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## The effects of public progress charts upon self-pacing in a PSI course in social studies in a traditional middle school

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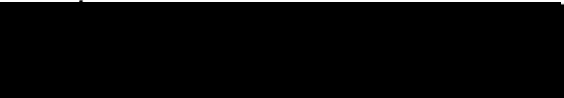
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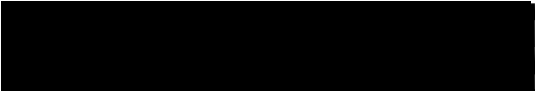
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AN ABSTRACT OF THE THESIS OF Lynnette Hager-Godat for the Master of Science in Psychology, presented May 8, 1981.

Title: The Effects of Public Progress Charts upon Self-Pacing in a PSI Course in Social Studies in a Traditional Middle School

APPROVED BY MEMBERS OF THE THESIS COMMITTEE:

  
Gerald Guthrie, Chairman

  
James Paulson

  
Cathleen Smith

The present study investigated the effects of public progress charts on self-pacing in a social studies course taught by the PSI method in a middle school (grades 5-8). It was found that public progress charts significantly enhanced a student's rate of progress,  $t(45) = 5.06, p < .01$ . Student satisfaction with the PSI method was measured and it was found that students liked the PSI method.

Subjects were 46 volunteer students (18 females and 18 males) in two fifth grade classrooms. The study lasted for four 2-week sessions. The material to be learned

consisted of information presented on 4 cassette tapes from Nystrom's Map & Globe Study Skills Program "Where and Why" (1972). Each student served as his own control. Each classroom studied the same material concurrently; however, when one classroom was in the treatment condition (public progress charts) the other was in the baseline condition.

First, students were given an introduction to PSI method and tested for their general comprehension of PSI. Then, students were instructed on how to follow time-recording procedures, obtain, listen to, and follow directions given on the cassette tape as well as fill out an accompanying worksheet before qualifying to attempt a quiz. Each student could take as many quizzes as necessary until mastery level of 80% was obtained.

The two public progress charts consisted of (1) a large poster-sized puzzle, the pieces of which were randomly distributed in sealed envelopes on (2) the envelope chart. As each student mastered a unit during the treatment condition, the date was recorded on his or her envelope, it was then opened, and the student obtained the puzzle piece and secured it to the puzzle backing. In the control condition the student progressed through a unit without the progress charts.

Differences between classrooms in the treatment condition were found in the amount of time a student spent working at the station and the number of trials a student took to

master a quiz. These results were thought to be due to differences among the cassettes. In addition, differences between classrooms were found in the treatment condition in the number of days a student took before beginning work at the station. This finding was thought to be due to different classroom environments: students in the "modest" environment were found to begin work sooner when the treatment condition was present.

Students began work sooner in the beginning of the study than in the end of the study. This was attributed to the novelty of the equipment. Students mastered a unit quicker in the middle of the study compared to the ends. This was thought to be due to the timing of the study itself.

THE EFFECTS OF PUBLIC PROGRESS CHARTS UPON  
SELF-PACING IN A PSI COURSE IN SOCIAL  
STUDIES IN A TRADITIONAL  
MIDDLE SCHOOL

by

Lynnette Hager-Godat

A thesis submitted in partial fulfillment of the  
requirements for the degree of

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in  
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TO THE OFFICE OF GRADUATE STUDIES AND RESEARCH:

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## CHAPTER I

### INTRODUCTION

In recent years a great deal of research has been directed at evaluating Keller's (1968) Personalized System of Instruction (PSI). This teaching technique is widely recognized as an innovative educational alternative based upon a systematic behavioral approach to teaching and is currently used in several thousand college courses. Student evaluations of PSI consistently report that students favor PSI to traditional methods, regardless of the course content covered (Johnson & Ruskin, 1977).

Among the current applications of the PSI method are courses such as tennis, exercise, golf and bowling (Williams & McMillian, 1975), public speaking (Fawcett & Miller, 1975), musical form (Sonnenschein, 1977), various medical courses (Schimpfhauser, Richardson, & Cook, 1977; Cohen, Slovin, Franzbau & Sinex, 1973; Weisman & Shapiro, 1973; Stahl, Hennes, & Fleischi, 1975; Prentice, Metcalf, Metcalf, & Sharp, 1975), and in such novel situations as teaching community canvassing (Fawcett, Miller, & Braukmann, 1977), U.S. Navy personnel training (McMichael, Brock, & Delong, 1976; McMichael & Murphy, 1976), and in many diverse community education programs (Henneberry, 1977). Effective

PSI course have been prepared for young learners. The initial research in the elementary school (grades 1-8) reported success with the PSI method and demonstrated it as promising (McLaughlin & Malaby, 1974, 1975; Tosti, 1976; Werner & Bono, 1977; Atkinson, note 1; Farnum, note 2; Van der Schoot, note 3; Werner, note 4; Werner & McLaughlin, note 5).

The five general features that characterize courses taught by this method are: (a) progress through course material is self-paced, not instructor paced, (b) mastery criteria are provided for each successive unit of work, that is, a predetermined mastery level must be achieved before the student is allowed to proceed on to the next unit of study, (c) student proctors are used to assist in tutoring and sometimes grading, (d) there is emphasis on written materials rather than dependence on the teacher to present the information critical to the course, and (e) the instructor's role is as a resource person who provides motivation and communicates information supplemental to the written materials.

Student procrastination, defined as the student's infrequent rate of response by putting off work to some future time, is often cited as a problem related to the self-pace component of PSI. It has been suggested that a long "teacher-directed" educational history does not prepare students to effectively manage their time in a

self-pace course; students have typically been assigned papers and have taken quizzes on a fixed interval schedule. When such educational tasks are teacher-paced, regardless of the differential amounts of study time by the students, all students receive and are given credit for finishing assignments at the same time. Thus, passage of time is reinforced. Perhaps the change from a time-based to a behavior-based schedule is too abrupt for many students.

