

Plant Height Data	
Height (in cm)	Number of Plants
9	/
14	
17	
22	
23	
25	/
26	
27	
28	
29	
30	/
31	
32	
33	
35	
39	/
40	

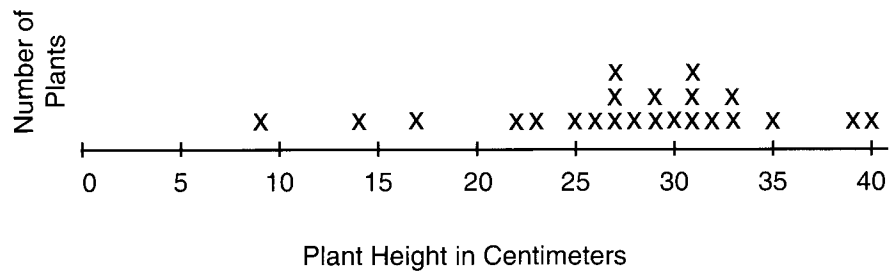


Fig. 5.22.

Plant height data from a third-grade class

that, overall, the set of third-grade plants grew taller than the set of fourth-grade plants. But it is also important to look at the distributions of the data, which tell an even more dramatic story: Although the ranges of the two data sets are about the same, most of the third graders' plants grew taller than all but a few of the fourth graders' plants.

In grade 5, once students are experienced using the mode and median as part of their data descriptions, they can begin to conceptually explore the role of the mean as a balance point for the data set, using small data sets. The idea of a mean value—what it is, what information it gives about the data, and how it must be interpreted in the context of other characteristics of the data—is a complex one, which will continue to be developed in later grades.

Develop and evaluate inferences and predictions that are based on data

Data can be used for developing arguments that are based on evidence and for continued problem posing. As students discuss data gathered to address a particular question, they should begin to distinguish between what the data show and what might account for the results. For example, a fourth-grade class investigating the sleep patterns of first graders and fifth graders found that first graders were heavier sleepers than fifth graders, as shown in the graphs in figure 5.23 (Russell, Schifter, and Bastable 1999). They had predicted that first graders would be lighter sleepers and were surprised by their results. After describing their data, they developed a hypothesis: First graders have a higher activity level because they play outside more, and this higher activity level leads to deeper sleep. They realized they would need to collect data about a typical day for first and fifth graders in order to investigate their hypothesis. This example demonstrates how students can be encouraged to develop conjectures, show how these are based on the data, consider alternative explanations, and design further studies to examine their conjectures.

With appropriate experiences, students should begin to understand that many data sets are samples of larger populations. They can look at several samples drawn from the same population, such as different classrooms in their school, or compare statistics about their own sample to known parameters for a larger population, for example, how the median family size for their class compares with the median family size reported for their town. They can think about the issues that affect the representativeness of a sample—how well it represents the population

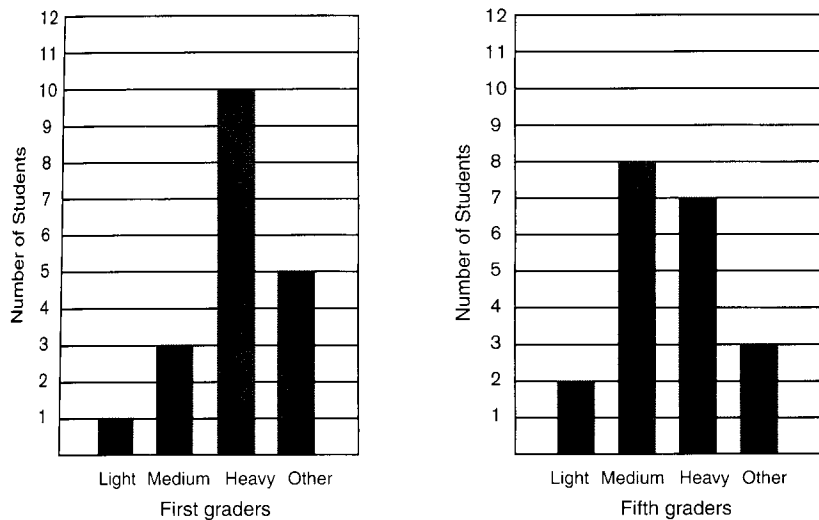


Fig. 5.23.

A student investigation of sleeping habits

Type of Sleeper	
Light	Wakes up to the slightest noise
Medium	Wakes up to louder noises
Heavy	Sleeps through the night without waking up
Other	None of the previous three

(Russell, Schifter, and Bastable 1999)

from which it is drawn—and begin to notice how samples from the same population can vary.

Understand and apply basic concepts of probability

Students in grades 3–5 should begin to learn about probability as a measurement of the likelihood of events. In previous grades, they will have begun to describe events as certain, likely, or impossible, but now they can begin to learn how to quantify likelihood. For instance, what is the likelihood of seeing a commercial when you turn on the television? To estimate this probability, students could collect data about the number of minutes of commercials in an hour.

Students should also explore probability through experiments that have only a few outcomes, such as using game spinners with certain portions shaded and considering how likely it is that the spinner will land on a particular color. They should come to understand and use 0 to represent the probability of an impossible event and 1 to represent the probability of a certain event, and they should use common fractions to represent the probability of events that are neither certain nor impossible. Through these experiences, students encounter the idea that although they cannot determine an individual outcome, such as which color the spinner will land on next, they can predict the frequency of various outcomes.