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ABSTRACT

Student performance in a self-paced personalized system of instruction course is varied in rates and patterns of work. Using 118 students in a college level introductory psychology course the investigators found 1) students worked at a variety of rates and patterns; 2) students who started to work early had a much greater chance of finishing the course than those who started later; and 3) that most students who made long pauses did so after taking one of the first four written exams regardless of when in the course they started to work. The implication presented was that a student should be reinforced for starting work early in a self-paced class. (MC)

Self-Pacing in a Personalized System of Instruction: Work Patterns and Course Completion

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Abstract

Student performance in a self-paced PSI course in introductory psychology is described. Students were required to complete 30 units of material by oral interviews and every third unit was followed by a written exam. Main findings were that: 1) students worked at a variety of rates and patterns, 2) students who started to work early had a much greater chance of finishing the course than those who started later, 3) most of the students who made long pauses did so after taking one of the first four written exams regardless of when in the course they started to work. A major implication of this study is that students should be reinforced for starting to work early in a self-paced class since starting early maximizes the probability that the student will complete the course.

So far there has been little information reported concerning the effects of self-pacing on the work patterns of students in PSI (Personalized System of Instruction) courses or their success at completing a self-paced course. The purpose of this paper is to describe some of the PSI contingencies in effect for an introductory psychology course at Utah State University and to report some of our findings with respect to the self-paced features of the course.

Methods and Procedures

The class size was 118 and 16 student managers assisted in teaching the class. Students were required to complete 30 units of material orally at 100% mastery. A student who failed an oral interview was not penalized; he repeated the unit until he mastered it. Ten written exams and a final exam were also required. A written exam followed every third oral interview and consisted of one short-answer essay question from each unit. Students who failed a written exam always took a different form when re-taking the test. As with the oral interviews, students could retake the written exam until they achieved mastery. The final exam consisted of six short-answer essay questions. Questions on the final were of an applied nature intended to test for generalization and application of knowledge. At the last test session, attitude and interest questionnaires were given.

Text materials (Powers and Osborne, 1971) were especially designed in small units of about ten pages for use in the course. A reader, Readings in Psychology Today (CRM, 1969), was also used. Eighteen of

the course units came from the text, 10 course units were taken from the reader, and two course units were taken from the course syllabus.

During the second week of class, students could take the initial oral interviews and were allowed to take written exams. The oral interviews over a unit required about 10 min and were structured along lines similar to those of Ferster and Perrott (1968). Students were instructed to summarize a unit of material in their own words using the study guides to "jog their memory" if necessary. Following the student's summary, the proctor or manager questioned the student about material which was omitted or incorrect. Once the three-unit set was passed orally at the required mastery level, managers wrote out "permits" for the students to take a written test.

When "permits" to written tests were presented to the testing manager, students were given one of the five written exam forms. When the written exam was completed, students returned their test papers to one of the testing managers and waited until the tester could grade and review the questions with him. Students were then required to defend one answer orally whether or not it appeared correct. If all three questions were satisfactorily answered, the student was passed, the "permit" was signed by the testing manager, and the student returned to his interviewing manager for the next sequence of oral interviews.

Written exams were conducted by four testing managers who adhered to strict test-taking rules. All exams taken were kept in a file in alphabetical order; written reports of all tests taken were turned in to the instructor daily; and interviewing managers received daily reports of their students who had taken a written exam. These

reports allowed a double check on whether students were bypassing the managers.

Results

The per cent of students who completed the course as a function of the week they took the first exam is shown in Figure 1. Almost all (93.5%) of the students who started to work during the first opportunity (week 2) completed the course. As the weeks passed without a student starting to work, his likelihood of finishing the course diminished. Only 60% to 65% of those students who waited until weeks 4 or 5 to take their first written exam completed the course. A Pearson product-moment correlation of + .56 was obtained between the day an individual started to work and the day he finished (significant at $P < .01$).

Figure 2 shows several individual cumulative records of the rate of taking the 10 written exams. Part A of the figure shows performances of students who, once they started working, worked at a relatively high and sustained rate. These performances resemble those which obtain under a fixed ratio schedule and agree with the results that Lloyd and Knutzen (1969) obtained. Note that although K. S. did not start working until day 29, his record was similar to C. P.'s who finished the course before anyone. Part B of Figure 2 shows five students who started at about the same time and who worked at relatively constant rates. Although each worked at a slightly different rate, the curves were essentially linear. This mode of responding characterized about 40% of the students.

Part C of Figure 2 shows five records of students who exhibited long pauses after they had started working. The first four records evidence various amounts of "scalloping" and this mode of responding characterized roughly 25% of the students. The last record, M. L.'s, is not typical. Only 5 other students had pauses of one class week (days Monday through Friday) after taking the seventh exam.

