

THE SCIENCE MANAGEMENT OBSERVATION PROTOCOL



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Using structured observations to improve teachers' management of inquiry-based classrooms

— Victor Sampson —

With the publication of the *National Science Education Standards* (NRC 1996) and the *Benchmarks for Science Literacy* (AAAS 1993), we now have a thorough idea of what an inquiry-based teacher is, and what he or she needs to do within a classroom in order to be successful. However, one major barrier in learning how to become an effective inquiry-based science teacher is classroom management. Research has shown that teachers often resist teaching inquiry-based science because they feel they will lose control of their classrooms (Marek, Eubanks, and Gallaher 1990). This is due, in part, to the fact that teachers often lack the procedural knowledge needed to manage a classroom where collaboration and scientific inquiry are emphasized. To combat this problem, a great deal of educational research has been devoted to the goal of identifying what makes an effective classroom manager.

The Science Management Observation Protocol (SMOP) synthesizes this research into an assessment tool that can be used to conduct structured observations of classroom practice (Figure 1, p. 32). SMOP allows an observer to focus on specific teacher behaviors and classroom characteristics that influence how well an inquiry-based classroom is managed. The protocol provides valuable information on five different management issues that are especially important in inquiry-based science classrooms:

- ◆ classroom characteristics and routines
- ◆ use of time and transitions
- ◆ collaboration among students
- ◆ safety, and
- ◆ care and use of materials

This information supplies teachers with objective data rather than vague, undocumented “feelings” about the activities that take place during an inquiry-based lesson. These measurable details provide teachers with information they need to make decisions and initiate changes that will make them better managers of inquiry-based classrooms.

Classroom characteristics and routines

When teaching inquiry-based science, teachers must learn basic routines for organizing and managing the classroom environment. Lawson (2000) surveyed teachers who had just completed teaching an inquiry-based science class for the first time to determine the most common management problems they experienced. Lawson found that key problems included students not participating enough, not listening, and talking at inappropriate times. Many teachers, regardless of their teaching style, have difficulty with group management.

To address these and other related problems, I developed the SMOP to assess aspects of classroom management that must be in place to effectively manage an inquiry-based classroom (Figure 1, p. 32). The SMOP consists of 25 descriptions of classroom and teacher characteristics that are rated on a scale of 0 (never observed) to 4 (very descriptive). For example, with the component “the teacher has an effective way of getting all students in the class quiet and listening within 10 seconds,” the observer looks to see if the teacher is able to consistently get all of the students’ attention quickly and efficiently even if occupied with other classroom activities. If the teacher is able to do this, the observer scores a 4 on this component of SMOP. If the teacher is completely unable to get the students attention within 10 seconds without resorting to raising his or her voice or threatening students with punishment, the teacher scores a 0.

SMOP was intentionally designed not to prescribe a single technique for teachers to follow when managing a classroom. For example, many different methods can be used to get all students in the class quiet and listening within 10 seconds; it is the teacher's responsibility to decide which method works best for the culture of his or her classroom. The important issue is that the classroom routine is in place and effective.

To help a teacher who is struggling with one of these components, a "comments, suggestions, or ideas" area follows each section of SMOP. The observer can use this area to give the teacher ideas or techniques that could improve the management of the classroom. This type of specific, detailed feedback provides the teacher with methods that are grounded in reality and this exchange of ideas between teachers can help transform teaching practice.

Classroom time and transitions

One of the most serious problems cited by teachers new to inquiry in Lawson's (2000) survey was a lack of participation on the part of students. The second section of SMOP, *Classroom time and transitions* (Figure 1, p. 32), focuses on teacher and classroom characteristics that must be in place to keep students engaged in academic activities and to limit opportunities for students to "goof-around." Research clearly shows that a relationship exists between how time is used in a classroom and management problems (Evertson and Harris 1992). The more free time students have at the beginning, end, or even during a lesson, the more time students will spend doing what they like to do best—socializing instead of participating. This can be a major problem in inquiry-based classrooms because a majority of students' time should be spent doing hands-on inquiries. In fact, a concern about using inquiry is that by its very nature, inquiry can be more time-consuming. Therefore, teachers must consider carefully, specifically, and in advance, how students will use their time in the classroom and move from one activity to another.

