

Lecturing *Is* a Personalized System of Instruction—for the Lecturer

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Editor's Note

PSI is an instructional strategy *not* an example of the instructional development process—so why is *JID* publishing an article about it?

Fisher's article differs from the technique/media articles we summarily reject. It offers insights into the opposition to designed instruction and suggests a strategy to manage that opposition.

Instructional developers are often at a loss to explain why lecturing is the favored method among so many instructors. Fisher discusses, in terms of psychological motivation, why she believes instructors cling so tenaciously to the lecture method, despite its deficiencies—she is interested in the real reasons for resistance to change, not the ones instructors overtly cite. Unless an instructional developer is aware of these primary motivational factors and is prepared to deal with them, no instructional strategy, no matter how good it is, will succeed.

Fisher combines two old techniques—lecturing and PSI—and develops a new approach that offers the developer yet another option in instructional strategy selection.

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PSI for Students— The Keller Plan

In 1968, Fred Keller described the now well known personalized system of instruction (PSI or Keller Plan) and the five features that distinguish this approach from most conventional instruction: (a) the go-at-your-own-pace feature, (b) the unit-perfection requirement for advance, (c) the use of lectures and demonstrations as vehicles of motivation, (d) the related stress upon the written word in teacher-student communication, and (e) the use of proctors for repeated testing, immediate scoring, and tutoring. Keller hypothesized that the reinforcement contingencies included in PSI would enhance student learning. To date, this hypothesis has been substantiated. Reviews of many evaluative research studies on Keller teaching conclude that final examination performance in Keller sections always equals, and usually significantly exceeds, performance in lecture sections (Kulik, Kulik, & Carmichael, 1974; Taveggia, 1976). Further, students consistently rate the plan more favorably than teaching by lecture; they also report feeling that they learn more in Keller sections. These findings are particularly striking when one considers how few significant differences in student achievement have been found with previously known (traditional) teaching methods (Dubin & Taveggia, 1969).

The Keller Plan thus has seemingly well documented superiority for students over the lecture method of learning. It is the subject of much research and enjoys considerable popularity as

an innovative teaching method. Yet it has not succeeded in becoming the dominant or even a major mode of college and university teaching. On the contrary, Kulik, et al. (1974) reported 877 psychology courses taught by the Keller method in the United States in 1972, a modest fraction of total psychology courses. Similarly, a 1975 survey of a nine-campus university found the Keller Plan used in just 36 courses (Susskind, 1975)—less than 1.0 percent of all courses taught in the system. Even if these reports underestimate PSI use by a factor of 2, which is unlikely, the frequency of PSI instruction is impressively small.

In contrast, a study of the University of California at Davis found the lecture method used at least 75 percent of the time in more than 70 percent of all classes surveyed (Wallick, Note 3; Venturino, Note 2). This figure is similar to, or perhaps greater than, that reported by faculty in 28 southern and midwestern colleges and universities almost 30 years ago, where lecturing accounted for 58 percent of all class time (Umstatt, 1964). If lecturing is decreasing in frequency as more alternative teaching methods become available, as might be expected, the trend seems almost imperceptible.

Why does the lecture, an invention of the Middle Ages, continue to prevail? Many have pondered this question and a variety of answers have been suggested (Paulsen, 1902; Smithers, 1970; McLeish, 1976). For me, the most persuasive response is the one suggested by the title of this paper—that lecturing is a personalized system of instruction, *for the lecturer*.

PSI for Faculty—The Lecture Method

The reaction of faculty members to the lecture method of instruction is almost universally favorable. Compared to other teaching methods, lecturing seems to produce a greater sense of understanding of the course content, generate a greater feeling of achievement, and provide a greater recognition of the faculty member as a person and eminent authority.

Among the important features of the lecture method are:

- The stress upon the spoken word in teacher-student communication with its associated spontaneity, flexibility, simplicity, and familiarity;

- The immediate feedback provided by the live audience and the appreciation that is demonstrated when the intellectual and/or dramatic performance is well done;

- The marked enhancement of the personal-social aspect of the educational process wherein the lecturer can project his or her personality and philosophy to the students and serve as a role model for them;

- The emphasis on the teacher as knowledgeable authority and the self-confidence that results from identification with this role;

as proofreading, planning, organizing, and managing.

