

WHY LECTURE?†

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For students who can read and for teachers who can write, a formal lecture is often an inconvenient, financially costly, and unreliable device for transferring information from a lecturer to a student. Many of the traditional functions of a lecturer—collecting, organizing and summarizing material; stressing important points; expanding upon particularly difficult features of the discipline; repeating and reviewing facts and theories; presenting interesting examples and illustrative material; and (in the U.S.A.) indicating what will be on the next examination—many of these functions can be discharged well, often better, on the printed page.

Why, then, do we lecture? Why not mimeograph what one might say in a lecture and be done with it? While in the short run that might be more difficult, both for the lecturer (writing is more difficult than talking) and for the student (reading is more difficult than listening), in the long run the printed word is superior to the spoken word in: availability to the student (even small libraries have more books than large universities have classrooms or low-fidelity TV has channels); convenience, as to time and location (no mid-winter eight o'clocks, traffic jams, or parking problems); value as a permanent reference (ink lasts longer than sound waves); technical accuracy (printing presses do not misspeak); ease of scanning (browsing through a book is more fun, and less time-consuming, than scanning selectively a set of live—or taped—lectures); promotion of the habit of independent study (learning to learn without the help of a teacher; perhaps THE most important skill a student might acquire in college).

Yet, by design or by habit, most teachers—among them successful authors—continue to lecture. Whether acknowledged consciously or unconsciously, the efficient communication of knowledge is evidently not the only, or possibly even the chief, function of some, possibly most, lectures.

When asked Why have lectures? students reply as follows‡ (emphasis added): I *enjoy* lectures. It is more *interesting* to listen to a lecture than read. In a lecture an instructor is able to relate his ideas with *zest*, *Figure 1*. Lectures arouse my *curiosity*. Lectures are the *easiest* way for students to learn. It is *very difficult* to learn material for the first time from a book. A course would be quite *boring* without lectures. Lectures break up the *monotony* of just solid reading. Lectures cover material *more slowly* than the text does. In lectures one can ask *questions*.

† First presented at the Hamline University Seminar on 'Some Reflections on Teaching Techniques', St Paul, Minnesota, 12 February 1969.

‡ Typical responses of 120 freshmen chemistry majors at the University of Minnesota, 1968.

Teachers reply similarly—though characteristically at greater length—when asked Why Lecture? Replies of sixteen master teachers at colleges and universities representing, collectively, most regions of the U.S.A. are summarized as follows:

Inspiration

“‘Why Lecture?’” Because it provides a means for personal stimulation and excitement which is not present in the printed page.’

‘I suspect that the only function of lecture that could not be carried out by a text or other self-instruction device is that of inspiration.’

‘The final justification I can see for a lecture course is a matter of personality and excitement which can be a part of a good lecture more easily than they can be obtained from a book.’

‘Many students need to hear someone who is excited about his discipline.’

‘Most importantly he [the lecturer] shows enthusiasm. This is the best way to get students enthusiastic and probably the only way for many students.’

‘Without the inspiration, explanation, and even goading of the teacher, few students can make much progress in reasonable time. Many make little enough with this help.’

‘Lectures should be factual, informative, entertaining, and, above all, stimulating to students.’

Personal identification and commitment

‘I lecture a lot, on the theory that learning depends on identifying with someone (a teacher) and this can’t happen with a book. For this to work, my lectures have to be highly personal, which they are.’

‘Students get pretty well acquainted with the personality of a lecturer. If they come to respect him, feel that they have confidence in him, they receive some motivation from this experience. One can tell by the type of smile one gets outside the classroom, the waving at an intersection as they dodge your car, etc., how they feel.’

‘To me it seems that students become engaged with the problems of a subject only after they have chosen for themselves a certain life image. The most effective thing the teacher can do, then, is to act out for them what it means to be a chemist, seeking to evoke their commitment by his own.’

Personal contact (between the teacher and his students)

‘The point of major importance is individual contact between teacher and student. This is extremely important even in large classes.’

‘I can find no suggestion that there is any substitute for the personal interaction between student and teacher in learning really challenging material.’

Companionship (among students)

‘One advantage of a large class is that you can count on the emotional response of a large group in a way that is impossible with a dozen or so [or a single student].’