Ample research has been carried out regarding the procrastination issue with PSI at the college level and various techniques have been implemented to enhance and maintain student progress throughout the course. In contrast, very little is known about procrastination and self-pacing behavior at the elementary school level. McLaughlin and Malaby (1974) report the only systematic manipulation of the self-pace component of PSI with a grade school population. These researchers investigated the effect of forced-pacing, with aversive consequences for not completing the required unit, versus self-pacing in a PSI course in the sixth grade, and found that forced-pacing was more effective than self-pacing in producing student responses. However, no systematic research on PSI has been reported investigating the effects of a positive technique to encourage student responses at the elementary school level. It was thought to be useful, therefore, to gain specific information regarding the

effect of positive reinforcement for unit completion in a PSI course in the elementary school.

### Problem

The present study investigated the effects of a positive pacing contingency in a middle school (grades 5-8) social studies course taught by the PSI method using primarily an auditory mode of subject presentation. This study also measured student satisfaction with the PSI method.

### Hypothesis

It has been shown that PSI can be successfully implemented in the elementary school. Usually some type of intervention on the self-pace component was reported to avoid student procrastination and maintain a steady rate of response. However, the only systematic investigation on the self-pace component at the elementary school level employed a punitive measure if the student failed to make the response. At the college level, a variety of positive techniques have been systematically tested and shown to be effective for getting the student started and maintaining progress in a PSI course. It was inferred, therefore, that a positive technique, specifically a public classroom puzzle and an accompanying name-chart, would be more effective than self-pacing in getting the student through a unit in a

PSI course at the elementary school level. In addition, since PSI has enjoyed overwhelming success in the college population in respect to student satisfaction, it was predicted that PSI method would also be popular with the younger population.

The hypothesis of the present study was that public progress charts would enhance student progress in a PSI course in social studies in the fifth grade and that students would be satisfied with the teaching method.

## CHAPTER II

### REVIEW OF THE LITERATURE

#### Maintaining Progress with PSI in College Populations

Keller originally included the self-pace component in his teaching method so that the student could progress through a course at a speed appropriate for him or her. From the outset educators reported problems with student procrastination. Keller himself (1968, 1969) and Green (1971) used optional lectures for their college students to maintain student progress with attendance contingent upon passing a certain number of units. Other modifications to reduce procrastination include publishing a list of recommended unit completion dates (Green, 1971); providing the opportunity to take early final exams (Green, 1971, 1973; Hess, 1974) and using progress charts, both public and private (Born, 1971; Hess, 1974). Walen (note 6) reported that college students progressed faster with public charts than with private charts. Taylor (1975) reported that the number of students who took the first unit quiz at an early date increased with the use of progress charts, and Henneberry (1976) found that the use of progress charts increased the number of students who finished the course early. Lazar, Soares, and Terman (1977) found that the

number of days between taking successive unit quizzes was reduced when students were given a schedule of recommended unit completion dates and a quiz item that required students to indicate whether they were behind, ahead of, or on schedule according to the recommended schedule provided.

Bonus points have also been used to maintain student progress through a PSI course. Powers and Edwards (1974) reported that bonus points for early completion of units significantly reduced procrastination and withdrawals. Riedel, Harney, LaFief, and Finch (1976) found that bonus points for completing units at a linear pace decreased withdrawals and incompletes. Semb et al. (1975) found fewer withdrawals and incompletes in their courses when bonus points were either (a) awarded for mastering units at a suggested rate or (b) taken away for failure to do so. Quiz taking was more evenly distributed with these contingency groups as compared to a control group. Bufford (1976, 1977) awarded one bonus point for every unit completed during a specific two-week period. Burt (1975) encouraged early unit completion by giving credit for unit completion only if it was within four days of the previous unit completion. Bitgood and Seagrave (1975) and Powers and Wald (1975) found that gradually decreasing amounts of points awarded for units completed increased the rate of early completion.



The effect of negative contingencies on student progress has also been studied. Wilson and Tosti (1972) suggested that instructors contact students falling behind by mail or telephone. Gallup (note 7) suggested the placing of an upper limit on the number of quizzes that may be taken during the last few weeks of the semester. Doomsday contingencies have been used by Semb et al. (1975) in which point fines were given for not maintaining a specified rate of progress. Similar fines were given by Hess (1974) for not completing a single unit by a specified date at the beginning of the term; Lloyd and Knutzen (1969) and Goodall (note 8) imposed fines near the end of the term. Glick and Semb (1978) required that students meet five deadlines during the semester. If these deadlines were not met, students were required to withdraw from the course with a grade of W. Semb et al. (1975) and Sutterer and Holloway (1975) also used the deadline procedure and subtracted points from a student's accumulation if a unit was not mastered on schedule.

A gradual shaping and fading technique was suggested by Hess (1976), Henneberry (1975), Coldeway and Keys (1976), and Davies and Semb (note 9). These studies controlled student progress initially and then removed the contingencies once the student was successfully progressing through the course. Green (1971) and Hess (1974) proposed using an adequate number of proctors to increase personalization,

and thus, social reinforcement, in a behavioral course; McMichael and Corey (1969) recommended instructor attendance at class sessions to maximize personalization and give encouragement. Green (1973), Liedecker (1972) and others have emphasized the role of interesting and stimulating units to start the students moving through the course. Once the students are moving, other features of behavioral instruction can take over to maintain progress.