The satisfactions associated with lecture teaching contrast markedly with the PSI experience, which offers relatively little reinforcement for most instructors. PSI is designed to move ahead at various paces set by the students, not the teacher. The professor becomes an invisible behind-the-scenes organizer who arranges things so students can productively “do their own thing.” He or she plays the role of facilitator rather than knowledgeable authority and may experience a concomitant loss (or lack

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- The motivation that lecturing provides for keeping current in the literature, with the consequent reinforcement of the lecturer’s scholarly endeavors; and

- The use of teaching assistants to free instructors from the tedious aspects of lecture teaching so the latter may concentrate on the intellectually satisfying activities of preparing lectures and the psychologically satisfying activities of delivering them.

In addition to the intrinsic psychological rewards, external contingencies also operate to make lecturing the method of choice for most university professors. Peers, for example, recognize lecturing as appropriate, desirable, and comprehensible behavior, and the reward system in many institutions is biased in favor of teachers who use the lecture method. Also, teaching by lecture is generally less time-consuming than teaching with alternative methods such as the Keller Plan, especially at the outset. More importantly, a greater proportion of the time invested in a lecture course seems to be on a relatively high intellectual plane (reading, thinking, synthesizing), while individualized instruction seems to demand the expenditure of relatively large amounts of time on comparatively uninteresting tasks. Because of its emphasis on the written word and on self-pacing, individualized methods usually entail significantly greater time commitments to tasks such

of enhancement) of self-image and self-confidence. In PSI, the instructor can interact with some students on a one-to-one basis, but there is relatively little opportunity to project one’s persona to the class as a whole. Stress upon the printed word, while it may enhance precision, constrains spontaneity and flexibility. It also discourages continuous updating, because it is more difficult to modify print materials than oral presentations. Even the teaching assistants and tutors in PSI courses, rather than relieving instructors from tedium, often add to their burdens because of the requirements for special training, coordination, and supervision. And for all of the effort that PSI requires, the instructor receives little recognition and no immediate feedback. The evidence seems strong that the Keller Plan is good for students and lecturing is good for faculty.

PSI for All—the Combination Method of Instruction

To resolve this dilemma, a new instructional method is proposed which incorporates the empirically documented strengths of both approaches. Dubbed the combination method of instruction (CMI), it is intended to significantly enhance student learning and personal-social development while at the same time providing intellectual stimulation and personal satisfaction to the instructor. It should be a valuable method from the institutional viewpoint

as well because it is conducive to continuous updating of the knowledge framework and it recognizes the importance of the discovery and ordering of knowledge as well as its transmission.

The reader will recognize that CMI, or some variations of it, has been used in university teaching for many years. But these variants are often just thought of as compromises, either by the lecturer who feels he or she should do something to innovate or by the instructor of an individualized course who is unable to maintain a full-blown individualized approach. The combination method of instruction is not generally recognized as a valuable, perhaps even an ideal, strategy in its own right. Yet there is every reason to believe that, when applied systematically, CMI will produce levels of student achievement and retention as high as those now obtained with PSI and instructor satisfaction as great as that associated with the lecture method.

Six features characterize the combination method of instruction:

1. Substantive oral presentations (lectures) given frequently by the instructor to the class;
2. Frequent individualized testing with immediate feedback on test results;
3. Emphasis on higher order learning skills;
4. Unit perfection requirement or mastery grading (for some topics);
5. Normative grading (for other topics); and
6. Carefully structured learning materials to provide precise and definitive sources of information which students can study independently and each at his or her own pace.

It may be useful to examine the theoretical and empirical bases for the elements of the combination method of instruction.

