Why Do We Lecture?

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Abstract

Given the opportunities offered by present-day technology, there is a great deal of emphasis, if not pressure, on engineering faculty to make use of computers, the web, and technology classrooms in the educational process. In this environment, the role of the traditional lecture is often brought into question. While it is agreed that “technology in the classroom” is here to stay and even has an important educational role to play, it is equally certain that the traditional lecture, decorated with various high-tech teaching tools, should be an important part in the educational process. Books, the first great lecture replacement technology, have been around for over a thousand years, but with the possible exception of Ph.D. students during the dissertation phase of training, educators have never thrown them at students and expected effective learning to take place. Why is this? Why is the lecture still the stalwart of educational methodologies? The answer is the motivation for lecturing face-to-face.

We do not lecture primarily to transfer the information that already exists in books and is now on the web. Rather, we lecture to inspire, motivate, and allow students into our heads to see how we think and approach new problems. We lecture so that we can stay connected to our audience in real time. These aspects of the traditional lecture cannot be easily replaced and they provide the answer to the question of why most student still prefer to “go to class” whenever that is a viable option.

Introduction

The lecture, taken here to be a more or less continuous exposition by the teacher,\(^1\) has long been considered the standard method of teaching at the university level.\(^2,3\) In recent years, however, it has been the focus of much criticism. It is argued that the lecture method allows, if not forces, students to be passive and uninvolved rather than encouraging them to interact with the material, the teacher, and their fellow students. Critics stress that students retain more by participating in a discussion or other activities than by seeing and hearing.\(^4\) Still, when the main criterion is the acquisition of information, the lecture is as effective as reading, inquiry, discussion, audio and computer assisted methods.\(^5\)
Our exploration into this topic stemmed from our own questions about the lecture. Why is it that some of our best and worst learning experiences have been with the lecture format? Why have our institutions of higher learning clung to the approach, albeit altered over the years? Moreover, what can we do to make the face-to-face lecture time with students a more meaningful learning experience for them? These questions are important because even if a degree of validity is awarded to the above stated criticisms, an important role still remains for the lecture-format type of class. While its primary use may now be somewhat different from its traditional one, there are still some things a lecture can accomplish that reading and computer-based methods cannot. For these tasks, the importance of the lecture may be greater than ever.

**Traditional Teaching Strategies and the Lecture Format**

Traditionally, the lecture method is most suited for transferring information and knowledge from the instructor to large groups of students in a relatively short amount of time. Prior to the lecture, the instructor organizes the presentation according to the key points that are to be covered. Sometimes the lecturer builds several seemingly unrelated strands of information and then ties them together with the well-placed link or punchline. Other times the lecturer begins with a problem or hypothesis and begins to unfold the current understanding layer by layer before the audience’s eyes. The information presented is all that more valuable because of the way the lecturer has staged the delivery. Perhaps the greatest advantage of the lecture, however, is the potential for spontaneity. In particular, the instructor can adapt the presentation to specific audiences, and can do so while the lecture is in progress. By being aware of how students are responding to the presentation, the lecturer can alter the approach as necessary.

While the lecture method has been criticized for encouraging students to be passive, a more active audience is ideally achieved using discussion methods. Discussion methods are generally regarded as being most effective in developing problem-solving and critical-thinking skills. In between the two extremes of the lecture and discussion methods, a number of other possibilities exist, including collaborative-learning and problem-based approaches. These methods generally require small learning groups, and typically encompass open-ended exercises as well as design projects. Such learning strategies are thought of as best for promoting active learning, critical thinking, and conceptual understanding. They usually produce high levels of student satisfaction, and are regarded as valuable preparation for the “real world”.

In today’s teaching environment, the effective instructor uses all of these strategies in order to educate students. In fact, it is possible that elements of all of these methods will be employed during a single classroom period for an engineering course. For example, a class might begin with a lecture to present new material to the students, followed by a discussion (question-answer) session, and finally a small group problem-solving assignment, computer-aided example, or even blackboard demonstration. All of these strategies, with the possible exception of small group activities, are likely to occur routinely in the current form of the engineering class. Note that aside from the few
minutes of question and answer, the notion of the lecture being a more or less continuous exposition by the teacher holds true.