Regardless of whether a student started to work early or late, he could work at a steady rate or he could stop working for an extended period of time. We defined a long pause as one class week (Monday through Friday) and found that approximately half (52%) of the students did some work (took at least one written exam) each week once they started to work. Most (67%) of the students who paused did so after the early exams (exams 1 through 4).

The pattern of responding for the 25 (21%) students who dropped the course was analyzed in an effort to detect any trends. Most (72%) of the students who dropped did so after one of the first three exams. However, there was little evidence that the students who dropped were having difficulty with the material. Only four of the students who withdrew had failed any exam and only one of these dropped after failing. The other three successfully passed a previously failed exam before dropping.

Pre- and post-class surveys were obtained from 77% of the students who completed the course. Students who finished any time prior to the last week (early finishers) were compared to those who finished during the last week (late finishers) to see if any difference existed between their attitudes toward the course. According to this criterion, 40 (34%) finished early and 52 (44%) finished late. Slightly more than 50% in

both groups reported that the course was the "most interesting" and the "most informative" of the courses they were taking that quarter. More of the late finishers were displeased with the class with 4 (10%) reporting that the course was the "least interesting" and "least informative" while only one (3%) of the early finishers responded this way.

In response to the item, "the best thing about this class was . . .," about 33% of the respondents mentioned the self-pacing feature. The ratio of early finishers mentioning this feature to late finishers was 2:1. The other item mentioned by 25% of the students was the material taught ("learned about people or myself") with twice as many late finishers mentioning this as early finishers.

Two items were prominent on the feature least liked about the class. About 26% of the students mentioned something connected with their lab projects (busy work, not understanding it, or difficulty in getting help from their manager) at least liked. Confusion engendered by the course requirements and special contingencies was mentioned by 19% of the students. This problem was especially troublesome at the beginning of the course. Neither of these items differentiated early and late finishers.

More students shifted toward becoming a major than shifted away (47% vs. 20%) and the split was even steeper for minoring in psychology (56% vs. 18%) ($P < .05$ for both majors and minors, McNemar test for the significance of changes). More of the late finishers changed in the direction of becoming a major or minor than the early finishers (53% vs. 41%) but the early finishers tended to shift favorably to a greater extent than did the late finishers. Thirteen early finishers shifted toward becoming a major by 37 points or an average shift of 2.84 points on the 10 point scale while 20 late finishers shifted 37 points or an average

of 1.85. With respect to adopting a psychology minor, 14 early finishers shifted 49 points or an average of 3.50 points while 25 late finishers changed 58 points or an average of 2.31 in favor of minoring in psychology.

Discussion

One finding at odds with previous findings of student performance in PSI courses is that the pattern of working found in this study could not be fitted into any one mode. Some students started to work during the first week of class and worked at a high, steady rate until they completed the exam sequence. Another larger group started during the first or second week and used the entire allottment of time to finish the requirements. Three modes of responding could be discerned: a linear rate characteristic of about 40% of the students; a "scalloped" pattern of responding characteristic of about 25% of the students; and a fixed ratio or high rate performance characteristic of 19% of the students. There were also a small number of students (about 10%) who waited at least three weeks before starting to work and these displayed both fixed ratio and fixed interval performances. About 50% of the students paused for at least one, one-week period once they started to work. Given this diversity in the modes of responding under the completely self-paced system used, it would seem premature to characterize student work habits as resembling either a fixed ratio performance (Lloyd and Knutzen, 1969) or a fixed interval performance (Ferster, 1968). Although the contingencies of 30 oral and 10 written exams were specified by the instructor, the time contingencies were not. Under these conditions

it would seem reasonable to assume that the self-pacing contingency permits the conditioning history of the student to determine the work pace. Since most students in high school and in college have been trained in a system in which high sustained rates of working are not reinforced, it is not surprising that this mode of responding does not occur frequently (only 19% of all students displayed a high, sustained rate).

A second finding of interest was the correspondence between starting early and completing the course. This agrees with others who have found a correspondence between the time a student starts to work and the grade he or she receives in the course (Lloyd and Knutzen, 1969; Sheppard and MacDermot, 1970). Since the percentage of students who finish decreased substantially as a function of their starting time, it would seem imperative to devise a system wherein early starting is highly reinforced. Even for those students who take their first exam early, there is a tendency to pause. Two-thirds of the students who paused did so after taking one of the first four exams. This pattern would suggest that we should reinforce the student for taking the first exam early and for maintaining some minimal pace. An adjusting payoff schedule for taking the first three or four written exams may increase the percentage of students who start early and may also eliminate long pauses (Cheney and Powers, 1971).