Theoretical and Empirical Bases

The Lecture

More than 100 studies demonstrate that, on the average, students learn no more with the lecture method of instruction than they do through discussion, supervised independent study, or even unsupervised independent study (Dublin & Taveggia, 1969). Reviews of the literature conclude that students learn significantly less with lectures than when taught by the personalized system

of instruction (Kulik et al., 1974; Taveggia, 1976) or various autotutorial methods (Fisher & MacWhinney, 1976). Students also appear to retain significantly less from a lecture course than from a PSI course (Kulik & Jaksa, 1977). Yet college and university professors continue to prefer the lecture method. Why?

It seems that lectures are not dinosaurs of past ages, but rather a highly evolved and successful species in the pedagogical sphere. The process of preparing lectures seems to provide continual intellectual stimulation to faculty members and prompt them to continuously reassess and rethink the knowledge structures of their fields. A recent survey (Fisher & Cohen, Note 1), for example, found lecturers significantly more inclined than instructors of individualized courses to report that their instructional method helps them keep current in the literature, integrate new knowledge, and develop new research ideas. Thus, the lecture method of teaching may stimulate faculty to greater creativity, insight, and/or research productivity than other instructional methods do. Two well known adages, "teaching (lecturing) and research go hand in hand" and "the best researchers are the best teachers (lecturers)," reflect the popular view that university teaching is an adjunct to or extension of the processes of research and scholarship. Likewise, faculty members generally opt for teaching assignments which are closely related to their fields of expertise and which will rein-

fessors derive more satisfaction from teaching than from any of their other responsibilities (Ladd & Lipset, 1976). Students also tend to enjoy the psychological benefits associated with witnessing a live performance and interacting with a role model, and they generally appreciate the fact that information is presented from a here and now perspective (see, for example, Dubin & Hedley, 1969).

Furthermore, lecturing is generally cost-effective and conserves instructor time as well. More importantly, as suggested previously, a greater proportion of the time invested in a lecture course seems to be on a relatively high intellectual plane. Faculty members indicate that lecturing stimulates them to engage in more reading, thinking, writing, and rethinking than individualized instruction does (Fisher & Cohen, Note 1). If this is so, the institution as well as the individual has a stake in preserving the lecture method. Students are, after all, transients in academia. Faculty are the pillars of the organization and the determinants of its quality. Development of new ideas and fresh perspectives seems to be an arduous process which generally requires a lot of thinking and rethinking. The learning gains which individualized instruction can contribute to current students may be counterbalanced by learning losses for future students if the intellectual vigor of the faculty declines. That is, while students may generally learn more of whatever is taught in a PSI course, the quality of what is taught may sometimes be higher

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force their intellectual growth in those fields. Transmission of knowledge is not the sole priority of institutions of higher education. The discovery of new knowledge and the ordering and preservation of existing knowledge are important priorities, too.

The process of delivering lectures provides immediate feedback to faculty regarding their current thinking, and it offers personal-social satisfaction to instructors because they can project their personalities and philosophies to the class. In fact, college and university pro-

and/or more current in a lecture course, especially as courses age.

Frequent Testing and Immediate Feedback

Theoretically, frequent testing with immediate feedback stimulates a continuous rate of learning (rather than cramming) by students and provides guidance so that things are learned in productive rather than unproductive ways (Skinner, 1954). The process provides a steady stream of reinforcement contingencies to reduce the chances of a

student learning things "wrong" and then subsequently having to go through the tedious processes of "unlearning" and "relearning." Misconceptions are eliminated early, before they become fully integrated into the student's knowledge structure.

The optimum frequency of testing is not known, but in practice "frequent" implies to one to three quizzes each week in a typical course, preferably (but not necessarily) at the student's convenience. The quizzes may be oral or writ-

above, the quiz group scored about 10 percent higher than the midterm group on the final examination, even though the two groups had equivalent pretest scores. Even more encouraging, the differences between the two groups lay almost entirely in the students' problem-solving abilities; there was relatively little difference in performance on fact-recall items.

In summary, the repeated study-test-feedback loop provides students an opportunity to assess their learning

that repeated stimulation is required to maintain deep-level thinking. In my own classes, I often ask students to bring in tests they've taken in other courses, identify the questions according to Bloom's taxonomy (Bloom, 1956), and rate the tests according to (a) how good a test they think it is and (b) how much they enjoyed taking the test. Almost invariably, students prefer tests with higher order questions. Construction of higher order test questions can be an intellectually stimulating task for the instructor, too.

