

Counting Collections

Lakeisha has lined up paintbrushes across a table and is rolling them one by one to the side. Tyler and Auveen are wrapping pencils into bundles. Maya is organizing toy kangaroos, and her partner, Max, is drawing a picture of how she is doing it. What is going on in this classroom?

Why Count Collections?

At the beginning of every school year, the five- to seven-year-olds at Corinne A. Seeds University Elementary School (UES) spend several weeks “counting collections.” UES, the laboratory school of the Graduate School of Education and Information Studies at UCLA, serves a socioeconomically and ethnically diverse student population from urban and suburban Los Angeles. The classes are multiage, and the five- to seven-year-old classes include children who would be considered kindergarten and first-grade students.

Our work in counting collections was inspired by Megan Franke, a parent at our school and a researcher in mathematics education and children’s thinking who has often worked in our classrooms. Megan encouraged us to try counting collections

of objects with our young children, believing this would provide children with rich opportunities to practice oral counting, develop efficient counting strategies, group objects in strategic ways, record numbers, and represent their thinking. Research shows that although counting is one of the best ways we know to help children develop number sense and other important mathematical ideas, we do not do nearly enough of it in elementary schools. Children need lots of experience with counting to learn which number comes next, how this number sequence is related to the objects in front of them, and how to keep track of which ones have been counted and which still need to be counted (Fuson 1988). Experience with counting provides a solid foundation for future experience with addition, subtraction, multiplication, and division (National Research Council 2001).

Convinced by the literature as well as the outcomes we have seen with our students, we have made counting collections a fundamental part of what we do with young children at UES beginning the first week of school each fall. We hope this article will provide a window on the process of counting collections in our classrooms as well as evidence that every child in our classrooms can build his or her mathematical skills by counting collections.

Identifying Collections and Beginning the Counting Process

At first, as the children are getting to know the classroom and we are getting to know them, we have them take an inventory of objects they find in the room, such as buckets of markers, pattern blocks, and Legos. We have also accumulated boxes of shells, keys, coins, bottle caps, and the



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like, all of which are available for the children to count. Later on, to add variety to what we have on hand, children bring collections from home, including objects such as hair clips, sugar packets, toy cars, beads, seed pods, acorns, pennies, and corks.

Initially, we simply ask the children to choose a collection, count with a partner, and record what they counted and what their total was (see **fig. 1**). Sooner rather than later we increase the complexity of the task by asking the children to also show us *how* they counted. **Figure 2a** shows Tess and Ashley’s recording of how they counted chains of ten links each. While Ashley moved the chains two at a time from the table to the floor, Tess counted out loud by twenties (**fig. 2b**). Their recording not only helped them keep track of their collection but also clearly represents their strategy.

For children who have had ample practice counting by ones, we find that packages of supplies from the supply closet make excellent collections for counting by groups. We challenge the children to count without opening the shrink-wrapped packages. Paper clips come in boxes of 100. If ten boxes are shrink-wrapped together, how many paper clips are in the whole package? How many paper clips do we have if we include the half-used box in the classroom? Resealable plastic bags come 125 to a box, so how many bags are in a case of ten boxes? Watercolor paints have eight pans in a box. How can we add those up without peeking into the boxes? These challenges push children beyond counting by ones. No longer able to touch each object or even

Figure 1

James and Theo used tally marks to keep track of the collection they counted.

James and Theo

153 □ cyubes

decide on how to group them, our older children begin thinking in multiples and invent impressive strategies for counting their collections.

Noticing What Children Do and Helping Them Notice What Others Are Doing

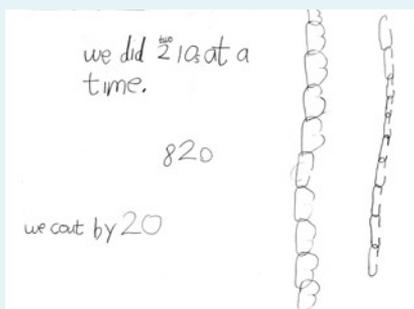
Counting collections early in the school year serves as an important assessment for us: We get to know the children as we watch them count. We find out who can make one-to-one correspondence and count consistently, who can “count on,” who remembers what comes after 59, and who can



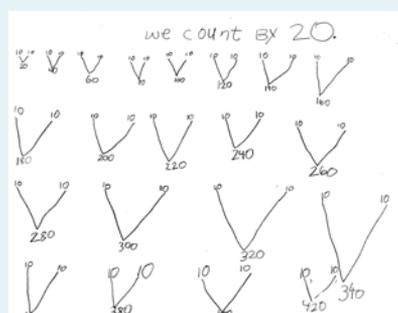


Figure 2

Tess and Ashley made chains of links to facilitate counting by tens and then by twenties.



a. Tess and Ashley's record of how they counted chains of ten links each



b. Their recording of moving the chains two at a time from the table to the floor

record the numbers they can count to. We watch to see if anyone is counting by twos or grouping objects into tens.

