

In Defense of the Lecture

By Mark Bland, Gerald Saunders, and Jennifer Kreps Frisch

Science education research has produced empirical data supporting good teaching techniques. An awareness of this body of knowledge can be helpful in deciding what to do with your 50 minutes to increase the effectiveness of your lecture. Some simple but effective research-based lecture strategies are reviewed.

Teachers teach, professors profess, and students learn. This is our conceptual model for education. In this age of active educational research, we have more information on how we think and learn than ever before. Yet, many teachers and professors continue to rely on age-old instructional strategies, many of which are ineffective and inefficient. Why are these practices perpetuated? As students make the transition to professors, they commonly emulate the teachers they had as students. Additionally, many professors are not aware of research in science education, or how this research might impact the effectiveness of their own teaching.

Teaching is an art. Being able to detect students' interest, attention level, and comprehension involves a suite of tangible and intangible signals from students. However, education research makes teaching every bit as much a science as it is an art. Teachers who are aware of research supporting good teaching techniques can learn to implement them more efficiently.

Perhaps the most tradition-laden strategy for instruction is the lecture. This strategy can be traced back to Greek society and Plato's Academy, where oratory was the principal mode of mass communication. This system was adopted and used by medieval Eu-

ropean universities, where instruction took the form of reading a book (the word lecture comes from the Latin *legere*, meaning "to read"), followed by commentary from the instructor. Often, only one manuscript of any work was available because of scarcity and expense, and the lecture was the only way in which the knowledge stored in these manuscripts could be disseminated to students (Kozma et al. 1978).

The lecture has been criticized for its lack of effectiveness as an instructional strategy. The usual arguments tend to run along the lines of encouraging passivity on students' part and of discouraging critical and independent thinking. Yet, when these authors reflect on our most memorable experiences as students, lectures that were well-organized and well-delivered stand out. Good lecturers knew how to get and keep our attention.

It is unlikely that the lecture method will be given up any time soon. Should this be of concern? Perhaps. Does it mean that our educational system is doomed to fail? We do not think so. Kozma et al. (1978) suggest that at least part of the reason that lecturing has received such negative attention has more to do with teachers doing it so poorly than with its potential effectiveness as an instructional strategy.

McKeachie and Svinicki (2006) note that lectures are good because they (a) are appropriate for communicating up-to-date information on the most current research and ideas related to the topics they are studying; (b) can summarize related information from scattered sources in a much more efficient way than if students were to read the sources on their own; (c) can

be tailored to the specific interests of their audiences; (d) can enhance students' abilities to read relevant text; and (e) can motivate students to learn more about the topic, particularly if the lecturer shows enthusiasm for the topic. Further, lecturers, as experts in their subjects, can model scholarly behaviors such as approaches to problem solving.

Conversely, Kozma et al. (1978) point out that lectures are *disadvantageous* because they (a) essentially are a one-way mode of communication, giving the student little or no control over the nature, rate, and flow of information. If used too much, this tends to promote intellectual passivity; (b) prevent students from really experiencing the subject; and (c) promote poor retention, a problem that is especially pronounced during longer lectures. Indeed, student attention spans have been shown to drop off after 10 to 15 minutes (Hartley and Davies 1978).

Studies comparing student learning from lecture with other strategies, such as discussion, indicate that students learn at a comparable level with the lecture format, as measured by course exams (McKeachie and Kulik 1975). However, it seems clear that content-driven, teacher-centered lectures do tend to promote intellectual passivity in students and the memorization of facts in order to pass exams, rather than the development of problem-solving skills, the ability to transfer information to new situations, or even the motivation to learn further (McKeachie and Kulik 1975; McKeachie et al. 1990).

The central element in making lectures work is to *engage* students. Because teaching is (and should be)

individualistic, not all strategies that have been developed or tested on students will work for all teachers. A certain amount of experimentation may be necessary to find the right combination of effective strategies for each instructor. Lord (2001) describes his own experimentation with cooperative learning strategies over the course of three years, during which he tracked the progress of his students with measures such as his direct observations of student attitudes toward the course and their performance on exams. Decisions about strategies to keep and those to be replaced were based on what did and did not work for *him*.