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ten, essay or objective. Tests may be administered and feedback provided by an instructor, teaching assistant, undergraduate tutor, computer, or in some other way.

Pressey (1926, 1950) first demonstrated the value of frequent testing with immediate feedback in promoting student learning. Research aimed at assessing the relative contributions of various PSI components to overall effectiveness of the method also finds these factors important. Frequent testing produces significant gains in student achievement and retention, often resulting in scores 10 percent higher or more as compared to scores of matched groups of students who are tested infrequently (Nelson & Bennett, 1973; Semb, 1974; O'Neill, Johnston, Walters, & Rashed, 1975; Calhoun, 1976). Immediate feedback on quizzes likewise results in significantly higher final test scores than are obtained when feedback is delayed (Farmer, Lachter, Blaustein, & Cole, 1972; Calhoun, 1976). It is interesting to note that frequent testing has been successfully combined with lecture teaching (Stalling, 1971).

Our studies (Williams, Note 4; Williams & Fisher, Note 5; Fisher, Roth, & Williams, Note 6) examined student learning in a video-autotutorial course during a 10 week period. One group of students received 24 individualized quizzes with immediate feedback and the other received two midterms and delayed feedback. As with the studies

progress and to keep themselves on the right track, making continuous fine-tuning adjustments as they go along. It decreases the chances that a student will learn something incorrectly (as often happens with infrequent testing) and then have to go through the difficult process of "unlearning." It is akin to monitoring a satellite continuously and making minor course adjustments as needed, rather than trying to keep it in orbit by giving it a rocket blast once every 5 weeks. The significance of frequent testing and immediate feedback has been consistently emphasized by the theoreticians (Pressey, 1926, 1950; Skinner, 1954, 1958, 1968; Ammons, 1956).

Emphasis on High-Level Skills

Although the importance of frequent testing is often emphasized in discussions of PSI, the quality of the tests is rarely mentioned. Yet it seems clear that trivial tests will lead to trivial learning. Questions in the higher levels of the cognitive domain (i.e., interpretation, application, synthesis, analysis, evaluation) are generally preferable to simple fact-recall items. Marten and Säljö (1976a, 1976b) have done some interesting studies to show that higher order questions promote "deep-level processing" in students, while lower order questions lead to superficial types of thought processes. They also find that students tend to revert from deep-level to superficial processing over time, so it seems

Mastery Grading for Core Topics

Mastery learning theory asserts that under appropriate instructional conditions virtually all students can learn well (Block & Anderson, 1975; Anderson & Block, 1976). That is, teachers can teach in such a way that most students can master most of what is taught. Further, as a result of these successful learning experiences, students theoretically develop positive attitudes toward learning and therefore enjoy increasingly strong intrinsic motivation to continue learning. The concept of mastery is not new; its origins can be traced to such early educational philosophers as John Locke (Bloom, 1974).

In mastery teaching, the instructor determines a minimum acceptable level of performance on unit tests (usually 80 percent to 100 percent) and requires that students who fail to achieve this level restudy and retake quizzes until they obtain an acceptable score. There is no penalty for unacceptable quiz scores.

Mastery teaching produces significant learning gains among students. A review of 97 studies of achievement with mastery and nonmastery conditions found that mastery students scored higher 89 percent of the time and significantly higher 61 percent of the time; likewise, in 27 comparisons of retention scores, mastery students almost always scored higher than nonmastery students and significantly higher 63 percent of the time (Block & Burns, 1976).

Yet mastery seems to generate greater skepticism among college and university faculty than any of the other components of PSI. The nature of the controversy has been succinctly summarized by Block and Burns (1976):

Critics of mastery learning assert that mastery approaches to instruction are rigid, mechanistic, training strategies . . . that they can only give

students the simple skills required to survive in a closed society . . . ; and that they do not appreciate the complexities of school learning Adherents of mastery approaches to instruction maintain that they are flexible, humanistic, educational strategies . . . ; that they can provide students with the complex skills needed to prosper in an increasingly open society . . . ; and that they do take into account the realities of classroom life . . . (p. 3).