Always, when we let the children develop their own strategies that make sense to them, we are surprised and delighted by their thinking. We name each child's counting strategy and encourage the other children to give the various strategies a try. The "Jackson way" might be to move objects to one side to help keep track of what has been counted and what has not. Natalie's idea might be to use Dixie cups to group beads; she puts five beads in a cup and then counts up by fives. Jimmy might line up his collection of wooden people into "armies of ten." Once he has covered a table with little armies, he might notice that some of the armies are larger than others. He then makes adjustments as necessary so that each grouping has five rows of two and

then counts up his groups by tens. Alex might use a sticky note to write down how many blocks she counted today so that she does not have to count them over tomorrow. She will come back to her tray labeled "not counted" and count on from where she left off (fig. 3). All these strategies, coming straight from the children, become topics of group conversation as we gather on the carpet at the end of mathematics time.

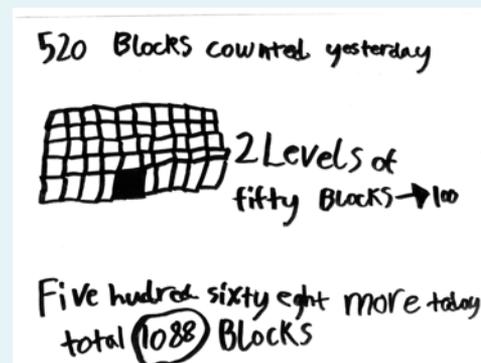
By the end of each hour-long session spent counting collections, some students have counted more than one collection and have multiple recording sheets, while others are still in the middle of their first counting project. We wrap up the session by gathering on the carpet and sharing the children's counting strategies as a group. We begin the next counting collections session by revisiting these strategies before we send the students off to continue counting their current collections or begin counting new ones.

Something for Everyone: Multiple Entry Points

At any given time, the students in any UES classroom are at different points in their development of counting skills and number sense. In our multi-grade classrooms, where students from two different grade levels (for example, second and third graders) are combined, teachers are continually challenged to create curriculum with multiple entry points. Perhaps the most convincing evidence for teachers

Figure 3

Alex's strategy for noting which blocks she has counted and which remain to be counted



that counting collections is valuable in our multiage classrooms is the ease with which we can engage and challenge children at different points in their development. By getting to know the children as we watch them count, we can figure out where they are on the trajectory of their counting development and stretch them forward.

As we walk around the room, we appreciate how many different ways the children are approaching the job at hand. Leo, who is just beginning to make one-to-one correspondence between the objects he touches and the counting words he says, has brought a collection of pebbles from home. He loses track of which pebbles he has counted and which he has not. We stop to talk about how he could help himself keep track. Instead of just moving the pebbles to the side as he counts them, he puts a bowl in his lap; then he pushes the pebbles to the edge of his table and counts them as they drop into the bowl. At the end of mathematics time, he will ask for help writing “56” in his mathematics journal and will draw a picture labeled “pbls” to show what he counted.

In the same classroom on the same day, and showing the same seriousness of purpose, Grace groups teddy bear counters into families of five while her partner, Lindsey, points to two families at a time to help count up by tens. At another table Spencer and his friends are making “one hundred” buildings out of one-inch cubes. They have agreed that each building will have two floors of fifty blocks each. The trouble comes when seven full buildings have been completed but two buildings are incomplete. The boys are puzzling over how to combine their numbers. Yet another group is figuring out how to count all the legs on the chairs in the classroom, a problem that requires an organizational strategy (the chairs are occupied and so cannot be moved) and poses the challenge of counting by groups of four.

Another way to increase the complexity of the counting task is to have children add collections or parts of collections together. For example, we often count how many books are in our classrooms, assigning small teams of children to various shelves and baskets. Of course, we want to keep the books in their places, so rather than bringing all the books to a central location and stacking them into piles of tens, for example, each shelf or basket ends up with a label indicating the number of books on that shelf or in that basket. As a group, we figure out how to add those numbers together to get our total.



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Working Together and Pushing One Another’s Mathematical Ideas

We are encouraged by the range of challenges that can so easily be created to meet the wide range of needs of the children in our classrooms. We also find compelling evidence that the children learn a great deal from one another’s strategies. Leo and Carlos have the job of counting markers from the supply closet. Some of the markers come in boxes of ten and some in boxes of eight. Leo, who is just learning to read numbers, begins by separating boxes with an “8” on the cover from boxes with a “10” on the cover. As Leo makes a stack of the





boxes of tens, Carlos counts out loud by ten. When they get to the boxes of eight markers, Carlos hesitates. He spreads the boxes of eight out on the floor and stops to think. Meanwhile, he sees Leo lining up the loose markers, thinking about how he could count them. Carlos asks for some of the loose markers and places two markers next to each box of eight to make tens. Leo, by his side, counts the remaining loose markers into a basket. In the end, Leo has counted up to 28 and, with a teacher's help, has written that number on his paper so that he does not forget it. Carlos has reached a total of 160. Although Carlos quickly says the total is 188, the teacher asks Leo to help Carlos double-check to see if he is right. Leo sits by Carlos's side and takes one pen at a time out of the basket, hearing Carlos count by ones from 160 to 188 and joining in when he can.

