



Growing Mathematical Ideas in Kindergarten

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Kindergarten is an important beginning. It can be the positive start of a child's lifelong exploration of mathematical ideas or it can lay the first stones in what can become an impenetrable wall between "real math" and "school math." In Growing Mathematical Ideas in Kindergarten, Linda and Rebeka present their vision of a kindergarten classroom that nurtures students' mathematical understanding. And they provide specific guidelines for creating such an exciting classroom, including how to establish a thoughtful classroom environment, make plans for teaching and learning mathematics, choose mathematical tasks, and assess for understanding. The following is excerpted from Chapter 4, "Choosing Mathematical Tasks."

The mathematical tasks we select greatly influence what our students learn about mathematics and how they view it. If the tasks are fragmented, rote exercises unrelated to their questions, children learn that mathematics consists of memorizing unconnected rules that are unnecessary to their lives. If, however, the tasks emphasize the exploration of ideas, the creation of relationships, and the forming of conceptual understanding, mathematics becomes an exciting arena of sense making. Therefore, we need to think critically about the characteristics of worthwhile tasks.

Most of us recognize the worth of a particular mathematical task when we experience it with our students. The children are engaged, and the activity stimulates the communication of ideas and, when finished, leaves the children with something of mathematical value. Certain characteristics increase the likelihood that a task will unfold in a worthwhile manner.

A Worthwhile Task Focuses on Significant Mathematics

A worthwhile task should encourage children to gain insights into the structure of mathematics and the relationships within mathematics.

Becky used to have her students cut out pictures of shapes from magazines. Her intention was to help children relate geometry to the real world. After she began to think more critically about the mathematics embedded in such tasks, however, she no longer found this activity to be worthwhile. First, most of the children's time is devoted to cutting, a physical task that requires a rather intense concentration on fine motor skills, rather than on mathematical thinking. Further, the mathematics is somewhat troubling. Children basically locate objects that they already think are a particular shape. For example, they find a picture of a pizza as an example of a circle and then cut it out. Not only does this do little to further their understanding of geometry, it might even provide them with the false notion that a circle is a three-dimensional shape.

Even at the kindergarten level, exploration of geometric shapes in the real world can be more mathematically focused. Becky now asks children to respond to what-if questions like What would happen if a kickball were shaped like a cube? After they talk about it for a while, she has the students test the difference between kicking a sphere and kicking a cube.

A Worthwhile Task Offers an Appropriate Challenge

Worthwhile tasks are geared to an appropriate level of difficulty. Tasks should not be presented in bite-size chunks that eliminate all procedural decisions and cognitive challenge. On the other hand, they should not be so broad that they overwhelm the children and leave them not knowing where to begin. Just as the question How many chins do you have? is too simple, the query How many chins are there in this school today? is too difficult. Becky must challenge children in order to instigate the growth of ideas, but that challenge must lie within the children's reach.

A Worthwhile Task Allows for Multiple Perspectives

Tasks that encourage multiple perspectives make it easier to meet the needs of a variety of learners. Such tasks are sometimes referred to as open ended. Tasks can be open in different ways. For instance, they may encourage various interpretations, various methods of exploration, various materials, various responses, various representations, and various related mathematical ideas

How Can I Create a Worthwhile Task?

The prospect of creating or selecting tasks that focus on significant mathematics, have a real-world context, offer appropriate challenges, and encourage multiple perspectives is daunting! One way to develop worthwhile tasks is to relate them to classroom events and issues. During the first few days of school, Becky holds small-group math workshops by gathering six children at a time. She asks the children to join her at a nearby table, on which she has placed a bucket of Unifix cubes.

Becky begins the small-group workshop with a question: "How many letters are there in your name?" The children work independently trying to answer the question. Children with names of three or four letters respond quickly. Most children with longer names find it more difficult.

ALLISON: Each time I try to count my letters I keep thinking I already had them.

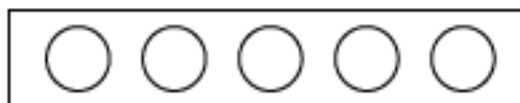
BECKY: What could you do about that?

ALLISON: Can I write my name down?

BECKY: Of course, if you think it would help.

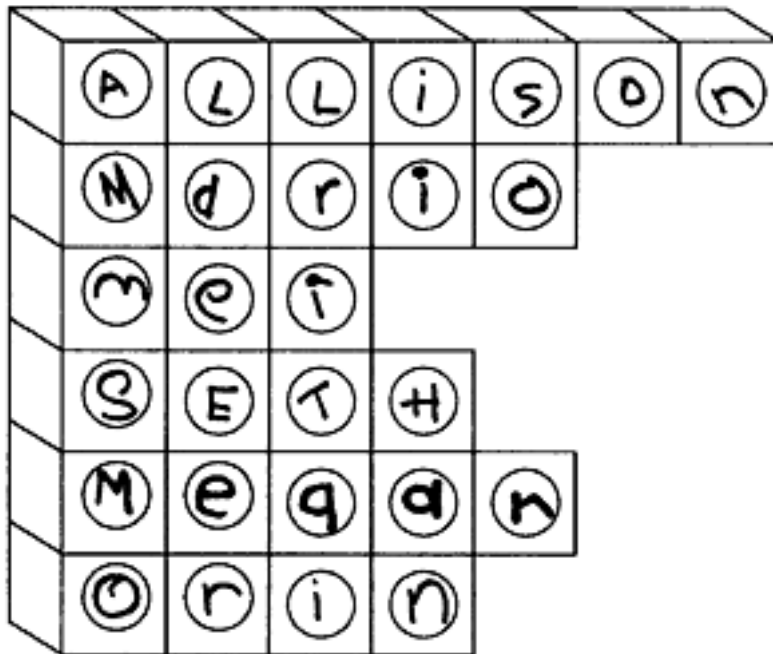
ALLISON: Oh boy, would it.

As the children determine the number of letters in their name, Becky asks them to snap together that many Unifix cubes. Then the children tell Becky the number of letters in their name and Becky hands them a strip containing that many dot stickers. Mario, for example, receives a row of five stickers:



The children then write the letters in their name on the dots and stick them, in order, to their train of cubes, one to a cube. As the children work, Becky notes how they determine the number of letters, how they count out the number of cubes to take, whether or not they ever double-check their counts, and any counting errors they may make. She also makes sure that names are spelled correctly, helping if needed.

When everyone has finished, the trains are laid in the center of the table.



BECKY: Whose name begins with the letter M?

MEGAN: Mine does.

MEI: Mine does.

MARIO: Mine does, too!

BECKY: How many names is that?

SETH: Three.

BECKY: How do you know?

SETH: I counted the names.

MEGAN: You could count the people.

BECKY: Whose names are four letters long?

ORIN: Mine is and Seth's is, too.

BECKY: Can you find a name with exactly six letters?

MEI: I don't see any.

ALLISON: That's a tricky question.

BECKY: Whose name has the greatest number of letters?

ALLISON: That's me.

BECKY: How did you decide?

ALLISON: It's the longest.

BECKY: Is there another way to tell?

ORIN: You can count.

Pursuing this activity early in the year allows Becky to engage children in meaningful investigations right away. It also gives her the opportunity to observe her students at work. She makes quick notes about the ways the children count, their name and letter recognition skills, and how they work in a teacher-directed group.

Another way to create worthwhile tasks is to build them around children's questions. Children naturally ask questions as they encounter their world, and their questions are by definition authentic. By creating tasks in response to these questions, teachers are taking advantage of teachable moments.