Polyani¹ speaks of ‘the primitive sentiment of fellowship’ and ‘the emotional comfort of the flock’ and adds, ‘The fostering of good fellowship within small groups of people living together, be it as families, as school-fellows, as shipmates, as fellow members of a congregation or of a workshop or office team, is a direct contribution to the fulfilment of man’s purpose. . . . Industrial psychologists have observed that the output of a workshop increases when its operatives find pleasure in each other’s company. Many are the instances in which the improvement of conviviality is deliberately advanced for the sake of such advantageous results. . . .’

Professional at work

‘I think at best a lecture can be a demonstration of how a professional thinks about a problem, can be an interesting, enjoyable experience, can be inspirational to students to go on and do likewise.’

‘By your approach to the material, you are giving an example of [a professional] at work.’

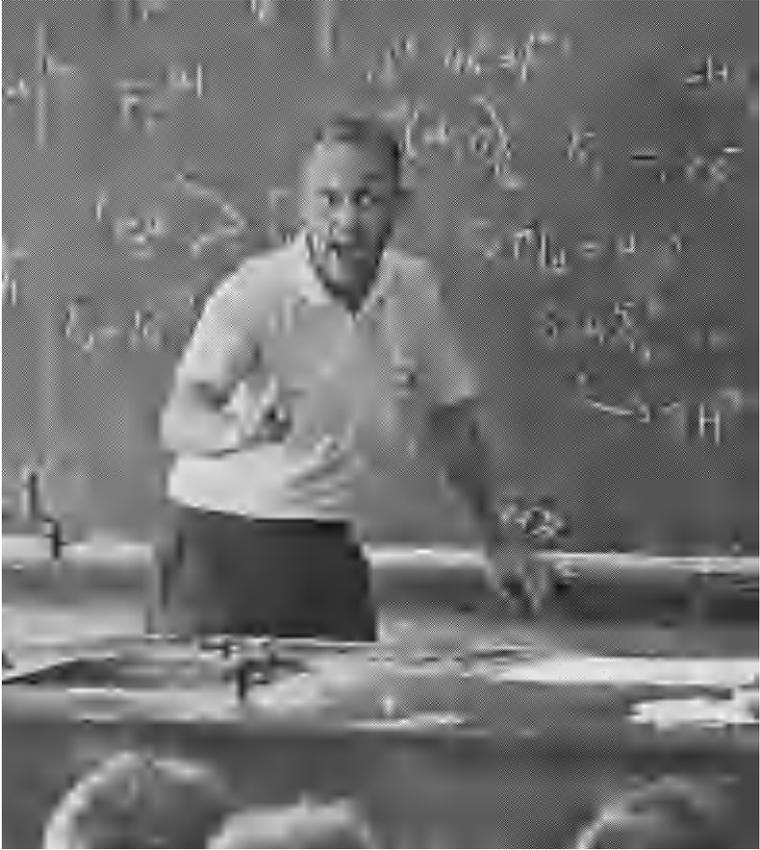


Figure 1. Professor Clark E. Bricker. Courtesy of Dr Eugenc C. Jekel, Hope College, Holland, Michigan.

WHY LECTURE?

'At times a lecturer will get into trouble in his lecture or with questions asked by students. He owes it to the students to show how he thinks and works when in trouble.'

'A student is trying to learn not only a subject, but also how one learns a subject. He therefore needs to see a person expert in the subject at work. Imitation is a powerful instinct.'

'There is one more attribute of a class which I think is important in the sense that it cannot be obtained, as far as I can see, from any other kind of contact. This is the opportunity for the student to see how a presumably educated person handles problems when they are given to him. . . . Since the solution of real problems is an important component of life, it may well be that this could be one of the most important aspects of the classroom situation.'

Beyond chemistry

'There is much more to education than learning the content of a series of courses. Part of education is learning to appreciate the meaning of scholarship, beauty and social responsibility. It is well if the lecturer combines some of the desired qualities in himself, but even if he does not he can exhibit to the class his admiration for those qualities which he wishes he had. . . .'

'Students, in general, are searching for something, not only a discipline to study, but a philosophy of life. . . . I often digress and give some of my philosophy of life—the importance of integrity, the value of having pride in one's job, the significance of using our talents, how to study, how to approach problems, etc. . . . Many students have reminded me, several years after being in my class, about something that I said in lecture and such recollections are not usually pure chemistry.'