Suggestions

How do we engage our students in a content-heavy science course? How do we promote active learning in large lecture sections? How do we justify alternative strategies that take more time, when new scientific discoveries are added virtually every day to an already large body of knowledge? In a meta-analysis of several decades of research on good teaching principles, Chickering and Gamson (1987) concluded that students must do more than just listen. Rather, they must read, write, discuss, or be engaged in solving problems. Moreover, active engagement for students requires involvement in higher-order thinking tasks such as analysis, synthesis, and evaluation. Bonwell and Eison (1991) define strategies promoting active learning as “instructional activities involving students in doing things and thinking about what they are doing” (p. 2). The following elements may be valuable in considering ways to improve your lecture:

Open a dialogue with your students—There are some excellent ways to interact with your students, even in large classes. One such practice is the minute paper. At some point during the lecture, preferably toward the beginning, prime students for this task by

announcing that they will be asked to write for one minute (or two or three) on a topic specifically related to the lecture. When the time comes for students to write, ask them to summarize the major point(s) or central idea(s) thus far in the lecture, and/or write one question about a concept they did not understand. When collected, these papers provide a valuable source of information on the level of students’ thinking (and, in this author’s case, recently provided impetus for the development of a new line of research). If deemed necessary, some “carrot” such as participation points can be assigned to ensure that students take the task seriously. A select number of thoughtful questions from these papers can be the starting point for the following class session.

An alternative to collecting these papers is to have students pair up and share their papers with each other in a discussion format. It may be helpful to wander amongst students to benefit from the feedback directly. The instructor’s presence may encourage students to stay on task and help them feel more comfortable asking questions. A few could also be asked to share with the large group, completing a “think-pair-share” activity.

An additional benefit from giving this task to students on a regular basis is that students will begin to think more actively during the course of the lecture, in anticipation of the question: “What IS the most important thing we are talking about?” Finally, if this task is given to students during the lecture period, it can serve as an effective tool for refocusing attention. Angelo and Cross (1993), Harwood (1996), and McKeachie and Svinicki (2006) provide more ideas on how to use the minute paper.

Get, and keep, students’ attention—It is all too easy to get wrapped up in the unidirectional dissemination of knowledge and fail to consider such important things as attention span.

Studies have shown that attention may be adequate for the first 10 to 18 minutes of a lecture, but attention spans drop off as the class progresses (Hartley and Davies 1978; Johnstone and Percival 1976). Whether or not students are attending to the presentation will, of course, directly affect their recall of material. Hartley and Davies found that students recalled 70% of material presented in the first 10 minutes, but only 20% of material covered in the last 10 minutes, of a 50-minute lecture.

Changing students’ environment will help hold their attention (McKeachie and Svinicki 2006). Variations in the pitch of one’s voice, shifts in intensity and pace of the presentation, and even facial expression and movement about the classroom or lecture hall are often relatively easy for a lecturer to accommodate. Because auditory attention tends to follow visual attention, and one’s eyes tend to follow moving objects, then simply being more animated during a lecture can help.

An additional effective strategy is humor. Studies from the last 20 years suggest positive benefits of using humor in the classroom. Not only do college students commonly include a sense of humor when asked to describe the positive attributes of good teachers (Brown and Tomlin 1996), but some positive psychological effects of humor also result, including the reduction of anxiety, a decrease in stress, and an increase in self-motivation (Berk 1998). Furthermore, appropriate use of humor can enhance student learning. Garner (2006) found that participants demonstrated an increase in retention of course content when exposed to lectures containing course-specific humor, as compared to those who received the same course content without humor.

Anecdotal evidence suggests that humor need not be directly related to the topic at hand. The use of simple jokes can help refocus students’ atten-

tion. When jokes are injected at 10- to 15-minute intervals, students chuckle, their posture and facial expressions brighten, eyes refocus, and it is though a collective sigh passes through the entire class; they are ready to attend again. Korobkin (1988) presents a nice summary of the advantages of using humor in the classroom.

Another benefit of taking the time to engage students' interest either through humor or nonverbal behaviors is increased teacher immediacy. A concept derived from communication studies, *teacher immediacy* measures the extent to which teachers reduce the psychological distance between themselves and their students. When lecturers use behaviors that increase teacher immediacy, including smiling and humor, students report increased affective and cognitive learning (Gorham 1988; Gorham and Christophel 1990; Kelley and Gorham 1988; Richmond, Gorham, and McCroskey 1987).