#### PSI in the Elementary School: Maintaining Progress

The application of PSI to elementary school populations remains in its infancy. The majority of studies address the general feasibility of using the PSI method with the elementary school population. Probably the first systematic application of PSI with the elementary school population was implemented by Tosti (1976). He applied the technique to an entire combination-elementary school-high school in California. Student progress was maintained with the use of daily contracts and a task-point system (points were given upon completion of a specific assignment). In the beginning, contracts were made out by the teacher; however, this control was shifted to the student as rapidly as possible since an objective of the school's program was self-management. After a certain number of task-points was earned a student could take a "break" and have access to a variety of resources such as music tapes,

games, and snacks. Completing the contract early in the day earned a reinforcing event, such as an entire afternoon of fun activities. Van Der Schoot (note 3) used the PSI method to teach math to a fourth grade classroom in Holland. The students were given tokens for successful unit completion. When the student had acquired five tokens he/she could exchange them for a class insignia and advance his/her name card on a class progress chart. However, a pacing problem became apparent by the end of the school year, as about one-third of the students had not completed all sixteen units.

Other researchers (McLaughlin & Malaby, 1974) reported the use of a modified PSI format to teach social studies to a sixth grade population in a Spokane, Washington, elementary school. These investigators compared two pacing contingencies, self-paced and forced-paced, in commercially available material. The self-paced students were allowed to proceed through the material at their own rate as long as they worked the whole period set aside for social studies. The forced-paced students had to complete a minimum of two units per day. Aversive techniques were used to maintain this behavior. If a student did not finish the required units, he/she was considered to be failing until the deficiency was made up. Only after the student completed the two units per day could some privileged behavior be engaged in, such as going to the library or spending time with the school pets. The forced-paced

condition generated higher rates of performance than did the self-paced condition. In another discussion, the same researchers again reported positive results using PSI method in a sixth grade classroom and found that for some students the rate of unit completion increased when 100% mastery was required (McLaughlin & Malaby, 1975).

Werner and McLaughlin (note 5) implemented the PSI method with a second grade spelling class in West Virginia. Students were able to work on spelling every morning during the week for 20 minutes and also at various free times during the day. A token economy was used to encourage higher rates of test taking. Students could earn one token for a correct workbook exercise and one token for passing a unit. These investigators did not report progress rates to be a problem when they used this system. In a follow-up study Werner (note 4) reported that this same PSI course was still in existence and doing well. Atkinson (note 1) successfully used the PSI method for teaching sixth grade spelling, with no mention of using a pacing intervention. Werner and Bono (1977) implemented PSI in another second grade classroom, again in West Virginia. This time both spelling and math were adapted to PSI, and students worked on each subject during the time allotted and also when their teacher was also occupied with certain other activities such as reading groups. Originally progress was maintained by a point system in which students

could earn points for passing quizzes and proctoring. These points could be exchanged for candy and small toys. The reinforcement system was eventually changed because it was costly and viewed as artificial. Social praise, public progress charts with happy faces and dates of unit completion replaced the point system and maintained progress at a satisfactory rate.

## CHAPTER III

### METHODS

#### Subjects

Subjects were 46 volunteer students in two fifth-grade classrooms at a local year-around middle school. Classroom activity was organized in the traditional style. The subjects were expected to participate for the entire eight weeks of the study. Both sexes, 18 females and 28 males, were represented. Each student served as his own control and alternately experienced the treatment condition twice.

#### Tasks

The material to be learned consisted of social studies information presented on four cassette tapes from Nystrom's Map and Globe Study Skills Program, "Where and Why" (1972). Each classroom was equipped with two stations located at the rear of the classroom, and each was supplied with the appropriate materials, depending on the cassette: a sculptured relief globe; a 28" by 18" raised relief world map; several "nyco" marking pens; scratch paper and one cassette recorder. In addition, each station had a digital clock and a daily sign-in sign-out sheet. Cassettes and worksheets were located on top of the teacher's desk. An

additional globe and world map were also located in the rear of the room for use during quizzes. All the tasks and information required to pass the unit quiz were presented clearly on the tape. The student was required to actively respond to explicit instructions given on the cassette and make the appropriate response with the accompanying materials, e.g., search on the map or globe for a specific geographical location, marking the map or globe as directed with the special marking pen. A worksheet accompanied each cassette which consisted of specific questions or concepts presented on the cassette. These worksheets were written by the investigator and were used to measure the student's general comprehension of the information presented on the cassette. The students were asked to show this worksheet and their responses on the map or globe to the teacher or the investigator upon completion in order to demonstrate readiness to take a unit quiz.

The first step in preparation to work on a social studies unit was to sign in at the station by indicating one's name and entering the exact time in hours and minutes on the sign-in time sheet. Upon signing-in the student would go to the teacher's desk and obtain the appropriate cassette tape. Whenever the student left the station he/she was instructed to follow the same general time-recording procedure and return the cassette to the teacher's desk.

Each student was expected to progress sequentially through the material, that is, as it was presented in the study. The first social studies unit was presented on Nystrom's cassette #4--information on how to find directions on a globe. Nystrom's cassette #5 presented information on how to find directions on a map. Cassette #6 from the "Where and Why" program presented information on how to use a compass rose. Cassette #7 from Nystrom's sequence presented information on the hemispheres. Hereafter, the cassettes will be referred to as cassette #1, cassette #2, cassette #3, and cassette #4.

A pretest was administered one week before the study to determine the appropriate level of difficulty of the initial cassette to be used with this particular population. The pretest accompanied the "Where and Why" program and was of standard multiple choice form. In addition, the grouping of four cassettes was chosen because together they present a basic, complete unit of information. One quiz per cassette accompanied the "Where and Why" program; the investigator composed two similar alternatives.