Questions

'Through questions a lecturer can find out what is "bugging" his class, at the moment, and select his material accordingly. No author can do that. A lecture can be highly relevant, topical and up-to-date.'

'If the student is able to ask questions, . . . it allows you to be sure that you are transferring understanding. This point of instant clarification and reinforcement is a great advantage of lecturing. Too often, however, . . . the lecture system degenerates into a completely one-way street of non-communication.'

Bias for the spoken word

'Students could effect great tuition savings if they would but go into the library and learn by themselves. But they don't. It is too hard.'

'Even our good students do not find working by themselves easy and don't do it very well, at least for a long time.'

'It is hard work and often frustrating for a student to get to the place where self-study is efficient.'

'Some students pick up best that which they hear.'

'Lecturing, although admittedly inefficient as far as volume of information per time is concerned, is also the easiest way for the student—that is, requires the least effort and makes the most painless demands on the student's time.'

'For many people the spoken word is still the best method.'

'Basically, I would have to agree that for very intelligent students who know how to study, know how to find information in the printed word, and know what they want in college, lecturing is not a very efficient way to impart information. However, the number of students entering college today that fulfil these requirements is, in my opinion, low.'

'Some students cannot read. Or if they can it is very hard for them. Modern life trains people to listen, hence we should take advantage of this asset and not ignore it. We need all the help we can get to be successful in chemistry with some students.'

In summary, reading is hard work. Listening is easier. Moreover, 'Even though people may conceivably misunderstand any particular words addressed to them, they can, as a rule, convey information to each other reliably enough by speech¹.' Conversely,

'[S]ome points that an author feels he has presented [clearly] are virtually impossible for a student to understand since he doesn't know what was in the author's mind, but only what he puts down.'

It is difficult for most teachers to convey to students what they mean, in writing. Similarly,

It is difficult for many students to convey to teachers what they know, in writing.

In conventional lecture courses we dispense information in verbal form (the least difficult thing for a teacher to do) and demand it back in written form (the most difficult thing for students to do).

In higher education, we often do it the easy way for the teacher, the hard way for the student.

Pace

'Lectures offer a change of pace. A student cannot study difficult material eight hours a day. A certain kind of relaxation is possible in a lecture which can be a stimulus to work from a text.'

'A course of lectures provides students with a schedule.' Left to themselves, most students attempt to read technical books too rapidly and become discouraged.

Use of models, demonstrations and the blackboard

'Even the most illustrative books and the most lucidly written texts are not able to present three-dimensions adequately for most freshmen. *The use of models is enormously productive*, and even a relatively formal, organized, lecture can do things that no book can do. . . .'

'The Chinese say a picture is worth a thousand words. I would add that the thing itself is worth a thousand pictures. We get so used to secondary sources, which is what books and pictures are, that we forget the value of seeing the thing itself. Many things are presented simultaneously in a [lecture] experiment, which are artificially presented in sequence on the printed page. Furthermore, colour, light, sound, odour may all be part of an experiment. 'I didn't know what the word REACTION meant until I put nitric acid on copper' said Ira Remsen.

'An idea can be developed on the blackboard with suitable emphasis, reference back to earlier parts of the discussion still on the board in a way that is impossible on the printed page [or with film, or an overhead projector]. The lecturer selects easily and quickly the items he needs and helps the student simply by pointing for his reference.'

In teaching subjects rich in symbolic and positional notation, there is an unusual opportunity to use effectively, and no substitute for, the blackboard.

Reservations and conclusions

'What bothers me most is the realization that these lectures [before large classes] might be best described as a *performance*. I think I'm quite good at it and then another shock—I have an *audience*, not a class. This performance-for-an-audience bit, no matter how well done, I feel is not teaching. Certainly it is not good education, when it is the only association with students.'

'The more the classroom situation became a performance (and perhaps it was a good performance or a lesser performance depending upon how I felt from day to day), the more I wasn't doing what I wanted to do.'

'Basically, listening to a lecture is a *passive* experience; whereas real learning requires an aggressive, affirmative posture and attitude.'

