

# Techniques for new Teachers

**N**EW TEACHERS ARE ENCOURAGED TO use various forms of inquiry such as cooperative projects, investigations, and laboratory experiences to help their students develop conceptual understandings of science. Such practices take skill and experience to manage well and can be difficult to implement for novice teachers, who are generally preoccupied with the successful delivery of their lessons. These teachers often lack the intuition and experience to manage a classroom with student movement, multiple tasks, and potential discipline problems. They find the initial experience of teaching logistically complicated lessons (such as those involving hands-on learning) to be overwhelming. To overcome these problems, experienced science educators should help new teachers implement hands-on teaching practices in their classrooms.

## CREATING EXPERIENCED TEACHERS

Most principals and school systems favor inquiry-based approaches to science teaching, and support for such practices is increasing. However, although school officials want good teaching, in the face of growing difficulties with discipline in U.S. schools, they also want effective classroom management. Evaluations of new teachers and a principal's decision to retain a new teacher center on the teacher's ability to properly manage a classroom. These administrative decisions can work against energetic new teachers who begin using hands-on practices but soon realize the complexity of managing students by these methods. Initial attempts at creating hands-on learning environments often fail because of unclear expectations of students and lack of foresight about poten-

tial management problems. Chaotic classroom situations and poor student behavior may result. When faced with losing control of the classroom and possible unemployment, new teachers usually choose easily managed (or traditional) teaching approaches. Over time, these teachers do gain experience in managing the learning environment, but they do not necessarily convert to a hands-on approach. For most, only a later transformative experience will precipitate a change to using such practices.

How can science teacher educators and experienced science teachers bridge this gap between inexperience and hands-on science teaching for beginning teachers? The expectation set by universities for preservice teachers to immediately implement a hands-on learning environment is often unrealistic. In the end, this expectation may actually do more harm than good toward achieving the long-term goal of developing teachers who are comfortable with inquiry-based lessons.

Most interns in our science education program implement many of the hands-on teaching practices they learned in theory from their classes on campus. Although some are successful within the contexts of their schools in doing this, most face difficulties. They plan exciting lessons but do not know how to effectively implement the logistics of their lessons with real students. In addition, they do not anticipate the social reactions and understanding level of their students. New teachers initially believe that their students are much like college students in maturity and ability to understand and do science. These difficulties are rooted in their lack of teaching experience, the nature of their unique classroom environments, and their inability to effectively manage hands-on practices as novices. Interns who struggle most with implementing hands-on practices say their university experience failed them or that such

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practices do not work in real classrooms. Early failure can have a lasting effect on new teachers and discourage their future use of innovative teaching practices.

To alleviate some of this pressure on preservice teachers, they should be told, “Go slow, but go!” This means that interns need to use inquiry methods of teaching, including hands-on practices, but in a limited way. A “Go slow, but go!” approach allows new teachers to implement effective practices at a rate that grows with their experience. Small successes in practice can build confidence and lead to larger successes over time. Also, innovative practices that build on traditional practices create a powerful transfer to innovative teaching. One

**FIGURE 1.**

Format for an interactive lecture that follows the learning cycle.

1. Engage phase—teacher engages students through a targeted question that elicits their ideas and assesses their prior knowledge of a topic. Teachers can use a focused question of interest, brief story or narrative, journal writing, or a brainstorming session. After this phase, students share their thoughts for others to see/hear, for class discussion, and for the teacher to use in the lecture.

2. Explore phase—students explore a topic to begin understanding it. At this point, teachers can use an inquiry demonstration, a limited cooperative or partnered assignment, a brief video clip, or a laser disk segment. After this phase, students share their thoughts for others to see/hear, for class discussion, and for the teacher to use in the lecture.

3. Explain phase—the teacher further develops students’ ideas through a targeted note-taking session that lasts no longer than 20 minutes. Basic notes prepared in advance have room for student additions and modifications. These notes can be examples, hypotheses, additional ideas, lists, other connections, and so forth. Notes are delivered with ongoing reference to (and in the context of) students’ previous work, discussion, and thoughts. Students internalize important information by participating in the lecture by asking questions, proposing new ideas, asking for clarifications, and so forth.

4. Application phase—students are assigned an individual, partner, or team activity that applies their newly developing understanding of the new topic. Activities, assignments, or worksheets are in the context of authentic uses, issues, and applications, and are inherently motivational and of interest to students.

Students are given the opportunity to share their work with the class through brief team or individual sharing of completed work; posting of work on bulletin boards, walls, or hallway; and using student portfolios.

example of an easily managed teaching method is the interactive lecture that follows the learning cycle (Karplus, 1977). Preservice teachers learn to be “constructively” creative through the lecture method of teaching. They devise lessons that allow for maximum student involvement and understanding within a lecture that incorporates inquiry-based methods of learning. Student teachers are familiar with lectures and feel comfortable managing them because lectures enable educators to teach without the fear of losing control of their classrooms.