### Independent Variables

The materials used in the treatment condition consisted of two publically posted classroom charts: one, with the student's name printed on sealed envelopes within which puzzle pieces were randomly distributed, and the second, a 2' by 3' pre-coded puzzle backing upon which



the pre-coded puzzle pieces were mounted immediately after a student mastered a quiz. The student's procedure, upon quiz mastery, consisted of posting the date of mastery on the envelope chart, thereby demonstrating his/her progress and unit mastery, then opening the sealed envelope, obtaining and posting the puzzle piece in the coded position on the puzzle backing. As each student mastered a quiz, his or her success contributed to the completion of the large poster puzzle (a group progress-chart). The student's behavior in the treatment conditions was compared to his/her behavior in the control (baseline) condition (no progress charts).

Student satisfaction forms were given to the students at the end of each 2-week phase. Students were asked to circle the number that indicated how they felt about the PSI method compared to the way they were accustomed to being taught. The satisfaction scale ranged from 1 ("don't like it at all") to 5 ("like it a lot more than the regular method").

### Dependent Variables

The data for the hypothesis that public progress charts would enhance a student's rate of progress through a unit were recorded by this investigator's charting the number of days that had elapsed from the student's first response on the unit to the student's mastery of the unit. With respect to this measure, number-of-days-to-mastery,

students were allowed up to 8 days to master a quiz before the teacher intervened. Mastery was defined as a score of at least 80% on a quiz.

In addition, several other related dependent measures were taken. First, the number of days which had elapsed before the student initially worked at the station was noted. This measure, number-of-days-to-start-unit, was recorded by a student signing in on a daily sign-in time sheet. Students were allowed 1-8 days to make the initial response without intervention from their teacher.

Second, the number of minutes the student spent working at the station was recorded. In this case, the student beginning work at the station entered the exact time of day on the time sheet attached to the station. Students were also told to record the time whenever they left the station and to sign-in upon re-entry.

Third, the number of trials necessary for quiz mastery was determined by the number of attempts at quizzes a student took to successfully master a unit. This measure, number-of-trials-to-mastery, was recorded by the investigator. Any time a student requested and received a quiz, whether or not the student chose to respond on it, was considered a quiz attempt.

Fourth, the final score (80%, 90%, 100%) on every quiz was recorded by the investigator as well as the quiz form used.

The data for the hypothesis that students would like the PSI method were taken from the student's responses on the satisfaction form.

### Procedures

Each classroom was given a brief explanation of the PSI method of instruction. Following this introduction each student was given a programmed-instruction ditto sheet regarding the logistics of PSI and subsequently quizzed on the information. 100% mastery was expected. Any student who did not understand the mechanics of the PSI course was tutored and given a quiz retake. This procedure tested the comprehension of the student regarding the behaviors expected of him or her in a PSI course and clarified many confusions the students had about the PSI method. The student was advised that this score was not used for assessment purposes.

Next, the equipment was explained. Cassette #14 from the "Where and Why" program was used to acquaint the student with the general style of information presentation and the mechanics of operating the cassette recorder. The procedure the student was expected to follow while working at the station was also demonstrated. Students were shown where the maps, the globes, the cassette recorders, the marking pens, the worksheets, the time sheets, and the scratch paper were located. Students were advised that they needed to use their own pencils and rulers. The

signing-in and signing-out procedure was then explained. The students were advised that whenever they used the station they were to enter their name and the exact time they arrived and left the station. Students were told that acquiring the cassette from the teacher was contingent upon signing-in at the station. Students were also told that they were expected to return the cassette to the teacher's desk upon signing out. The time sheets were changed on a daily basis by a student volunteer; this task was assigned once a week for the duration of the week.

Students were advised that all the information they needed to learn was presented on the cassette, but if they needed additional help the teacher or this author were available to assist. Students were told that they were required to obtain at least 80% on each quiz. They were told that if they didn't obtain 80% on the quiz that they could take another similar quiz until they achieved the required score. Students were advised that they would not be jeopardized for retaking a unit quiz except for a loss of time. A response on a quiz was defined as correct if it matched the answer on the key. All answer keys were held by the author until the student was ready to have his/her quiz graded.

Students were advised that while they listened to a cassette certain directions would be given and they were expected to respond appropriately on the map or globe and

the worksheet. They were told that they should show their responses to the teacher or this author in order to get it checked so that they could take a quiz at that time if they wished. Since peer interaction and feedback is one of the essential components of PSI, students were advised that they could work in pairs as well as individually at the station. If they chose to work with a partner, students were advised that a cooperative, mutual interaction was expected. In this case both the students could show the teacher or the author the map or globe reflecting their joint effort; however, each had to individually complete a worksheet and have it checked before qualifying to attempt the quiz.

Students were told that a 45-minute period was set aside for social studies every Monday, Wednesday, and Friday. A daily study hall of 30 to 45 minutes was also designated as an appropriate time to work at the station. Students were told that recesses, after lunch, or various other free times during the day could be used for studying at the station. The tapes were approximately 6-8 minutes when played from beginning to end.

Quizzes were given only during the Monday, Wednesday, and Friday social studies period and the Tuesday and Thursday study hall periods.

Prior to the execution of the study an individual file-packet was prepared for each student. Each contained

a selection of quiz forms. Students were assigned their specific packet in the order they attempted the first quiz, that is, the first student to attempt a quiz was assigned packet #1, etc. If a retake was necessary the packet was pulled and the next quiz in that particular sequence was given to the student. The files were prepared such that student #1 was given a different quiz sequence than student #2, etc. (Therefore, for every fourth student the sequence was repeated.) The order of the sequences was also changed for each cassette. The quizzes were scored the same day the student took the quiz so that immediate feedback was given.

Both classrooms studied the same social studies material. Students were told of changes in procedure (the treatment condition) only when the designated changes were scheduled to take place. The classroom in the treatment condition was given the additional information necessary to understand the operations involved in obtaining their puzzle piece.