In general, students tend to use time most productively when they are given a time frame to complete a specified amount of work (Evertson and Harris 1992). This is true in inquiry-based classrooms as well. Students work well in the classroom when teachers stay enthusiastically involved in the activity and give their students a time frame in which to complete their work. On the other hand, when teachers sit down at their desks to do their own work during student activities, students tend to shut down. Success, therefore, depends on a teacher establishing time constraints and then continually circulating the room to keep students on task (teachers can quickly pick up on which students are not participating), and when necessary, to challenge students with questions to steer them in new directions.

Collaboration

Collaboration is an essential part of the inquiry-based classroom. While working, students should bounce ideas off each other as they make observations, raise questions, design investigations, and construct knowledge. Few teachers argue against the benefits of collaborative learning, however many have difficulty putting theory into practice. One reason this happens is because in terms of classroom management, teachers can fail to realize that the content-free "how" of instruction is equally important as the academic content that is taught. Teachers who use inquiry-based teaching methods must learn how to organize the interactions that take place among students (Kagan 1997). Teachers will find it much easier to successfully implement collaborative learning by taking into account the components listed in the collaboration section of SMOP (Figure 1).

Classroom safety

According to the National Science Teachers Association (NSTA) position statement on safety and school science instruction (2000), high quality science instruction must include laboratory investigations and inherent in these activities is the potential for injury. The likelihood of accidents increases, however, when science teachers are not well versed in safety and when students conduct experiments without safety standards in place in the classroom laboratory.

Unfortunately, this seems to be the case in many classrooms; in a survey of NSTA members, Gerlovich and Parsa (2002) found that few teachers are aware of safety obligations within their science settings. Teachers must establish and maintain safety standards as a part of their management plan. The fourth section of SMOP (Figure 1) deals with characteristics of classrooms that keep students and teachers safe. All teachers must implement safety standards in their classroom for students in addition to providing safety equipment so that inquiry-based learning can take place without the fear of students injuring themselves or others around them.

Care and use of classroom materials

As discussed earlier, laboratory work is an essential component of inquiry. Ask any science teacher to discuss the obstacles they face when trying to implement inquiry-based science teaching and you will hear them mention managing the hands-on materials used in the laboratory. Some of the biggest challenges in inquiry classrooms involve how to organize and store materials, how to keep expensive materials in good shape, and how to distribute and then collect materials efficiently. Often teachers do not realize that they need to plan for these challenges just as they need to plan for how they will assess student learning. The fifth section of SMOP (Figure 1) deals with managing the physical materials used by students as they participate

FIGURE 1

The Science Management Observation Protocol (SMOP).

Teacher:
Subject:

Observer:
Class Length:

Date:
Time:

Classroom characteristics and routines	Never observed		Very descriptive		
1. The teacher has an effective way of getting all students in the class quiet and listening within 10 seconds.	0	1	2	3	4
2. There is a set routine that students use in order to get the teacher’s attention.	0	1	2	3	4
3. Students listen to the teacher when he or she is talking and the teacher does not try to “talk over” the students.	0	1	2	3	4
4. The teacher consistently enforces a set of well-developed classroom rules, and interventions are based on logical consequences.	0	1	2	3	4
5. The lesson is designed to be student-centered, take advantage of students’ curiosity, and be highly engaging.	0	1	2	3	4
Comments, suggestions, or ideas:					
Classroom time and transitions					
6. The majority of class time is spent devoted to academic tasks.	0	1	2	3	4
7. The teacher informs students of what they need to accomplish during the class period and students are given a time frame to complete their work.	0	1	2	3	4
8. The teacher has “with-it-ness” (the ability to communicate awareness of student behavior) and is able to “overlap” (do more than one thing at once).	0	1	2	3	4
9. The teacher limits the number of directions given before a transition, these directions are specific, and students understand what they are to do before a transition (or an activity) begins.	0	1	2	3	4
10. Transitions between activities are short (less than a minute).	0	1	2	3	4
11. The teacher continually circulates the room in order to keep students on task, to listen, and, where possible, to challenge students with questions.	0	1	2	3	4
Comments, suggestions, or ideas:					

in inquiry-based activities. Many methods exist for accomplishing these various tasks, and once again the important issue is not how tasks are accomplished, but that a method is in place and that the method is effective.