There is some gain for the instructor and student if the student finishes early as well as starts early. Those students who finished the course at least one week early were somewhat more positive toward the course than those who finished during the final week. There was also a

greater shift in the direction of majoring or minoring in psychology for those who finished early. This indicates that the course had a more positive effect on students who finished early.

Footnotes

1. Reprints may be obtained from either author, Department of Psychology, Utah State University, Logan, Utah 84322.

2. Appreciation is expressed to the testing managers, Lynette Atkinson, Cordell Atkins, John Firth, and Dave Graven for their enthusiasm and unstinting efforts.

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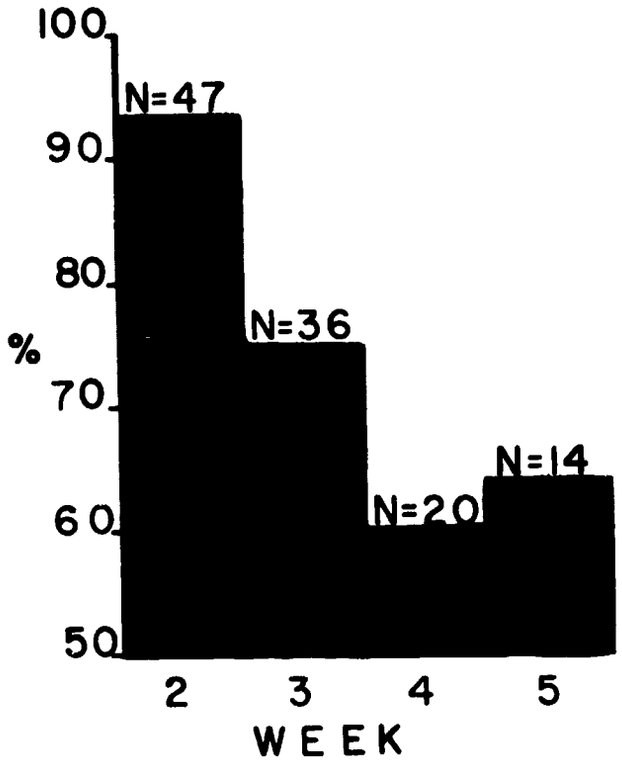
Figure Captions

Fig 1. The per cent of students who completed the course as a function of the week they took the first written exam. The number of students upon which the percentage is based is shown in each column.

Fig 2. Individual cumulative records of written exam performance. A) Records showing fixed ratio performances. B) Records showing different, but essentially linear rates. C) Top four records show positive acceleration; last record shows an atypical long pause toward the end of the exam sequence.


100
90
80
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2
3
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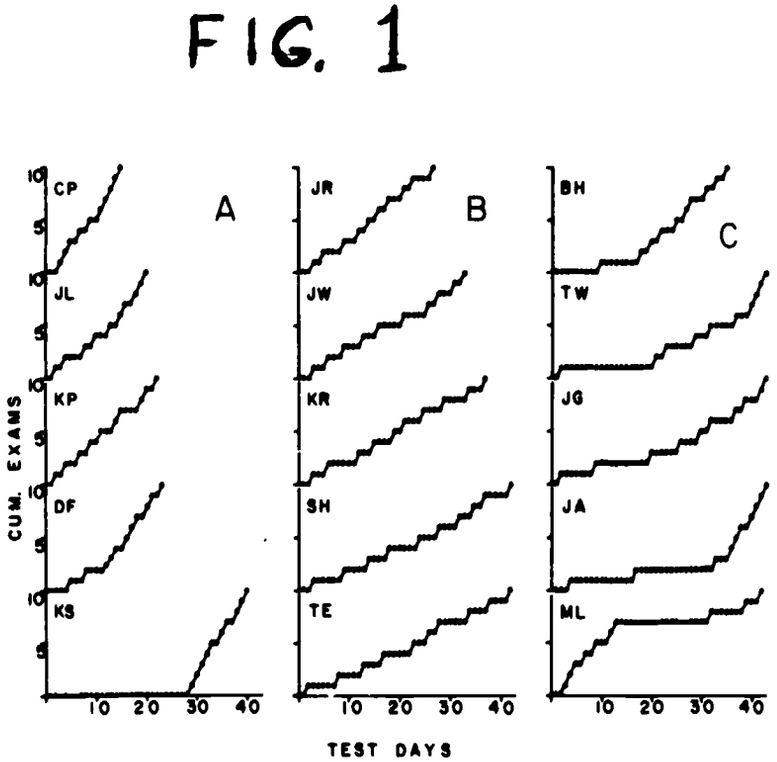
5
WEEK

FIG. 1


A
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ML
CUM. EXAMS
10
20
30
40
TEST DAYS

FIG. 2