

Categorical Data Collection A Lesson for Second Graders

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The need to interpret data accurately looms large in today's world. By modeling ways to gather, represent, and interpret data, teachers can make young children feel more comfortable in this arena; children can then do these activities independently. Categorical Data Collection appears in the "December" chapter of Nancy Litton's new book, Second-Grade Math: A Month-to-Month Guide (Math Solutions Publications, 2003). Second-Grade Math is part of a three-book series that also includes First-Grade and Third-Grade Math.

Young children are especially interested in data about themselves. So begin by creating some simple class charts on which students record personal information. For example, you could ask students to choose their favorite season, or you might document something about eye color in your class. (See Figure 1.)

When you create a graphic display for students to fill in, you're modeling one of many ways to collect and display data. For instance, you could include pictographs. (See Figure 2.)

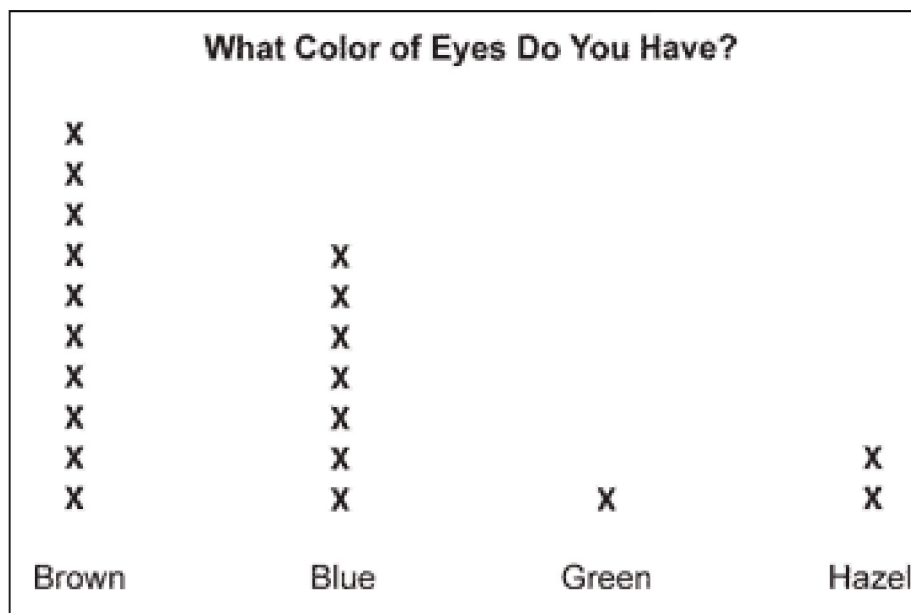


Figure 1. Students placed an X on the graph to show if their eyes were brown, blue, green, or hazel.



Figure 2. Students used pictures of ice-cream cones to show their favorite flavors.

Consider bar graphs as well. (See Figure 3.)

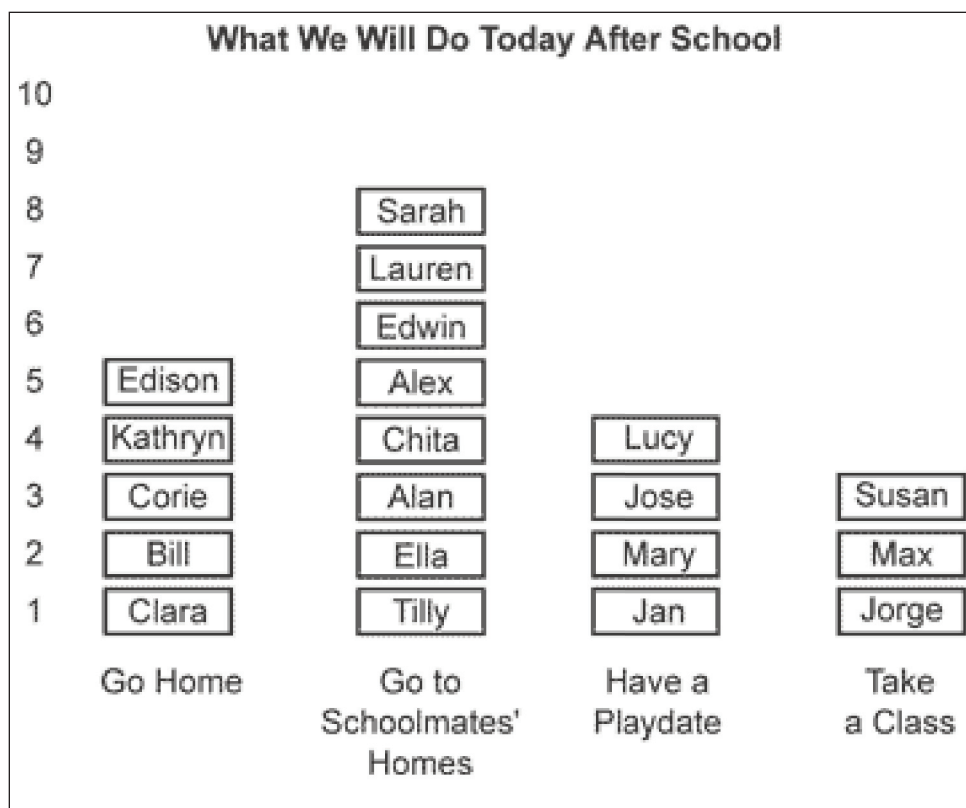


Figure 3. This bar graph is made from placing students' names in different categories.