Facilitating change

Most of the management techniques used in classrooms that focus on direct instruction often prove inadequate in inquiry-based classrooms. After all, more activity in a classroom means more movement, more noise, and more opportunities for students to misbehave. During class, many teachers do not implement inquiry-based activities because they feel that the very nature of these activities will lead to management issues. To combat this problem, a teacher must be provided with nonthreatening, objective, and detailed feedback about what is happening while he or she is teaching. In this way, the teacher can learn how to manage an inquiry-based classroom with confidence, just as he or she learned how to manage a traditional teacher-centered classroom.

Unfortunately, most classroom observations provide very little concrete feedback that can be used to guide a teacher as they develop their understanding of classroom management. Many mentor teachers and university supervisors have difficulty providing feedback that focuses on more than one or two aspects of classroom management. After using SMOP as part of their observation, many teachers have commented that they are able to provide better constructive feedback and urge their peers to pay more attention to key management issues.

In some cases, student teachers even use SMOP to observe veteran teachers who they consider an expert in classroom management. As they watch, they record the ways these teachers handle each of the components of SMOP. They can then incorporate these new ideas into their own classroom practices. When used in this manner, even in informal teacher-teacher collaborations or class visits, SMOP becomes a way to use peers as a resource for improving practice.

SMOP has proven to be an excellent tool for facilitating discussions between peers and providing teach-

Collaboration within the classroom	Never observed		Very descriptive		
	0	1	2	3	4
12. The teacher uses various collaborative structures (e.g., think-pair-share, numbered heads) to ensure every student is involved during collaborative activities.	0	1	2	3	4
13. The teacher has an effective and equitable way of assigning roles to students.	0	1	2	3	4
14. Groups are small (groups of three generally are ideal) and each student has a meaningful and important role in the group.	0	1	2	3	4
15. Each student is held personally accountable for the content learned during a collaborative activity.	0	1	2	3	4
16. Students respect the ideas and opinions of others.	0	1	2	3	4

Comments, suggestions, or ideas:

Classroom safety

17. There is a set of rules for acceptable (and safe) behavior during science laboratory activities and students are regularly reminded of these rules.	0	1	2	3	4
18. Students know where to find safety equipment and what to do if there is a fire or accident.	0	1	2	3	4
19. Any time chemicals, glassware, or heat is used, students wear approved laboratory goggles. No exception.	0	1	2	3	4

Comments, suggestions, or ideas:

Care and use of classroom materials

20. The teacher assigns clean-up duties to specific individuals.	0	1	2	3	4
21. There is a set routine for getting and putting away supplies.	0	1	2	3	4
22. Students are responsible and accountable for keeping all materials in good condition.	0	1	2	3	4
23. The teacher has a way to quickly and effectively inventory materials before and after lab activities.	0	1	2	3	4
24. There is a consequence for (and documentation of) unsafe/inappropriate behavior during laboratory activities.	0	1	2	3	4
25. Student movement around the classroom is limited during laboratory activities but there is a great deal of teacher movement between groups.	0	1	2	3	4

Comments, suggestions, or ideas:

ers with specific and measurable information that can be used as they reflect on the challenges of managing an active, student-centered classroom. The relatively quantitative nature of the tool simplifies the observation process and often helps the observer to clarify and isolate key components of the complex interactions that occur within a classroom. In addition, I have found that science teachers are more willing to participate in a peer-evaluation process because SMOP helps to reduce the number of situations in which vague, inadequate feedback leads to uncomfortable criticism and tension between peers. ■

Victor Sampson is a doctoral student and university supervisor at Arizona State University, Main Campus, P.O. Box 871704, Tempe AZ 85287; e-mail: victor.sampson@cox.net.

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