

guesses: "the pitcher," "the beer bottle," "the teapot." The teacher stands aside and ponders: "Some of you said one thing, others said something different. You don't agree with each other. There must be some way we can find out who is correct. How can we know who is correct?" Interest is high, and the discussion continues.

The students soon agree that to find out how much each container holds they will need to fill the containers with something. How about water? The teacher finds some buckets and sends several children out to fill them with water. When they return, the teacher says: "Now what do we do?" Again there is a discussion, and after several minutes the children decide that they will need to use a smaller container to measure how much water fits into each of the larger containers. They decide on a drinking cup, and one of the students warns that they all have to fill each cup to the same level—otherwise the measure won't be the same for all of the groups.

At this point the teacher divides the class into their groups (*han*) and gives each group one of the containers and a drinking cup. Each group fills its container, counts how many cups of water it holds, and writes the result in a notebook.

When all of the groups have completed the task, the teacher calls on the leader of each group to report on the group's findings and notes the results on the blackboard. She has written the names of the containers in a column on the left and a scale from 1 to 6 along the bottom. Pitcher, 4.5 cups; vase, 3 cups; beer bottle, 1.5 cups; and so on. As each group makes its report the teacher draws a bar representing the amount, in cups, the container holds.

Finally, the teacher returns to the question she posed at the beginning of the lesson: Which container holds the most water? She reviews how they were able to solve the problem and points out that the answer is now contained in the bar graph on the board. She then arranges the containers on the table in order according to how much they hold and writes a rank order on each container, from 1 to 6. She ends the class with a brief review of what they have done. No definitions of ordinate and abscissa, no discussion of how to make a graph preceded the example—these all became obvious in the course of the lesson, and only at the end did the teacher mention the terms that describe the horizontal and vertical axes of the graph they had made.

With one carefully crafted problem, this Japanese teacher has guided her students to discover—and most likely to remember—several important con-

cepts. As this article unfolds, we hope to demonstrate that this example of how well-designed Asian class lessons are is not an isolated one; to the contrary, it is the norm. And as we hope to further demonstrate, excellent class lessons do not come effortlessly or magically. Asian teachers are not born great teachers; they and the lessons they develop require careful nurturing and constant refinement. The practice of teaching in Japan and China is more uniformly perfected than it is in the United States because their systems of education are structured to encourage teaching excellence to develop and flourish. Ours is not. We will take up the question of why and what can be done about this later in the piece. But first, we present a more detailed look at what Asian lessons are like.

### COHERENCE BROKEN

Asian lessons almost always begin with a practical problem, such as the example we have just given, or with a word problem written on the blackboard. Asian teachers, to a much greater degree than American teachers, give coherence to their lessons by introducing the lesson with a word problem.

It is not uncommon for the Asian teacher to organize the entire lesson around the solution to this single problem. The teacher leads the children to recognize what is known and what is unknown and directs the students' attention to the critical parts of the problem. Teachers are careful to see that the problem is understood by all of the children, and even mechanics, such as mathematical computation, are presented in the context of solving a problem.

Before ending the lesson, the teacher reviews what has been learned and relates it to the problem she posed at the beginning of the lesson. American teachers are much less likely than Asian teachers to begin and end lessons in this way. For example, we found that fifth-grade teachers in Beijing spent eight times as long at the end of the class period summarizing the lessons as did those in the Chicago metropolitan area.

Now contrast the Japanese math lesson described above with a fifth-grade American mathematics classroom that we recently visited. Immediately after getting the students' attention, the teacher pointed out that today was Tuesday, "band day," and that all students in the band should go to the band room. "Those of you doing the news report today should meet over there in the corner," he continued. He then began the mathematics class with the remaining students by reviewing the solution to a computation problem that had been included in the previous day's homework. After this brief review, the teacher directed the students' attention to the blackboard,