This study lasted 8 weeks which were divided into four 2-week sessions. Thus, one cassette was presented per 2-week period. Within this 8-week period, 8 days of "catch-up" were scheduled. This catch-up period was teacher-directed for those students who for one reason or another didn't master the material within the allotted first 8 days of the self-pace period. The remaining 2 days

of the 2-week period was considered the catch-up time. Initially classroom A was told they had 8 days to master cassette #1, using the regular PSI method (with no progress chart). Classroom B was also given 8 days to complete cassette #1; however, they were told that when they mastered a quiz that the mastery date would be posted on the envelope-chart and that they could post their puzzle piece in the appropriate coded position on the puzzle-backing chart. During the following 2-week period, students worked on cassette #2. This time classroom A used the public charts and classroom B used the regular PSI method. The remaining 4 weeks of the study followed this same procedure, reversing and alternating the condition at 2-week intervals, using cassettes #3 and #4.

In summary, the typical sequence followed by the individual pupil is described as follows. A student went to the station and entered his/her name and the time of day on the attached time chart. The student then obtained the cassette and the worksheet from the teacher and placed the cassette in the recorder and followed the instructions on it. The student stopped the tape or replayed parts of it as often as necessary. While listening to the tape the student also completed the accompanying worksheet. Upon leaving the station, the student signed out on the time sheet. When the student's work was completed, he/she showed the completed materials to the teacher or this

this author. If it was approved, the student had the option to take the quiz over the material immediately or to wait until a later time. When the quiz was completed and handed in the student had the option to observe it being corrected. If the student's score was below 80% he/she could then review the material via the cassette or retake the quiz without additional review. When the student achieved 80% mastery, his/her social studies work was considered complete until the next 2-week phase of the study.



## CHAPTER IV

### RESULTS

#### Treatment Effect: Publically Posted Progress Charts

The data from both classrooms were combined and the treatment condition was compared to the baseline condition of t-tests for related measures on four different independent variables (see Table 1). The dependent variables

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Table 1

Main Effect of the Treatment on  
Four Dependent Variables

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Treatment-Baseline Differences In	Treatment Mean ( <u>SD</u> )	Baseline Mean ( <u>SD</u> )	t(45) value <sup>a</sup>
No. of days to mastery	2.37(1.08)	4.11(2.46)	5.06**
No. of days to start a unit	4.80(1.89)	4.83(2.55)	.12
No. of trials to mastery	3.02(1.22)	3.30( .08)	.43
Time at station <sup>b</sup>	48.88(11.56)	48.98(9.35)	.07

---

<sup>a</sup>t-test for related measures

<sup>b</sup>d.f. = 41 for this comparison

\*\*  
p < .01

measured were: the number of days a student took from his first response to his quiz mastery, the number of days a student took before he started working at the station, the number of trials necessary before a student mastered a quiz, and the number of minutes a student spent working at a station. The hypothesis that public progress charts would enhance a student's progress, that is, number-of-days-to-mastery, in a PSI course was confirmed. On the average, students took 1.77 more days to complete a unit in the baseline condition than in the treatment condition  $t(45) = 5.06, p < .01$ . The treatment did not significantly influence the other dependent measures: the number-of-days-to-start-a-unit, the time spent at a station, or the number-of-trials-to-mastery.

A t-test for independent means indicated no significant differences between classrooms with respect to the size of the overall treatment effect regarding number-of-days-to-mastery (see Table 2). However, striking differences were found between the two classrooms on the t-test for independent means on three other dependent measures. The results indicated significant differences between classrooms with respect to the treatment's effect on number-of-days-to-start-a-unit,  $t(44) = 2.94, p < .01$ ; number-of-trials-to mastery,  $t(44) = 2.98, p < .01$ ; and time spent at the station,  $t(40) = 2.32, p < .05$ . Unusually long periods of time at the station were indicated on the sign-in

Table 2  
Interaction between Classrooms and Treatment-  
Baseline Differences on Four  
Dependent Variables

Treatment-Baseline Differences In:	Classroom A Means ( <u>SD</u> )	Classroom B Means ( <u>SD</u> )	t(44) value <sup>a</sup>
No. of days to mastery	-1.86(2.34)	-1.67(2.34)	.27
No. of days to start a unit	-1.09(2.11)	1.00(2.55)	2.94**
No. of trials to mastery	-.86(1.49)	.63(1.78)	2.98**
Time at the station <sup>b</sup>	-3.43(9.01)	3.24(10.15)	2.32*

<sup>a</sup>t-test for a difference between two independent means

<sup>b</sup>d.f. = 40 for this comparison

\* p < .05

\*\* p < .01

sheets by four students. Due to the likelihood that errors were made recording the time--or due to possible daydreaming while at the station--these students' data were omitted in this comparison. The mean differences between the treatment and baseline conditions for each of the dependent variables tested above are summarized separately in Table 2 for each classroom. It was found that students in classroom A went to the station to begin working on a unit 1.09 mean days sooner in the treatment condition than in the control condition. This was in contrast to classroom B in which

students went to the station to begin work 1.0 mean days faster in the baseline condition than in treatment condition. The students in classroom A took a mean of .86 less trials to master a quiz in the treatment condition than in the baseline condition whereas students in classroom B took an average of .63 more trials to master a quiz in the treatment condition. In addition, students in classroom A spent less time at the station in the treatment condition, 3.43 mean minutes less than in baseline, compared to students in classroom B who spent 3.24 mean minutes less in the baseline condition than in the treatment condition.

The effect of phase of the study was also examined; subsidiary tests were employed to explore the aspect of the order of cassette presentations with respect to each of the dependent measures. First, interactions between the phase of the study and the treatment effect were tested with t-tests for related measures which compared the treatment effect of the first phase of the study (the first two cassettes) with the treatment effect in the last phase of the study (the last two cassettes). In these comparisons no significant interactions were found with respect to number-of-days-to-mastery, number-of-days-to start-a-unit, number-of-trials-to-mastery, or time at the station (see Table 3).

