The Personalized System of Instruction -- 1962 to 1998

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Abstract

This paper describes the Personalized System of Instruction (PSI) that was originally proposed by Fred Keller in the '60s. The history of the method, evaluation of PSI, development of PSI courses, problems with PSI, and recent developments are described.

Basics of PSI

The basic characteristics of the Personalized System of Instruction (PSI) [1,2], also known as the Keller Plan, are:
1. A student is permitted to pace himself through the course at a rate commensurate with his ability and available time.
2. The student must demonstrate mastery of each study unit before going on to the next.
3. The written word is stressed; lectures are used only for motivation and not for transmission of critical information.
4. Use of proctors permits repeated testing, immediate scoring, and significant interaction with the students.

A typical PSI course is divided into a series of 10 to 30 study units. A typical unit includes a clear statement of objectives, a study guide, and reading material. It may also include problems to solve and laboratory exercises. No required lectures are given, and class time is devoted to self-study and taking readiness tests. Each time a student finishes studying a unit, he takes a readiness test to evaluate his mastery of the material. This test is immediately graded by a proctor. In order to pass the test and go on to the next unit, the student must achieve an essentially perfect score, although he is given an opportunity to correct minor errors or explain ambiguous answers. No penalty is attached to failure, and the student must repeatedly take a different form of the readiness test until he demonstrates mastery of the material. The course grade is usually based on the number of units completed (70-75%) and a final exam (30-25%). In a well-designed and well-implemented PSI course, a large percentage of the students make A's.

History of PSI [3,4]

It all began in Brazil back in 1962 when Fred Keller applied the principles of behavioral psychology to develop a new teaching methodology. Keller, together with Gil Sherman, later perfected the method -- known as the Personalized System of Instruction -- while teaching psychology at the University of Arizona. From there, PSI spread to other disciplines and to other universities. Billy Koen first applied the PSI method to engineering education in 1969 [5]. Based on his success, other engineering instructors adopted the method. PSI courses were developed in

many disciplines including Physics, Chemistry, Mathematics, Library Science, Biology, and even Philosophy.

The 1970's saw a rapid growth of PSI courses and the Center for Personalized Instruction was established at Georgetown University. The *PSI Newsletter* reported knowledge of 190 PSI courses in 1972, and by 1979 information was available on over 5000 courses. In the 80's, the novelty of the PSI method had worn off and most of the funding went away, resulting in a rapid decline in the number of PSI courses. Twenty PSI courses were developed at UT Austin in the period 1970 to 1975. By 1977, ten were still being taught by PSI, and seven had been successfully transferred to other institutions [6]. Today, only two of these courses are still being taught by PSI.

Evaluation of PSI

Considerable research has been done to evaluate PSI courses in comparison with standard lecture courses. In almost all studies, PSI courses received very positive student ratings, and most students consider the PSI method to be better than the lecture method. Students find the self-pacing, immediate feedback, and personal interaction to be attractive features of PSI. Kulik *et al* [7] reviewed 15 studies in which final examination results in PSI courses were compared with conventional courses. Of the 15 studies, superior performance for the PSI section was reported in 11, and no significant difference was found in four. Other studies have shown that PSI students put considerably more time and effort into PSI courses, and students report that they learn more in PSI courses than in lecture courses.

Development and Maintenance of a PSI Course in Logic Design

I personally developed a self-paced course in logic design of digital systems [8] starting in 1971, and the course is still going strong today. Initial development of study guides and unit tests required a very substantial amount of time and effort. When there are no lectures to patch things up, defects in the textbook become very apparent. I started writing supplements to the text, and these evolved into a new textbook, which is now in its fourth edition. The PSI method provides excellent feedback to the instructor compared with the lecture method. When mastery of the course material is required, student questions provide detailed feedback about ambiguous parts of the study materials. Using this feedback, study units were improved, and students achieved more rapid progress through the course.

The course requires continuous maintenance. This includes keeping the course materials up-to-date, as well as revising and improving study guides and unit tests. Throughout the years we have added new features like computer-based exercises and videotaped lectures for difficult topics. In order to accommodate a large numbers of students, we have developed an elaborate database system for record keeping and course management.

Back in 1971, we started with a class of 40 students, and now the course has grown to 450 students per semester. We now have two faculty members, seven TAs, and ten graders. Student performance has fallen off somewhat, probably because the large number of students reduces the personalized component of the course.

Problems with PSI Courses

Production of high-quality, well-designed instructional materials is important for the success of a PSI course since the course relies primarily on written materials. This initially requires a large amount of instructor time, but in the long run, operation of a large self-paced course can reduce the faculty time required per student.

Many administrative and logistic problems can occur. Recruitment and training of proctors is a big issue, especially if adequate funding to pay proctors is not available. Suitable facilities for testing, grading, tutoring, and studying must be provided. The administration and other faculty are sometimes suspicious of a course that produces too many A's.

Procrastination can be a problem if a large number of students come in to take unit tests near the end of the course. It is particularly a problem for students who are overloaded, and we often counsel such students to drop the course and take it when they have a less demanding schedule. We give students who finish the course early an opportunity to take the final exam early, and then repeat the final if they are not satisfied with the first score. This motivates many students to progress faster in the course.

There is a tendency for some instructors to modify the PSI method. Some students want deadlines, so the first thing to go is often self-pacing. You can't have rigid deadlines and demand mastery, so mastery is next to go. Then tests are given at scheduled times and graded off-line, so the personalized element is gone. What is left bears little resemblance to the original Keller plan. And then the instructors wonder why student achievement is less than expected.

Recent Developments in PSI

The advent of multi-media web-based instruction and more emphasis on distance learning have stimulated a new interest in PSI. Several papers relating to computer-based implementation of PSI were presented at the *1996 PSI Symposium*[9]. New PSI courses in psychology, computer science, and other disciplines have been developed. For example, a Computer-Aided Personalized System of Instruction (CAPSI)[10] is being used to teach five different undergraduate psychology courses at the University of Manitoba. Nathaniel Martin at the University of Rochester uses PSI to teach computer literacy[11]. John Kappleman uses computer-graded multimedia exams to teach a self-paced introductory anthropology course at the University of Texas[12].

Use of the computer for implementation of self-paced instruction raises several interesting issues. Can computer grading of readiness tests be as effective and motivating as interactive grading by a human proctor? Development of high-quality interactive computer-based instructional materials is difficult and time-consuming. There is often a tendency to substitute gee-whiz computer technology for high-quality instructional design. However, the computer has great potential for facilitating the use of PSI.

Conclusion

The Personalized System of Instruction is an instructional method that motivates students to work harder and to learn more. PSI has been proven to be effective in teaching college courses in a variety of disciplines. Many of the PSI courses that were developed in the '70s reverted to lecture when the instructors who developed them moved on to other activities. Recently, there

has been a resurgence of interest in self-paced instruction because of the widespread availability of computer technology.

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