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Research Article

How Computers Have Impacted Personalized System Of Instruction:

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ABSTRACT

Keller's Personalized System of Instruction dominated the literature in the teaching of psychology and behavior analysis in the 1970s and 1980s. After this brief flourish of interest, PSI research trickled off to a nearly imperceptible stream in the 1990s. However, with the increasing availability and ease of use of computers and the internet, along with demand created by an ever-growing need for distance education, PSI is beginning to curry favor among a new generation of faculty members. The question of whether this resurgence of interest will be permanent revival or fleeting fancy will depend on how researchers deal with the PSI paradoxes that stymied the researchers of the 1970s and 1980s. This article will review the current state of PSI research including the riddles left to be untangled, illustrate how computers have affected the PSI movement, and discuss the role PSI might play in distance education.

KEYWORDS: Personalized System of Instruction, PSI, Mastery-Based Learning, Distance Education.

Keller's Personalized System of Instruction

Keller created the Personalized System of Instruction (PSI) in the late 1960s in order to help students in Brazil be able to learn course material without an instructor standing by their side. Soon after, he brought his PSI program back to the United States. Due to its heavy reliance on behavioral principles, it was quickly adopted by many psychology professors and by individuals outside of psychology. Keller (1968) outlined five basic components that he deemed to be essential for a PSI class: (1) mastery of course material, (2) the use of proctors, (3) self-pacing, (4) stress upon the written word, and (5) use of lectures and demonstrations primarily for motivational purposes.

In a standard PSI course, the course material is broken down into small units of study (e.g., one textbook chapter). If students do not reach the mastery criterion then they restudy the information and retake the unit test as many times as it takes for them to demonstrate mastery of the material. Course credit is awarded when the unit has been mastered and there is no penalty imposed for not passing a unit test on a given attempt. The intent behind this is to reinforce test-taking attempts and mastering those tests while not punishing incorrect responses or failed attempts at mastery.

Another element in PSI is the use of proctors. Proctors, alternatively called mentors, peer-reviewers, or tutors, are students who have previously mastered the material. Students can either be ones who have previously taken the course and are hired or given course credit for serving as proctors (called external proctors), or they can be students enrolled in the course who have previously mastered a given unit of study (called internal proctors). The proctors provide individualized feedback to PSI students about their unit test performance and often provide individualized tutoring in areas where the student is weak.

The self-pacing feature of PSI courses allows students to move through the course material at their own pace. Thus, they can spend less time on material they understand and more time on areas they find difficult. In the initial PSI courses developed by Keller, students were not constrained by the traditional semester barriers. Rather, they could continue to work on a given course until they passed all of the unit tests.

Finally, within Keller's system the instructor is seen as the facilitator of learning rather than the person who imparts knowledge. For PSI students classroom meetings are typically used to help clarify material and motivate students to be engaged learners. The detailed learning of the material takes place outside of classroom

meetings through students' active reading of the textbook and supplemental materials. Many PSI classes that use a short-answer format rely on students' answering of guided study questions from the readings.

Current State of PSI

The PSI movement once consisted of hundreds of teachers and researchers generating multitudes of publications. They had a dedicated journal (*Journal of Personalized Instruction*) and even a Center for Personalized Instruction that served as a clearinghouse for PSI information (Sherman, 1992). Literature reviews and meta-analyses indicated that PSI was a more effective teaching method than traditional lecture methods (Kulik, Kulik, & Bangert-Drowns, 1990; Kulik, Kulik, & Cohen, 1979) and even the most ardent critic acknowledge the superiority of the PSI method (Taveggia, 1976). Many studies were conducted to determine the most efficient ways to train proctors, to reduce student procrastination, and to determine which elements of PSI were essential for the system to function effectively. However, a quick examination of PsycInfo will show that the number of PSI studies from 1990 to 2020 numbered fewer.