Table 3  
Phase by Treatment Interactions

Treatment-Baseline Differences In	1st Phase Means ( <u>SD</u> )	2nd Phase Means ( <u>SD</u> )	t(45) value <sup>a</sup>
No. of days to mastery	-.82(1.68)	-.93(2.23)	.23
No. of days to start unit	.09(1.85)	.09(2.09)	.00
No. of trials to mastery	.04(1.15)	-.11(1.18)	.71
Time at the station <sup>b</sup>	-1.17(8.11)	1.07(7.27)	.82

<sup>a</sup>t-test for related measures

<sup>b</sup>d.f. = .41 for this comparison

Second, the overall effect of phase was examined. The overall phase comparison of performance on the first and third cassettes with the performance on the second and fourth cassettes is the same comparison involved in the t-tests of class-by-treatment interaction. This comparison was the only significant one with respect to cassette differences affecting two dependent measures: the number-of-trials to mastery and time at the station. However, the phase comparisons were significant on the other dependent variables.

When the data from the middle two cassettes were combined and compared to the combined data of the first and last cassette, it was found that number-of-days-to-mastery was .68 mean days faster in the middle of the study compared to the

beginning and the end of the study,  $t(45) = 3.26$ ,  $p < .01$ .

The other significant finding with respect to overall effect of phase involved the number-of-days-to-start-a-unit. This time, data from the first half of the study (the first 2 cassettes) were combined and compared to the combined data from the last half of the study (the last 2 cassettes). It was found that the number-of-days-to-start-a-unit was 2.25 days on the average ( $SD = 2.35$ ) in the first half of the study compared to an average 2.74 days ( $SD = 2.33$ ) in the last half of the study,  $t(45) = 2.26$ ,  $p < .05$ .

Tables 4-7 specify the classroom mean values by cassette (unit) with respect to number-of-days-to-mastery, number-of-days-to-start-a-unit, number-of-trials-to-mastery, and time at the station.

Table 4

Means (Standard Deviations) by Classroom  
by Cassette on Number-of-Days-to-Mastery

	Cassette #1	Cassette #2	Cassette #3	Cassette #4	Total Means
Classroom A	2.64(1.68)	1.05(.90)	1.45(1.80)	1.18(.81)	1.58
Classroom B	<u>1.54(.83)</u>	<u>1.67(1.44)</u>	<u>.92(.78)</u>	<u>2.46(2.12)</u>	1.65
Total Means	2.09	1.36	1.19	1.82	

Table 5

Means (Standard Deviations) by Classroom by  
Cassette on Number-of-Days-to-Start-a-Unit

	Cassette #1	Cassette #2	Cassette #3	Cassette #4	Total Means
Classroom A	2.55(1.73)	1.91(.94)	3.32(1.64)	2.86(1.63)	2.66
Classroom B	<u>2.63(1.77)</u>	<u>1.88(1.47)</u>	<u>2.50(1.22)</u>	<u>2.25(1.78)</u>	2.32
Total Means	2.59	1.90	2.91	2.56	

Table 6

Means (Standard Deviations) by Classroom  
by Cassette on Time at the Station

	Cassette #1	Cassette #2	Cassette #3	Cassette #4	Total Means
Classroom A	26.24(10.20)	22.38(7.27)	24.00(4.29)	24.43(4.18)	24.26
Classroom B	<u>25.19(10.39)</u>	<u>23.67(9.32)</u>	<u>25.76(9.49)</u>	<u>24.04(6.55)</u>	24.67
Total Means	25.72	23.03	24.88	24.24	

Table 7

Means (Standard Deviations) by Classroom by  
Cassette on Number-of-Trials-to-Mastery

	Cassette #1	Cassette #2	Cassette #3	Cassette #4	Total Means
Classroom A	1.59(.79)	1.36(.63)	1.91(.87)	1.27(.60)	1.53
Classroom B	<u>1.67(1.01)</u>	<u>1.38(.75)</u>	<u>1.71(.86)</u>	<u>1.33(.56)</u>	1.52
Total Means	1.63	1.37	1.81	1.30	



### Student Satisfaction

The hypothesis that students would like the PSI method was also supported. Students indicated a strong preference for the PSI method regardless of the cassette, the classroom, the treatment, or the phase of the study. Of the students, 86% to 93% liked the PSI method from (4) a little more than the regular teaching method to (5) a lot more than the regular method on the 5-point satisfaction scale.

## CHAPTER V

### DISCUSSION

The overall effect of the treatment on number-of-days-to-mastery was dramatic: a student's progress through a unit was significantly enhanced when the public progress charts were used. The implications of this finding suggest that using motivational aids, such as the poster puzzle, may be an especially effective means of shaping self-motivational skills. Most educators agree that the acquisition of self-directed behavioral skills is a fundamental goal of the educational process. Certainly, the student who proceeds through his/her assignments without constant prodding has a clear advantage over the student who is dependent on the teacher for direction. Since self-pacing behavior is acquired through successful experience on a behavior-based schedule, perhaps a reinforcing early experience in a behavior-based course would aid in generalizing to a later behavior-based course where the other natural features of the course are expected to maintain progress.

The success of the treatment effect remained stable throughout the study even though significant differences between classrooms were found. An explanation for the

differences between classrooms with respect to number-of-days-to-start-a-unit is apparent from examination of the different general classroom environments. Classroom B was decorated colorfully; the walls were arranged with interesting displays, charts, pictures, and artwork. By contrast, classroom A's environment was modest with only a few magazine photos decorating the walls in addition to a few "superior" student papers. Perhaps the students in classroom A were more motivated by the presence of the poster-puzzle; thus they went to the station to begin work sooner when the treatment was in effect. Possibly it was especially stimulating in their otherwise plain surroundings.