One way to resolve the conflict is to combine mastery and normative grading in a single course, not an uncommon practice. Mastery grading may be used for those topics which the instructor feels are core elements; that is, those which, in the instructor's opinion, all students should master before going on to more advanced topics.

Normative Grading for Advanced Topics

It seems desirable at times to encourage students to "reach" or "stretch" as high as their own intellectual limits will allow, rather than to minimum acceptable levels set by the instructor. Normative grading has been successfully used for this purpose for years. The value of competition as a means of achieving ex-

mastery grading). For example, an instructor may present a hypothesis and ask students to design an experiment to test it. In this situation it's quite possible that a student will design a valid approach that the instructor had never thought of; this is not quite the same as training a person to fly an airplane, where both the necessary skills and the desired outcome can be neatly described in advance.

There are many ways in which mastery and normative grading can be combined in a single course. For example, instructors may give a C grade to students who satisfactorily master the basic elements of the course and then provide additional normatively graded requirements for those who wish to earn a B or A grade.

Learning Materials.

Three features of PSI have been shown to enhance student learning: frequent testing, immediate feedback, and mastery grading. One more element seems essential. It is a basic part of all PSI and autotutorial courses and of most lecture courses. This is reliance upon one or more media to present information to students. Printed materials (textbook, syllabus, etc.) provide careful organization, verbal precision, and

the greater the likelihood that a student's individual learning style will be optimized. More important than the quantity of the material selected, however, is its quality and appropriateness for the learning task.

Elements Excluded

Some features of PSI are not emphasized in CMI because available evidence suggests that they do not contribute significantly to gains in student learning. These include: motivational lectures, self-pacing, and proctor-grading. That is, student achievement remains about the same whether motivational (as opposed to substantive) lectures are included or omitted (Calhoun, 1976), whether progress is self-paced or instructor-paced (Robin & Graham, 1974; Semb, Conyers, Spencer, & Sanchez-Sosa, 1975; Calhoun, 1976), and whether quizzes are self-graded or proctor-graded (McMichael & Corey, 1969; Born, Gledhill, & Davis, 1972; Blackburn, Semb, & Hopkins, 1975; Calhoun, 1976). Some instructor-pacing seems preferable because self-pacing leads to problems of procrastination, higher drop-out rates, and failure to finish the course (Robin & Graham, 1974; Semb et al., 1975).

Prototypes

The combination method of instruction has been and is being developed in a number of large enrollment science classes at the University of California—Davis. Use of a computer system to generate and score unique quizzes makes the frequent testing both feasible and cost-effective in a large class setting. Discussion of quiz results by the student and teaching assistant serves both to personalize the feedback and to allow it to take on greater depth, while still keeping the cost relatively low.

Once appropriate computer programs are developed they can be shared by many different courses (providing the necessary flexibility is built into them), making program development cost-effective.

Typically, a professor and a part-time graduate student can produce a bank of reasonably high quality items in 6 months to a year, while continuing their other activities. We have found that professors can and are willing to share a single item bank for several different but similar lecture courses.

Maintenance of an item bank is less

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cellence has been repeatedly documented, not only in academia but in sports, social systems, and many other arenas. Competition in civil service examinations, for example, has been credited with creating a stable society in China for two millennia (Ebel, 1972). Competition is also an integral part of the American free-enterprise system. As a consequence, competition in school is valued not only as a means of identifying the brightest and most capable students, but also as important preparation for life in the "real world."