Choosing subjects for graphs requires sensitivity on your part. A graph about the holidays that each family celebrates in December may be a way of celebrating diversity in one classroom. In another, this same topic may make a child feel excluded. So make sure you think through issues like these before you choose a topic for a graph. Generally, children love to share information about themselves and their favorites.

You can connect home and school by asking students to collect data at home, as a homework assignment. This exercise will help parents understand what you are doing in the classroom. It also gives children a chance to collect data on a wide variety of neutral topics, such as birthplace, favorite foods, types of pets, and favorite pastimes.

Once you've chosen a topic and given the children a chance to gather their data, think through how you'll have each child add his or her information on the class graph. Make the process of adding data fast and snappy, with occasional stops to ask focusing questions such as

"What do you notice so far?"

"How many more brown-eyed people than blue-eyed people do we have so far?"

"Now that we've got data from half of the class on the graph, what do you think the most popular ice-cream flavor will be?"

When is the best time to analyze the data in a graph? You might best do this a few days after all the data has been posted and the graph has been displayed in a prominent place. Giving the children a chance to get to know the graph through casual observation helps them become familiar with the data. You may also want to set a class goal of noticing at least ten things about the data, over the course of the next few days. Explain to the children that today you will call on five volunteers to describe what they notice about the graph. Tomorrow, five more people will have a chance to offer their suggestions. Dividing up the discussion this way keeps it from becoming tedious. It also creates anticipation among the children, as they think about coming up with ideas. If your students are engaging in this type of observation and discussion for the first time, help them focus by asking questions such as

"Is there anything about this graph that surprises you?"

"How many people posted their favorite type of ice cream on this graph?"

Nudges like these help the children know what kinds of observations are appropriate when analyzing data.

Student-Created Projects

Eventually, you will want to give students opportunities to take more responsibility for all aspects of data collection. Deciding what data to collect—and then collecting, representing, and analyzing a body of data—encourages responsibility among students. Children who select their own categories for organizing data must think flexibly as they encounter the overlapping categories that inevitably arise from real-world data.

Data collection almost always involves sorting and categorizing information, because graphs are designed to present information quantified in easy-to-discern displays. So part of helping children develop data collection skills should include activities that provide opportunities to notice and sort the attributes of a set.

People-sorting games, such as the one described in *Mathematics Their Way* (Menlo Park, CA: Addison-Wesley Longman, 1994), are valuable ways to start. People sorting involves grouping children based on some obvious physical attribute, such as who is wearing shoes with laces. Decide how explicit to be about introducing the attribute you're using to sort the class. The first few times, you may need to be very explicit by saying something like, "Today we're going to sort ourselves by the types of shirts we are wearing. Those of us who are wearing shirts with buttons will come up to the front of the room. Let's look at Kayla. Does she fit my rule? Yes, she has buttons, so she should come up. Raise your hand if you think you should be standing next to Kayla." After you've added a few students to the button group, seek out some examples of people who do not have buttons on their shirts. Ask those students to stand in another area. You don't need to sort the whole class—just enough students so the children understand the rule you are using.

At other times, when you sense that most of the children understand the concept of sorting by an attribute, you'll want the class to be able to guess your (unstated) rule for sorting the class, based on careful observation. When you feel that students are ready for this level of reasoning, explain that you're going to play a game that will require them to "read your mind." Be sure to choose an easily visible attribute, such as whether someone is wearing a sweatshirt.

Explain that the class has the job of figuring out your mystery rule based on where you ask students to stand. Make this a silent game, explaining that you want everyone to have lots of time to think, so no one should tell an idea until you ask someone to. After you've motioned several students who fit your rule to move to the front of the room, invite silent volunteers to point to someone else who might fit the rule. Make it clear that you'll be the final judge of who joins the group at the front of the room: "If a person is chosen who does not fit my rule, we might be able to get valuable information by looking at that person. So we'll make a separate place for people who do not fit the rule." Once again, impose the rule of silence until several volunteers have made their suggestions.

When you feel that many children have discerned your rule, let students take turns saying what the rule might be. Encourage them to explain their reasoning, and ask questions such as

"Did anyone have an idea about the rule when we first started that changed as more people were added to the group?"

"What made you sure of the rule?"

Each time you play this game, record the number of students who do and don't fit your rule. Use this opportunity to show that there are a variety of ways to record data. For example, you might use tally marks in groups of five. Another time, you might use numbers. Another time, you might use simple pictures that relate to the topic in some way. (See Figure 4.)

Wearing a belt	
Not wearing a belt	
Long Sleeves	12
Short Sleeves	8
Buttons on shirt	⊞ ⊞ ⊞ ⊞ ⊞ ⊞
No buttons on shirt	⊞ ⊞ ⊞ ⊞ ⊞ ⊞ ⊞ ⊞ ⊞ ⊞ ⊞ ⊞ ⊞ ⊞

Figure 4. Three examples of tally marks that students can use to collect data.