more evident as children repeat the activity and take turns at the two roles.

In comparing the two structures, children have an opportunity to deepen their understanding of congruence. They need to scrutinize their structures carefully to determine whether or not they are identical. Since the Master Builder's structure must be congruent to the Architect's, children may need to change the orientation of the structures by flipping and rotating them. Structures that are mirror images, such as the ones pictured below, are not congruent.



The task of comparing structures provides immediate feedback for the partners on how well they were able to communicate with each other. Children can figure out what descriptions may have been misinterpreted and discuss better ways of explaining or describing those particular attributes of the structures.

Some children may be frustrated by the rule that prohibits them from asking questions. This initial restriction helps children to focus on the information they need and on the value of forming good questions to get that information. Later, when children are allowed to add questioning to the activity, they may have acquired a sense of the kinds of questions that will provide the most useful information.

The ability to use precise language and follow directions comes with practice. Once children have acquired this skill, they will have a greater chance of succeeding not just in mathematics, but in any academic discipline that involves communications.
