Ob-scertainers™: A Cooperative Activity on Hypotheses

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During the first week of a course an instructor often searches for an activity that will introduce students to one another. In a classroom or laboratory where stable base groups are being established introductory activities are essential for team building (1–3). The vital process of developing healthy group dynamics helps provide a foundation for teams that will work together over the course of a semester. This paper describes a laboratory activity that facilitates team building while teaching the students about hypothesis formation and the scientific method.

The Laboratory Activity

The activity described in this paper takes 40–80 minutes to complete. The apparatus used is simple and inexpensive. An Ob-scertainer (Lab-Aids, Inc.) is shaped like a petri dish and is black. Inside each Ob-scertainer is one or more lines molded into the dish. A small metal ball is placed inside the Ob-scertainer and the students, working in groups, must hypothesize about the shape of the interior without being able to see it; that is, they are not allowed to open the Ob-scertainer. The groups are given 15 to 20 minutes to form hypotheses about the shape of their Ob-scertainers. Students are instructed to read the section in the textbook relating to the scientific method before coming to the laboratory. The Ob-scertainer has been described for use in a biology lab, but the activity is equally applicable for chemistry (4).

The Ob-scertainer activity can be completed by students working individually, in pairs, or in groups. Because the pair approach has been described (4, 5), this paper reports the use of Ob-scertainers in a group activity. Use of the Ob-scertainer as an introductory group activity allows students time to observe how groups function. Group roles are explained at the beginning of the class. Roles within the group are leader (who helps organize the group), recorder (who writes down the hypotheses), and observer (who takes notes on the group dynamics). Because groups are used throughout the semester, I require that students assume each role at least once during the semester; for any given lab, students have their choice of role. During the Ob-scertainer exercise, all students are instructed to observe group dynamics, so that they can help the observer write a summary.

The pedagogical literature favors the use of instructor-assigned groups (2, 3, 6–8). The instructor-assigned groups in the laboratory course in which the Ob-scertainer exercise was used functioned effectively throughout the semester (unpublished data). Groups of three have been found to provide enough work for all members to contribute while still providing enough diversity of views (2).

Possible Variations of the Basic Activity

Several modifications to the basic activity are possible. Each group is usually given four different Ob-scertainers but the actual number could be varied. One or all of the suggestions below could be used for a given class:

1. Allow each group to open their first Ob-scertainer after making all their hypotheses, to check the accuracy of their first hypothesis. Ask if the group wants to change their other hypotheses on the basis of the results of their first Ob-scertainer “experiment”.
2. Allow each group to open all but one Ob-scertainer and then make a prediction about the likelihood that their final hypothesis is correct.
3. Do not allow students to look in their final Ob-scertainer for a few minutes. Explain that scientists often cannot know for a long time whether their hypotheses are correct. Students will most likely feel discomfited that they cannot find out whether they have made a correct hypothesis but they should gain a better appreciation for science not always knowing the “right” answer.
4. Pass out the same Ob-scertainer to each group as a final activity and then bring the entire class back together to make a group hypothesis.

Reflection

Whichever variations are chosen, the students need to reflect on their process of discovery. They should also reflect on group dynamics: Were there differences of opinion about the solution? How did the group come to a final decision for each hypothesis? Did everyone have a chance to contribute to the decision?

Reflection about the exercise should help the group to coalesce and to learn how scientific inquiry often requires multiple perspectives. At the conclusion of the Ob-scertainer exercise the entire class convenes and discusses the methods used by each group to develop hypotheses and to reach consensus.

A means of fostering reflection throughout the course is to have students include a sentence or two in each lab report that summarizes what worked well in the group and what needed refinement for the next laboratory. Although a laboratory report is not required for the Ob-scertainer exercise, formal, individual laboratory reports are required for all subsequent experiments. The report includes an abstract that contains a summary of the results, a description of what knowledge the student gained about chemistry, and a reflection about how the group dynamic could be improved for the next laboratory. The Ob-scertainer exercise demonstrates the kind of thinking about group dynamics that should be included in the formal laboratory reports. The inclusion of student opinions of group dynamics provides the instructor with information about group functioning. If a group is not functioning well, as assessed by student reflection in the laboratory report, the instructor can intervene and provide assistance to improve group dynamics.
Conclusions

Students seem to derive benefits from the exercise that relate to both the scientific method and teamwork, judging from their participation in the activity and from responses to exercises completed during the activity. Ob-scertainers provide a way to engage students in the process of hypothesis forming. The reflection that accompanies the activity encourages students to think about how they solve problems as well as how their group functions. The Ob-scertain activity is a powerful exercise to use on the first day of chemistry laboratory. It is especially useful as part of a laboratory that utilizes stable, instructor-assigned base groups throughout the course.

Note

1. The Ob-scertain can be purchased directly from Lab-Aids (http://www.lab-aids.com) or from Frey Scientific (http://www.freyscientific.com). Other resources use a cardboard “black box”, but no other manufacturer produces the molded plastic of the Ob-scertain.

Literature Cited