Normative grading also avoids problems of grade inflation which may result when mastery grading is used by itself. Further, it isn't always possible or appropriate for an instructor of a college-level course to define precisely the limits of a knowledge or skill set that students are to acquire (a necessary condition for

virtually random access. Students can study these materials at their convenience, at their own pace, and as often as they wish. Keller (1968) proposed sole reliance on printed materials for information transfer. The traditional lecture method offers substantive information to students in two modes, auditory (lectures) and print (text). The audio-autotutorial approach (Postlethwait, 1963) adds two more communication channels, visual images in tape/slide programs and interactive work with demonstration materials. As mentioned previously, audio-autotutorial methods have proven to be more effective than the lecture method in promoting student learning (Fisher & MacWhinney, 1976). One is reminded of the proverb, "I hear and I forget, I see and I remember, I do and I understand." Presumably, the greater the range of media employed,

problematic than might be anticipated. Students are excellent critics who call attention immediately to any item that seems wrong, outdated, or irrelevant to a particular course. This, in combination with item analyses generated by the computer, makes pruning and refining of the item bank a relatively simple task. Teaching assistants and faculty add some new items each quarter.

We find that students like frequent quizzes. They report feeling that they learn more and feeling less anxious about their progress. They seem especially to appreciate being able to take quizzes at times of their choosing.

This new PSI/lecture hybrid bears remarkable resemblance to a centuries-old tradition, the University of Oxford tutorial. The tutorial system includes: lectures; a weekly paper by the student which is presented orally to the tutor/professor; immediate feedback from and discussion with the tutor; emphasis on higher order skills including reading, writing, and elocution as well as content skills; and extensive use of structured learning materials (books). The method of grading is somewhat analogous to a mastery/normative combination.

While few universities enjoy Oxford's student-teacher ratio, or may hope to even in the future as student numbers decline, the advantages of including at least some student exposition, oral defense, and reading of original sources in the combination method of instruction (or other methods) are not to be overlooked.

Summary

The personalized system of instruction is designed to provide psychological reinforcement for the enhancement of student learning and satisfaction. It has proven to be one of the most effective instructional methods yet devised for college teaching. Unfortunately, it is not as satisfying a method for many instructors and it may at times introduce a time lag into the processes of transmitting knowledge.

The traditional lecture method has evolved in such a way that it maximizes intellectual stimulation and personal-social satisfaction for the instructor. It is hypothesized that the continuous impetus for reading, thinking, and synthesizing knowledge provided by this method is indirectly beneficial to institutions of higher learning and the world at large through its enhancement of re-

search and scholarship. The lecture method is accepted by students and is as effective as discussion or independent study. It is, however, less effective than PSI and other individualized approaches in promoting student learning and retention.

The evidence seems strong that the Keller Plan is good for students and lecturing is good for faculty. CMI resolves this dilemma. It is expected to produce levels of student achievement as high as those now obtained with PSI and instructor satisfaction as great as that associated with the lecture method. CMI consists of six elements: (a) substantive lectures, (b) frequent tests with immediate feedback, (c) emphasis on higher order skills, (d) mastery grading (for some units), (e) normative grading (for other units), and (f) carefully structured learning materials. With CMI, instructors find ongoing intellectual stimulation in the processes of preparing and delivering lectures and creating challenging test questions. Student learning and motivation are enhanced through the incorporation of frequent testing, immediate feedback, and mastery grading—i.e., those elements of PSI that have proven most potent. Normative grading is included for some units to encourage students to stretch as high as their intellectual limits will allow, rather than to some predetermined level. CMI is similar to PSI in its reliance upon carefully structured learning materials for independent, self-paced study; it is similar to the lecture method in that these learning materials are not the sole source of substantive information.

This, at least, is the theory. Considerable research will be required to determine if it is empirical fact. While it seems clear that frequent testing, immediate feedback, and mastery grading are potent components of PSI, will they be equally potent in another context? Why do most college teachers shy away from PSI? If it is because of the intellectual stimulation associated with lecturing, as proposed here, CMI may provide a suitable avenue for achieving higher levels of student learning and satisfaction on a widespread basis. If, on the other hand, it is simply adherence to tradition or aversion to change, then CMI is no more likely to be widely accepted than PSI has been. More research is needed on instructor attitudes and satisfactions as well as on institutional expectations, because these more than anything else determine the accep-

tance (or rejection) of new instructional methods.

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“More research is needed on instructor attitudes and satisfactions as well as on institutional expectations, because these more than anything else determine the acceptance (or rejection) of new instructional methods.”