Even better, combine several teacher immediacy behaviors: relax your stance, smile, and tell your students a humorous anecdote related to the concept you are teaching. Case studies and surveys conducted by Kreps (2005) indicated that students in an introductory biology course felt that they understood concepts better and enjoyed the class more when instructors used anecdotes to illustrate concepts.

Slow down—During lectures, instructors typically talk at rates between 120–240 words per minute. However, Greene (as cited in Ladas 1981) found that most students are capable of taking notes at an average rate of only 20 words per minute. Clearly, expecting students to take verbatim notes is unrealistic. Even if we assume that students are capable of taking meaningful notes, the possibility for a serious discrepancy is very real.

In a study involving medical students, Russell et al. (1984) found that students actually learned more in low-

density lectures. In this study, medical students who had been divided into three groups were given lectures with 90% new material, 70% new material, and 50% new material, respectively. During the remaining time, lecturers reinforced material by highlighting the material's significance, restating key ideas, providing examples, and the like. Students in the low-density lectures scored significantly higher on measures of learning as compared to the other two groups.

Yet another example is provided by Sundberg et al. (1994), who found that students who completed a nonmajors' college biology course actually demonstrated superior performance on a comprehension test than did biology majors after completing an introductory course designed for majors. The authors interpreted this to mean that because nonmajors were presented with fewer concepts and less detailed information, and more time was spent on developing the rationale behind key concepts, students were able to focus their attention on central ideas and key concepts rather than being distracted and overwhelmed by specific details covered in the course.

Additionally, using technological advances such as PowerPoint tends to promote more rapid delivery, making it even more difficult for students to keep up. Multimedia presentations have become prevalent as information-disseminating devices and may be effective tools in the right circumstances. However, new is not always better, and glitzy presentations will not turn a bad teacher into a good one. Indeed, student-centered learning is hardly the theme if all one does is turn down the lights and click a computer mouse.

We need to divorce ourselves from the notion that more is better. Sir Lawrence Bragg (as cited in Kozma et al. 1978) summed it up nicely:

The value of a lecture is not to be measured by how much one man-

ages to cram into an hour, how much important information has been referred to, or how completely it covers the ground. It is to be measured by how much a listener can tell his wife about it at breakfast the next morning. (pp. 151–52)

Finally, Randall (2000) points out that knowledge is more than information; it is the ability to understand the complex products of the human imagination. This kind of knowledge is central to all academic subjects, and the kind of teaching that supports this level of understanding is slow, labor-intensive, and inefficient. Randall goes on to promote the virtues of teaching the old-fashioned way, with chalk:

Highly unglamorous and prone to creating clouds of dust and teeth-gritting noise, chalk enjoys the advantage of being slow: it takes time to write with it, and you need to get up and go to the blackboard to use it... Chalk, hopelessly old-fashioned, by its very inefficiency helps to slow down the information flow and allows learning to take place. (p. B24)

Stop—A common trait among those who enter our noble profession is our tendency to enjoy explaining things. This, unfortunately, is not always consistent with models of student-centered active learning. Stop talking, at least occasionally, and make students the center of the class.

Empirical evidence suggests that regular and planned pauses during a lecture can enhance student retention and recall. Ruhl et al. (1987) found that three, two-minute pauses at intervals of 12–18 minutes during the course of a 50-minute lecture improved retention. During these pauses, students worked in pairs to discuss and rework their notes. This led to significantly higher scores (large enough to make a difference of up to two letter

grades) on several measures, including short- and long-term retention. If we talk six minutes less, students may indeed learn more! One should note that the timing of the pauses in this study is consistent with the attention span studies mentioned earlier.

Conclusion

We are obligated to do what we can to help our students learn. It is true, of course, that students must do the work; we cannot do it for them. Yet, there is a substantial body of knowledge on effective teaching and active learning. We also are obligated, regardless of our level of instruction, to become knowledgeable in this regard, and implement, where practical and in accordance with our individual styles, strategies that can help motivate and enable students to become engaged in the learning.

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