How Computers Have Impacted PSI

Although many debates about PSI still abound, the question of how to efficiently manage all of the tests in a PSI course has effectively been answered. This answer lies with computer and internet technology. Although computer-aided PSI courses have existed since the 1980s (e.g., Crowell, Quintanar, & Grant, 1981; Pear & Kinsner, 1988), the internet has dramatically increased the flexibility of PSI courses. Several researchers have made use of these technologies to create PSI-based programs. For example, the computer-aided personalized system of instruction (CAPSI) is an internet-based program that follows the tenets of PSI. That is, the instructor sets up units of study covering key course readings with a number of short-answer study questions (e.g., 20) that correspond to each unit. Students enter into the CAPSI system and take unit tests over the readings at their own pace. The computer randomly selects a predetermined number of study questions from the unit for the student to answer. Once answered, the student submits the unit test that is then marked for mastery by either student peer-reviewers who have already mastered the given unit, a student proctor who has already completed the class, or the instructor.

Although CAPSI only allows instructors to use short-answer questions, many other programs allow for instructors to set up mastery-based multiple-choice tests. Popular course platforms such as WebCT® and Blackboard® have a mastery-based component that the instructor can use to develop a PSI component. That is, instructors can set the percentage that a student must attain on a given test before they are allowed to access the next test. They can also set a maximum number of attempts in order for the student to achieve mastery (e.g., 4 attempts) or dates by which mastery must be achieved. Other programs created by individual instructors allow for integration of multiple-choice questions in unit tests instead of, or in conjunction with, short answer questions is another computer-based system that is designed to assist students in mastering mathematics and statistics. Although it was not designed as a PSI program, it employs many of the PSI principles such as individualized instruction based on each student's performance, mastery of material, emphasis on the written word, and frequent testing over small units of material. All answers are free response format that are then marked by the computer as correct or incorrect. The computer chooses the problems presented to the student based on a series of algorithms derived from the student's incoming knowledge (based on a pretest) and mastery of previous units to determine what the student is "ready to learn." also periodically reassesses students in order to determine the level of retention over time and to document retention of information.

Proctor Feedback

Research continues to be generated on improving proctor feedback in PSI courses. Chase (2006) demonstrated that students receiving elaborate feedback consisting of specific feedback about which multiple-choice option was correct and which were incorrect.

Future of PSI

PSI in Distance Education

One area where PSI is gaining popularity is in distance education. Grant and Spencer (2003) illustrate why PSI is an ideal format for distance education. In most distance education classes, like PSI, the written word is the primary method of communicating course-related content. Further, many distance education courses use timed tests or mastery-based tests taken over the internet as their primary assessment measure. These courses are already intentionally or unintentionally similar to PSI. Instructors could easily integrate PSI more systematically into these courses by setting the unit tests to cover a small amount of material, be mastery-based, and self-paced (see Liu, 2003 for a comprehensive example). Proctoring could be accomplished in a variety of ways including synchronous or asynchronous chats, discussion board postings, individualized test feedback, or preprogrammed test feedback if live feedback is not feasible or desirable. Lectures for motivational purposes can be given through streaming video, podcasts, discussion board posts, or other methods.

The PSI experience could be further enhanced by incorporating programmed instruction into a PSI course. The students could go through the course using a programmed online text where they fill in the word which the computer would recognize as correct or incorrect. They would work their way through a given unit and be given remedial work for any section not mastered. They then could take a unit test over the same material which they

would have to master before the next section of the programmed text became available. Another alternative would be to use a standard text, but have a programmed instruction tutorial available. That is, a student would read the standard text and then take a unit test over a given unit. For any items missed on the test, the student would complete a programmed instruction tutorial over these concepts. The programmed instruction tutorial in this case would serve to replace the live proctors.

Conclusions

There are many paradoxes yet to be solved, especially with the self-pacing and mastery components. Computers appear to have resolved one the major hurdles to effective PSI course management by automatically grading multiple-choice tests and providing feedback, as well as facilitating the grading of short-answer tests. The computer has also helped PSI move into new venues such as the rapidly expanding field of distance education and online courses where the instructor's traditional role of "lecturer" has been changed into one of "mentor" and "learning facilitator," consistent with Keller's vision and with the administration's blessing. Thus, although there are many problems yet to be resolved, it appears that there may just be the demand and market in the new millennium for this type of innovative approach. We will see in another decade or so if this resurgence of interest blossoms into a full-scale revival or was simply a fleeting fancy.

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