Classroom differences with respect to number-of-trials-to-mastery and time at the station can be explained in terms of cassette difficulty. An inspection of Table 6 and Table 7 with respect to these two variables shows that classroom A experienced the treatment condition during the second and fourth cassettes. These cassettes appeared to be somewhat less difficult for both classrooms. Therefore, the treatment effect appears to be confounded by cassettes on these two measures. Since it was unlikely that number-of-days-to-start-a-unit was affected by cassette difficulty, this difference between classrooms was not attributed to cassette differences but, as reported above, to features of the different environments.

It was also found that students were quicker to

approach the station to begin work at the beginning of the study than they were at the end. An obvious, yet plausible, explanation for this result lies in the attraction of the modern, novel equipment. In addition, it was found that students mastered a unit sooner in the middle, compared to either the beginning or the end, of the study. Initially, perhaps students were eager to investigate the station on the first cassette but more reluctant about approaching a stranger (this researcher) and obtaining a quiz and having it corrected and even more anxious about trying again on a non-mastered quiz. During the last cassette the effect of treatment on number-of-days-to-mastery might have been hampered by vacation preparation (subsequent to cessation of the study) in that the focus of the teachers was on finishing units from other current assignments and projects, completing delinquent or making up missing assignments, appealing to the student's free time to help prepare the classroom for "break." Therefore, students were distracted by competing activities and consequently did not master a unit as quickly as they might have otherwise.

The results with respect to student satisfaction are consistent with the vast majority of other investigators' research: not only is PSI a feasible teaching alternative, but students like the method. In addition, PSI was found to be adaptable to the auditory mode of presentation. Since most of the research done with PSI to date has focused on

the use of written materials, an exciting area for future research would be follow-up studies which systematically investigate the recently popularized materials which are of primarily auditory presentation. Perhaps the most promising area for future research suggested by this study lies in the investigation of motivational aids--a few areas to be explored might include investigation into the nature of the aid, that is, using different kinds of motivational devices employing either an individual approach or group approach, or an approach similar to this study using both, and investigation into the effects of fading the aid by gradually eliminating its use, thereby further studying the process of shaping self-directed motivational skills.

## REFERENCE NOTES

1. Atkinson, S. S. PSI in sixth-grade spelling. PSI Newsletter, March 1976, p. 2.
2. Farnum, M. J. A systematic investigation of personalized systems of instruction in a self-contained fifth-grade class. Diss. Abs. Intl. #77-25, 766, 40 pp., 1977.
3. Van der Schoot, F. PSI in fourth grade math. PSI Newsletter, December 1974, p. 3.
4. Werner, T. Kiddie PSI revisited. PSI Newsletter, December 1975, p. 2.
5. Werner, T., & McLaughlin, D. Kiddie PSI. PSI Newsletter, September 1975, pp. 1, 6.
6. Walen, S. R. Personalized instruction using the oral interview technique--Preliminary report on near-zero procrastination problems. Paper presented at the Conference on the Keller Plan, MIT, Cambridge, Massachusetts, October 1971.
7. Gallup, H. F. Individualized instruction in introductory psychology. Paper presented at the meeting of the Midwestern Psychological Association, Chicago, May 1969.
8. Goodall, P. Personalized instruction as viewed by an engineering student. Paper presented at the meeting of the Rocky Mountain Psychological Association, Albuquerque, New Mexico, May 1972.
9. Davies, C. S., & Semb, G. Effects of progressive contract schedules on rates of course completion. Paper presented at the meeting of the American Psychological Association, Washington, D.C., September 1976.

## REFERENCES

- Bitgood, S. C., & Seagrave, K. A comparison of graduated and fixed point systems of contingency-managed instruction. In J. M. Johnson (Ed.), Behavior research and technology in higher education. Springfield, Ill.: Charles C. Thomas, 1975.
- Born, D. G. Instructor manual for development of a personalized instruction course. Salt Lake City: Center to Improve Learning and Instruction, University of Utah, 1971.
- Bufford, R. K. Evaluation of a reinforcement procedure for accelerating work rate in a self-paced course. Journal of Applied Behavior Analysis, 1976, 9, 208.
- Bufford, R. K. Self-paced instruction: A practical procedure to reduce procrastination. In J. G. Sherman and R. Lazar (Eds.), Personalized instruction in higher education: Proceedings of the third national conference. Washington, D.C.: Center for Personalized Instruction, Georgetown University, 1977.
- Burt, D. W. Study and test performance of college students on concurrent assignment schedules. In J. M. Johnston (Ed.), Behavior research and technology in higher education. Springfield, Ill.: Charles C. Thomas, 1975.
- Cohen, A., Slovin, D., Franzblau, C., & Sinex, F. A self-paced biochemistry course for medical students. Journal of Medical Education, 1973, 48, 289-290.
- Coldeway, D. O., & Keys, C. B. The effects of instructor-pacing on later self-pacing. In L. E. Fraley & E. A. Vargus (Eds.), Behavior research and technology in higher education. Gainesville: University of Florida, 1976.
- Fawcett, S. B., & Miller, L. K. Training public speaking behavior: An experimental analysis and social validation. Journal of Applied Behavior Analysis, 1975, 8, 125-135.
- Fawcett, S. B., Miller, L. K., & Braukmann, C. J. The observation of community canvassing behaviors in scripted role-playing sessions. Journal of Applied Behavior Analysis, 1977.