The Current Role of the Lecture Format

The challenge to instructors is to maximize the benefits of the time spent in face-to-face learning environments, i.e., the classroom, given all the possible methods that can be incorporated into the class time. This is key, particularly when considering what computer assisted instruction has to offer. Modern computer-based methods can accomplish much of what the traditional face-to-face teaching strategies do. Such methods are well suited to the transfer of accurate information and potential knowledge to the student. Problem-solving demonstrations are easily accomplished. It is also possible to arrange discussion experiences for a course, with or without the instructor, by setting up chat rooms for specific groups of students. In fact, by anticipating a variety of student responses, some computer learning programs have been designed so that a degree of “pseudo-spontaneity” is even possible. The success of distance education with its imbedded technology requirements has clearly demonstrated that effective teaching is being accomplished using these methods.\textsuperscript{4,5}

Without question, computer-based methods are able to take over many of the tasks previously undertaken using the traditional learning strategies. In fact, the existence of mathematical, scientific, and engineering computer packages has greatly altered the skill sets needed by today’s engineering graduates. For example, in the past, it was necessary that students become proficient performing mathematical operations using a slide rule, along with needing to do integration, matrix manipulations, and so forth. Now, these vital skills are merely tasks routinely performed by calculators and computer packages such that today’s students never really pass these traditional skills into their “permanent” knowledge.

To be sure, as our knowledge base evolves, some of its past components and tools, i.e., slide rule manipulations, are, and should be removed; however, in today’s engineering environment, the rate of skill transfer to computer-based tools is rapidly increasing. For this reason, it is perhaps more important than ever that students truly understand the foundations that underlie manipulations incorporated into a computer package. Instructor-guided “tours” of these software packages (not unlike a 1950ish lecture guided tour of slide rules, etc.) can provide the students not only with faster learning rate, but also give them a deep appreciation for the capabilities, and, more importantly the limitations, of the software.

It can be argued that because of the less passive environment in the past, students came to the university with a better understanding of the qualitative stream of questions that need to be asked by an engineer. How big can it be made, how fast does it need to go, or can it be manufactured inexpensively? For these students, the university experience largely consisted of learning how to obtain the quantitative answers to these system-characterizing questions. Today, the computer has removed the student's need for
learning the skills to secure the answers to these questions; however, because of their less active involvement, these students seem to benefit from a greater emphasis on learning about the qualitative questioning stream. Thus, whereas the lecture format in the past dealt largely with the presentation and development of mathematical skills, today's lectures need to stress more about the questions that need to be asked for which these tools can provide answers.

The lecture is not merely the presentation of material, but rather an interaction of the lecturer and the class, in which the lecturer is constantly aware of whether or not the students comprehend and are interested in the material. If it is apparent that learning is not taking place, then the presentation can be adjusted accordingly, perhaps taking a completely different direction. With visual and verbal clues from the learners, an instructor can easily shift focus, direction, remove or change a poorly understood example or analogy, repeat all or part of a topic, and reevaluate what and how material will be covered in the subsequent lectures. Finally, it offers a personal interaction between instructor and student that is just not possible within books and computers. This interaction allows the instructor the possibility of exciting students about the material. It affords the students the possibility of “getting into the instructors head” to see how one with more experience approaches and solves a new problem. In addition, the “randomness” that comes with such interactions allows the instructor to click and hit the mark with some students on some days, and with other students on other days. These major “ah hah!” or “understand the whole picture” revelation events, either observed in peers or directly experienced, are beneficial and encouraging to students as they work over an understanding barrier. Such revelations strengthen learning resolve and are seldom experienced when using online resources.

Conclusion

Unquestionably, the incorporation of computers and other technologies into engineering education has been a positive and constructive turn of events. Indeed, the use of computational packages has changed the nature of engineering practices. Technology classrooms facilitate learning by the adjustment of the information transfer rates with which students are accustomed, those of MTV and computer games. None of these alterations in the learning environment, however, provide any justification for the removal of the lecture as a valuable teaching tool. These alterations do demand that the lecture take on a different mantle. Lectures as presented through the late 20th century are archaic. Today's lecture should be performed, not presented. The lecturer must use the technology tools available as instruments that blend with the lecturer’s knowledge and experience to excite and inspire the learner. The excitement of education is the best incentive for the learner. The instructor is the only component of an educational tool kit that can demonstrate and infuse that attribute into a student.

Finally, the lecture is still the only vehicle that responds to unpredicted kinks in a learning situation with maximum efficiency. During a lecture, the instructor can change the pace, mode and style of learning as the situation demands. The lecturer can manipulate the situation from planned chaos to quiet contemplation. The lecture itself
can range from pure entertainment that aims to make a single point, to a broad sweep of a complete concept with the intent on skimming the surface to arouse curiosity. Thus, given the opportunities offered by present-day technology, the emphasis, if not pressure on engineering faculty, to make use of computers, the web, and technology classrooms in the educational process is all the more reason that the lecture will continue to remain as the cornerstone of a successful classroom experience.

Bibliography


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