

Create a Box Math Task Grades 3-5

Warning! This is not your typical lesson plan! The goal of this math task is to allow for students to be the ones doing the majority of the thinking and problem solving. They are not given the step-by-step instructions ahead of time like many of them are used to. Choosing to fight the battle of creating thinkers is not an easy one, but it is purposeful one. Also, this task, centered on problem solving, is designed to milk as many objectives from one scenario versus completely 20 problems on one content skill.

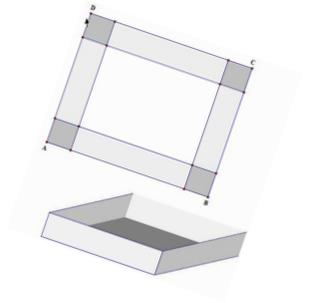
Notice and Wonder

Show various boxes, or pictures of boxes, made out of paper. These can be boxes that have been folded or cut and glued. The boxes should be a variety of sizes (shallow vs. deep). Ask:

"What do you notice about the boxes?"

Anticipated Responses:

This one is bigger/smaller, this one is shorter/taller, they are made out of paper, this one was glued in the corners, and this one has fold marks.



"What do you wonder about these boxes?"

Anticipated Responses:

How do you fold paper into a box?

How do you cut the corners to make a box?

Having manipulates out (paperclips, counting cubes, craft pompoms, etc.) will plant the seeds for them to ask how many of them will fit in the various boxes, which one holds more?

Having measuring tools out will also plant the seeds for questions like, how long, wide, deep are the boxes.



Teacher notice and wonder (if needed, the students may have already brought up these points):

I notice that a piece of paper measures 8.5 by 11 inches.

I wonder what would happen to the numbers if I make this two-dimensional paper into a three-dimensional box?

 *How many of them will fit in the various boxes, and which one holds more?*

Challenge the students to create their own box out of paper and add the twist that they will compete with the other groups to see whose will hold more of the manipulative. Once students start asking (aka thinking) about what tools they will need and possibilities they want to explore in creating their box, make supplies available.

Once each group has finished their boxes, have them calculate the volume based on the measurements of the completed box. Have groups exchange boxes, measure the sides and calculate the volume. Also have them count the number of manipulatives that fit inside the box.

As a whole group, graph the results and discuss why the boxes with the larger volumes can hold more manipulatives.

Measuring sides

In small groups, let students explore measuring dimensions of flat paper and then, measuring the boxes they created. Ask what they notice about what they are measuring. Responses should include that they have to measure a third direction (depth) for the three-dimensional objects.

Milking the Problem

Teacher's Notice and Wonder

I noticed that everyone started off with the same size sheet of paper.

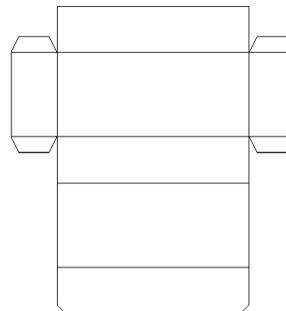
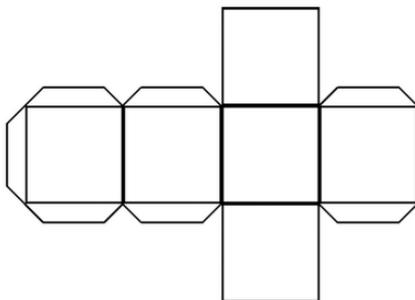
I wonder if the groups had been given different pieces of paper, would that have impacted the outcome? Would the group with the largest piece of paper win?

Task's Strengths

1. Creating the Boxes: Sometimes we tend to think things like this take too much time for "crafts" but in a case like this, students are thinking both critically and creatively and that is never a waste a time. They are exploring hands-on the difference of 2 and 3 dimensional shapes, problems solving how to make a box, and measuring in a way that accuracy has consequences.
2. Notice and Wonder- asking the students what they notice about the situation and then asking them what they wonder helps them generate the questions, fostering a natural curiosity and motivation to find the solutions versus being told what to find. Keeping the purpose of the lesson in mind, teachers should be ready to steer the conversation towards specific questions if it doesn't flow that way naturally.
3. Students get to explore several possibilities, see other students' thinking, and compare their outcomes to other students' outcomes.
4. The friendly competition of the groups brings in motivation and teamwork.

Alternative

If your students struggle with making the boxes, an alternative would be to have some templates run off so they could predict ahead of time, which would have the larger volume, justify their answer and they let them build it, measure it and compare. It takes some of the thinking away from them, but for those students that simply cannot get past that point without some assistance, this can be a lifesaver. You know your students best. If you believe they will benefit from choosing, you can show these at the beginning. If your students would tend to take this route before even trying to think about making the box, you may want to keep these out of sight until you identify those who really need them.



Content Skills: 2-Dimensional and 3-D Shapes, Area and Volume

Process Skills: Problem Solving, Reasoning, Representation and Communication