## THE INTERACTIVE LECTURE

The approach to the interactive lecture is simple. Teachers structure related concepts of learning from one day to the next by beginning with students’ ideas and prior knowledge. Students are actively involved in the entire lesson through sharing their ideas, asking questions, exploring the phenomenon being studied, developing concepts with the teacher, and seeing or applying their new learning to relevant works of interest. Figure 1 gives a detailed outline of an interactive lecture format that follows the learning cycle.

During the engage phase of the lecture, students write out and discuss their ideas, thoughts, or understandings of the topic. An interesting focus question about the topic is often used to begin this phase of the lesson, and then students share their thoughts with the class. Their ideas are written on the board for the class to see and become the focus of the lesson.

Next, teachers enter the explore phase of the lesson in which they conduct an inquiry demonstration or show a short video segment to get students to see and think about the lesson. In the explain phase, the teacher further develops the concept(s) with the students by handing out brief notes. These notes tie to the thoughts the students shared earlier and define key terms, principles, or concept(s). In the application phase of the lesson, teachers introduce an application of the concept through a simple activity that connects the lesson to a relevant use or interest of the students. In this way, students further develop understanding of the lesson by actively engaging and applying their new knowledge. At this time, students work in small groups or with partners. Teachers begin to apply the foundation of cooperative group activities, and the results of students’ work and thoughts on the activities are shared with the class. Threaded throughout the interactive lecture are links not only to students’ ideas and prior knowledge but also to issues and areas that are relevant to their lives.

The interactive lecture can take many forms. Possible approaches to making the lecture interactive are listed in Figure 2. All derivations of an interactive lecture include three key components:

- Assessing and building on students’ prior knowledge;
- Completely involving students in the lesson through ongoing discussion, sharing, and questioning; and

- Actively engaging students in an individual or small group activity.

Each approach incorporates the elements of inquiry-based practice through an easily managed and understood method of teaching—the lecture.

Implementing inquiry-based practices during an internship is a personal and professional challenge for new teachers who hear that hands-on activities are the most effective method of teaching science. However, after the first extremely stressful week, many new teachers realize that doing labs and hands-on activities every day is not a realistic goal.

### A SAMPLE LESSON

One lesson that can be taught successfully using the interactive lecture approach is an introduction to the relationships among organisms (Figure 3). Teachers can begin interactive lectures by asking students what they remember or know about food webs and food chains. As teachers and students share their ideas during a short discussion, ideas are written on the board for all to see. Then, students form groups of three and complete a handout that asks questions concerning the relationships between two pictured organisms (either plant, animal, or fungi). For 20 minutes, student teams discuss their ideas and record them on the handout. When the time is up, the whole class discusses the work and comes up with several descriptions of the relationships among these groups of organisms. The terms “mutualism” and “parasitism” are introduced at this time.

Through this approach to the lesson, students can teach themselves the relationships among organisms in these three kingdoms, and the teacher can remain calm and in charge. This is reassuring for new teachers. The interactive lecture approach allows students to be actively involved in their learning without placing the intense stress on a new teacher to manage a completely

#### FIGURE 2.

Possible variations of an interactive lecture lesson.

- 1. Brainstorming on topic. 2. Creating a list. 3. Choosing topic concept(s) from list. 4. Demonstrating inquiry techniques of concept(s). 5. Completing application activity (in pairs).
- 1. Inquiry demonstration. 2. Sharing of student thoughts. 3. Development of concept(s). 4. Application activity.
- 1. Teacher tells story or presents situation with inquiry question. 2. Students share thoughts. 3. Link is made to concept(s). 4. Further concept development through application activity. 5. Further shared learning and development of concept(s).
- 1. Videoclip (mini-presentation) shown and related to concept(s). 2. Student activity linked to presentation. 3. Students share thoughts. 4. Further development of concept(s). 5. Application activity

#### FIGURE 3.

Lesson plan on the relationships between organisms.

**Title:** Understanding relationships among organisms from the animal, plant, and fungi kingdoms.

**Objectives:**

- Discuss and review the parts and functions of the food chain and web;
- Discuss the ways in which organisms are dependent on each other and the consequences of disturbing a food chain and web; and
- Distinguish among the relationships of parasitism, mutualism, predation, and competition.

**Materials:** overhead projector, marker, clear transparency, food chain and web transparency, assignment handout with pictures of organisms.

**Activities:**

10 minutes—Review food chains and webs in class discussion by first asking students what they know and remember. Use overhead projector to write student and teacher notes and show diagrams.

5 minutes—Split in cooperative groups of three and explain individual student roles.

20 minutes— Complete group work on assignment to describe relationships between two given organisms (plant, animal, or fungi) on organism handout.

15 minutes—Discuss answers and ideas of students, and introduce the terms predation, competition, parasitism, and mutualism as they relate to their work.

hands-on lesson. We recommend an interactive lecture approach for any new teacher who wants to “go,” but needs to “go slow.”

Student teachers report a higher level of success through this approach than in trying to immediately enact daily hands-on lessons that require greater management skills. Transitional practices like this one may lead to the later successful and extensive use of more inquiry-based, hands-on practices as new teachers gain classroom experience. The interactive lecture is just one way to bridge the gap between hands-on science teaching practices and classroom inexperience. ◇

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**REFERENCE**

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