'To kill the bad habits of formal lecturing the student MUST . . . be put on his own. There is no substitute, it seems to me, for reading widely.' Ideally, lectures are a prelude to, not a substitute for, the hard work of independent study.

'Students must somehow learn what their instructors cannot teach them.'

'Lectures have a vital but limited role to play.'

Broadly speaking, it would appear that the *chief* function of a lecturer, in the view of students and teachers in the U.S.A., is to inspire students.

There are many ways to inspire students: getting to know them personally, in curricular and, importantly, extra-curricular activities (many chemistry teachers in the U.S.A. say that they come to know their students best through personal supervision of their laboratory work); answering

their questions, individually in tutorial sessions and before large classes; solving problems for them, unrehearsed, at the blackboard; showing them practical applications of the discipline to the human condition; introducing, selectively, historical and biographical material; preparing for them interesting and instructive lecture demonstrations and films; personally grading their problem-notebooks and term-papers (The only real gift, it has been said, is the gift of time)†; encouraging them to do outside reading‡; engaging them in special projects and research (often very gratifying, with limited numbers of superior students); and for some instructors perhaps the only way, preparing and giving formal lectures, examinations, and grades—with the threat of expulsion, should the students do poorly.

Psychologists say, however, that the most effective way to inspire students is not by lecturing or by getting to know them personally, helpful as these things may be, or by rewarding and punishing them, as in conventional grading systems. There is a more effective way to modify student behaviour; i.e. a better way to inspire students to study (or to make some other personal commitment to), e.g. chemistry.

Since studying is a lonely, often frustrating and discouragingly difficult activity, most students need the reinforcement and inspiration they receive from seeing friends of comparable age, background and experience successfully engaged in the same activity. Residential colleges, libraries, reading rooms, specially designed honour sections, conventional classes, possibly even car-pools contribute, each in its fashion, to this need. But could we not go farther? *Could we not take fuller advantage of the fact that students have a greater educational impact on students than do their teachers?*

From earliest times universities have had teachers to listen to and textbooks to read. These two traditions, the oral and the written, are mutually complementary: the former may be inspirational, e.g. but often is inconvenient, while the latter may be convenient but usually is not inspirational. In recent decades both traditions have been strengthened through, e.g. the use of television and programmed materials—without, however, there having been any significant change in the position of the undergraduate in the university. In spite of revolutionary changes in society, the university has not changed in its essential style since medieval times². In many instances, the lecture remains a tribal ritual affirming the ancient, vestigial eminence of the doctor³. *What university, for example, uses systematically the potential of undergraduates to teach undergraduates?*

Yet a student who has recently achieved superior control in a course and who is currently enrolled in a more advanced course in the same field would, in the rôle of a teacher or tutor, be a particularly effective model for slightly younger students to emulate.

† 'If small classes can be arranged, then *short student papers are the best educational tool I've found*. They learn from the paper and there is a guarantee that the students will be prepared for a good "Socratic" discussion.'

‡ 'We are all so busy going to class, however, that none of us has time to learn very much. . . . Students to a sorry extent are precluded from really reading because, along with everything else, they must run around to 15 lectures a week to hear their textbook summarized.' 'It is not conceivable that anyone can enjoy, or even understand, the study of five courses at one time.' 'At least at — the course load and pressure is designed to make the student learn to cut corners.'

Also, as we all know, the best way to learn a subject is to teach it. Yet we reserve this attractive feature of the educational enterprise for the senior faculty—who (we may hope) least need it—and the graduate students—who (though we wish it were otherwise) may need it, but often do not want it.

Unfortunately, in preparing undergraduates to serve as teachers or tutors, the prevailing curriculum in chemistry in the U.S.A. could hardly be worse. A student in a conventional, sophomore-level organic course cannot tutor first-year general chemistry students as well as he could at the end of his freshman year. Similarly, enrolment in a conventional, junior-level physical chemistry course does not enhance a student's ability to tutor students of organic chemistry.

To make effective use of the potential of students to teach students, we need a curriculum in which in the sophomore and junior years, particularly, students study *at least* one area (and perhaps several areas) of chemistry they studied in previous years—such as, e.g. structure, synthesis, mechanisms, energetics, and spectroscopy.

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