

Mrs. Graham's 5th Grade Class

One of the best ways to understand school science as inquiry is through a visit to a classroom where scientific inquiry is practiced. The following vignette features a particular grade, but, as illustrated throughout this book, classroom inquiry can and does happen at all grade levels. Sidebars point out some ways inquiry is occurring.

Several of the children in Mrs. Graham's fifth grade class were excited when they returned to their room after recess one fall day. They pulled their teacher over to a window, pointed outside, and said, "We noticed something about the trees on the playground. What's wrong with them?" Mrs. Graham didn't know what they were concerned about, so she said, "Show me what you mean."

The students pointed to three trees growing side by side. One had lost all its leaves, the middle one had multicolored leaves — mostly yellow — and the third had lush, green leaves. The children said, "Why are those three trees different? They used to look the same, didn't they?" Mrs. Graham didn't know the answer.

Mrs. Graham knew that her class was scheduled to study plants later in the year, and this was an opportunity for them to investigate questions about plant growth that they had originated and thus were especially motivated to answer. Although she was uncertain about where her students' questions would lead, Mrs. Graham chose to take the risk of letting her students pursue investigations under her guidance. After all, they had had some experience last year in examining how seeds grow under different conditions. She hung up a large sheet of butcher paper where all the students could see it and said, "Let's make a list of ideas that might explain what's happening to those three trees outside." A forest of hands went up:

Propose preliminary explanations or hypotheses

- It has something to do with the sunlight.
- It must be too much water.
- It must not be enough water.
- The trees look different. They used to look the same.
- It's the season, some trees lose their leaves earlier than others.
- There is poison in the ground.
- The trees have different ages.
- Insects are eating the trees.
- One tree is older than the others.

When the students were satisfied that they had enough ideas, Mrs. Graham encouraged them to think about which of their ideas were possible explanations that could be investigated and which were descriptions. She then invited each student to pick one explanation that he or she thought might be an answer. She grouped the students by choices:

Plan and conduct simple investigation

There was a "water group", a "seasons" group, an "insects" group, and so on. She asked each group to plan and conduct a simple investigation to see if they could find any evidence that answered their question. As they planned their investigations, Mrs. Graham visited each group of students and carefully listened as they formulated their plans. She then asked each group to explain their ideas to their classmates, resulting in further refinement. Using this quick and public assessment of where they were, she was able to help them think about the processes they were using to address their question and consider whether other approaches might work better.

Gather evidence from observation

For the next three weeks, science periods were set aside for each group to carry out its investigation. The groups used a variety of sources to gather information about characteristics of trees, their life cycles, and their environments. For example, the "different ages" group answered their question fairly quickly. They contacted the PTA members who were involved in planting that part of the playground and found the original receipts for the purchase of the trees. A check with the nursery indicated that all three trees were identical and of approximately the same age when purchased. As some groups completed their investigations early, Mrs. Graham invited their members to join other groups still in progress.

The water group decided to look at the ground around the trees every hour that they could. They took turns and jointly kept a journal of their individual observations. Since some students lived near the school, their observations continued after school hours and on weekends. They missed some hourly observations, but they had sufficient data to report to the class. "The tree without leaves is almost always standing in water, the middle tree is sometimes standing in water, and the green tree has damp ground but is never standing in water."

Consider other explanations

One of the students recalled that several months ago the leaves on one of his mother's geraniums had begun to turn yellow. She told him that the geranium was getting too much water. Mrs. Graham gave the group a pamphlet from a local nursery entitled "Growing Healthy Plants." The water group read the pamphlet and found that when plant roots are surrounded by water, they cannot take in air from the space around the roots and they essentially "drown." Based on their observations and the information they obtained from the pamphlet, the students concluded that the leafless tree was drowning, the middle tree was "kinda" drowning, and the third one was "just right."

The water group continued its work by investigating the source of the water. They found that the school custodian turned on a lawn sprinkler system three times a week. He left it running longer than necessary, and the excess water ran off the lawn and collected at the base of the trees. Since the ground was sloped, most of the water collected at one end of the tree-growing area. Together with the other groups, they reported their results to the rest of the class.

Communicate explanation

As different groups gave their reports, the class learned that some observations and information — such as those from the group investigating whether the trees were different — did not explain the observations. The results of other investigations, such as the idea that the trees could have a disease, partly supported the observations. But the explanation that seemed most reasonable to the students, that fit all the observations and conformed with what they had learned from other sources, was too much water. After their three weeks of work, the class was satisfied that together they had found a reasonable answer to their question. At Mrs. Graham's suggestion, they wrote a letter to the custodian telling him what they had found. The custodian came to class and thanked them. He said he would change his watering procedure and he did. Mrs. Graham then asked the students how they could find out if their explanation was correct. After some discussion they decided that they would have to wait until next year and see if all the trees got healthy again.

Test explanation

The following year, during the same month that they had observed the discrepancy, all three trees were fully clothed with green leaves. Mrs. Graham's former students were now even more convinced that what they had concluded was a valid explanation for their observations.