What do we think each child got out of this partnership and this counting project? Leo took on a counting project bigger than one he could have handled by himself. He watched Carlos group pens in ways that he himself was not ready to do and heard Carlos count out loud several times. Leo had opportunities to read numbers (the "8"s and "10"s on the boxes of markers); to practice a newly acquired strategy for keeping track (moving markers into a basket as he counted them, just as he had moved pebbles into a bowl on a previous day); to

record his total (28); and to count out loud (from 1 to 28 and from 160 to 188). And what did Carlos gain from the partnership? Perhaps the idea of adding the two pens to the boxes of eights came from watching Leo organize the loose markers. Leo also provided a reason for Carlos to count orally by ones from 160 to 188, a valuable opportunity he would otherwise have passed up. And Carlos, a whiz at counting but not necessarily at sharing his methods, took on a valuable mentoring role. Together, the boys accomplished a counting job in a way that they could not have on their own.

The evidence is abundant that children benefit from working together. The classroom is full of conversation and problem solving. Not everyone agrees on counting strategies. So what happens if William dumps out boxes of paper clips on the carpet while Cody starts counting the closed boxes by 100s? Partners have lots of negotiating to do as they decide on a collection, choose a place to work, and figure out a strategy. Will one person count while the other records? Will both children count all the tiles into cups of tens and then count up by tens together? Will the process work if the partners start counting from opposite sides of the pile until they meet in the middle? Opportunities to learn to work together are as abundant as opportunities to develop number sense and counting skills.

Notice, Question, Extend

So what is our job as adults as we watch children count collections and as we learn about the remarkable things children can already do? How do we as teachers help children move forward? We notice and name the strategies children are using; we ask questions that provoke children to think, articulate their thinking, and sometimes try a new strategy; and we extend their thinking.

We recently taped two hour-long mathematics sessions in a K-1 classroom in which children were counting collections. Here are some of the questions we heard the teachers ask:

"How do you know which ones you have counted and which ones you have not?"

"What were you doing yesterday to keep track?"

"Why did you switch strategies today?"

"Why did you decide to put those into cups of fifteens?"

"How many cups did it take to get up to 150?"

“If you made another set of 10 cups, would there be 150 in there too?”

“Can you explain to Cody what you are doing now?”

“Is it easier to count by tens than by eights?”

“What are you going to do with all those loose ones?”

“What will you do when you run out of counting cups?”

“By looking at Natalie’s recording, what can you tell about how she counted?”

“It looks like the two of you are using different strategies. Do you have a plan for how you will add your totals together?”

“Why did that turn out to be a tricky collection to count?”

“How are the two of you working together?”

“What will you do differently next time?”

In addition to asking questions, our job as teachers is also to keep track of what the children can do. As we walk through the room, we jot down our observations on sticky notes, both to document what the children can do at that time of year and to remind ourselves of strategies worth talking about later as we all sit together on the carpet. Patterns emerge, and these are helpful for planning instruction. Several young children may say more than one counting word per object, and so we group some of these children together to practice touching and counting or dropping one item into each cup of an egg carton. Teachers interact with so many children in a given mathematics hour and over the course of a day that these little records we keep as we run become important at the end of the day to help us figure out what is going well and what the children need next.

Keeping the Counting Going

All of this negotiating, organizing, and counting takes time. Early in the year, for a period of about three weeks, we are likely to devote our full mathematics hour every day to counting collections. Teachers convinced that counting collections enhances their students’ growth in number sense and counting strategies often revisit counting collections more than once during the year. They find that what the children are able to do in the spring is far different from what they could do in the fall, and this measure of accomplishment and growth is appreciated by both children and teachers.

To keep the counting going throughout the year,

we make sure that counting collections is part of our weekly work, even when we are delving into other mathematics units. We send a large plastic jar home with a note requesting that a family provide some objects for us to count, and about once each week, for the first few minutes of our mathematics hour, we count out these objects together as a class. We save the objects counted—75 cotton balls, 28 pencils, 125 pasta shells, and so forth—and put them in a “number gallery,” all labeled with their quantity.

And, of course, we begin each mathematics hour by counting orally—by ones starting at 85, by tens starting at 63, backwards from 50. But that is the subject of another article.

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