- Glick, D. M., & Semb, G. Instructor-set pacing contingencies versus the absence of such contingencies in a personalized university course. Journal of Personalized Instruction, 1978, 3(3), 131-138.
- Green, B. A., Jr. Physics teaching by the Keller Plan at M.I.T. American Journal of Physics, 1971, 39, 764-775.
- Green, B. A., Jr. Comment on "Keller vs. lecture method in general physics instruction." American Journal of Physics, 1973, 41, 706-707.
- Henneberry, J. K. Effects of priming period on procrastination and course performance in a "self-paced course." In R. S. Ruskin and S. F. Bono (Eds.), Personalized instruction in higher education: Proceedings of the First National Conference. Washington, D.C.: Center for Personalized Instruction, Georgetown University, 1975.
- Henneberry, J. K. Effects of three anti-procrastination measures in a PSI course. In B. A. Green (Ed.), Personalized instruction in higher education: Proceedings of the Second National Conference. Washington, D.C.: Center for Personalized Instruction, Georgetown University, 1976.
- Henneberry, J. K. A PSI approach with continuing education night division community college students. In J. G. Sherman & P. Lazar (Eds.), Personalized instruction in higher education: Proceedings of the Third National Conference. Washington, D.C.: Center for Personalized Instruction, Georgetown University, 1977.
- Hess, J. H. Keller Plan instruction: Implementation problems. In J. G. Sherman (Ed.), PSI: 41 Germinal papers. Menlo Park, Calif.: W. A. Benjamin, 1974.
- Hess, J. H., & Lehman, G. PSI among the acronyms. In R. S. Ruskin (Ed.), An evaluative review of the personalized system of instruction. Washington, D. C.: Center for Personalized Instruction, Georgetown University, 1976.
- Johnson, K., & Ruskin, R. S. Behavioral instruction: An evaluative review. Washington, D.C.: APA, 1977.
- Keller, F. S. "Goodbye, teacher . . ." Journal of Applied Behavior Analysis, 1968, 1, 79-89.



- Keller, F. S. A programmed system of instruction. Educational Technology Monographs, 1969, 2(1), 1-16.
- Lazar, R., Soares, C., & Terman, M. The interquiz interval: A method for analyzing student self-pacing. In J. G. Sherman & R. Lazar (Eds.), Personalized instruction in higher education: Proceedings of the Third National Conference. Washington, D.C.: Center for Personalized Instruction, Georgetown University, 1977.
- Liedecker, H. The removal of time constraints. In A. J. Dessler (Ed.), Proceedings of the Keller method Workshop Conference at Rice University. Houston, Tex.: Rice University, 1972.
- Lloyd, K. E., & Knutzen, N. J. A self-paced, programmed undergraduate course in the experimental analysis of behavior. Journal of Applied Behavior Analysis, 1969, 2, 125-133.
- McLaughlin, T. F., & Malaby, J. E. The effects of two pacing contingencies in commercially available materials. Improving Human Performance, 1974, 3, 187-198.
- McLaughlin, T. F., & Malaby, J. E. Elementary school children as behavioral engineers. In E. Ramp & G. Semb (Eds.), Behavior analysis: Areas of research and application. New York: Prentice-Hall, 1975.
- McMichael, J., Brock, J., & DeLong, J. Job relevant Navy training and Keller's PSI: Reduced attrition. Journal of Personalized Instruction, 1976, 1, 41-44.
- McMichael, J. S., & Corey, J. R. Contingency management in an introductory psychology course produces better learning. Journal of Applied Behavior Analysis, 1969, 2, 79-83.
- McMichael, J., & Murphy, H. A. A systems approach in post-secondary education. In L. E. Fraley & E. A. Vargas (Eds.), Behavior research and technology in higher education. Gainesville: University of Florida, 1976.
- Powers, R. B., & Edwards, K. A. Performance in a self-paced course. Journal of Experimental Education, 1974, 42, 60-64.
- Powers, R. B., & Wald, B. Some effects of a graduated bonus system on a PSI course. In R. S. Ruskin & S. F. Bono (Eds.), Personalized instruction in higher education: Proceedings of the First National Conference. Washington, D.C.: Center for Personalized Instruction, Georgetown University, 1975.

- Prentice, E. D., Metcalf, W., Metcalf, N., & Sharp, J. G. Multimedia approach to teaching human anatomy. In J. M. Johnston (Ed.), Research and technology in college and university teaching. Gainesville: University of Florida, 1975.
- Riedel, R. C., Harney, B., LaFief, W., & Finch, M. The effects of time as a contingency on student performance in an individualized course. In B. A. Green (Ed.), Personalized instruction in higher education: Proceedings of the Second National Conference. Washington, D.C.: Center for Personalized Instruction, Georgetown University, 1976.
- Schimpfhauser, F., Richardson, K., & Cook, S. Medical school biochemistry via the personalized system: A three-year perspective. In J. G. Sherman & R. Lazar (Eds.), Personalized instruction for higher education: Proceedings of the Third National Conference. Washington, D.C.: Center for Personalized Instruction, Georgetown University, 1977.
- Semb, G., Conyers, D., Spencer, R., & Sanchez-Sosa, J. J. An experimental comparison of four pacing contingencies in a personalized instruction course. In J. M. Johnston (Ed.), Behavior research and technology in higher education. Springfield, Ill.: Charles C. Thomas, 1975.
- Sonnenschein, D. Conveyance of non-verbal materials in a PSI introduction to music course. In J. G. Sherman & R. Lazar (Eds.), Personalized instruction in higher education: Proceedings of the Third National Conference. Washington, D.C.: Center for Personalized Instruction, Georgetown University, 1977.
- Stahl, S., Hennes, J., & Fleischli, G. Progress on self-learning in biostatistics. Journal of Medical Education, 1975, 50, 294-296.
- Sutterer, J. E., & Holloway, R. E. An analysis of student behavior in a self-paced introductory psychology course. In J. M. Johnston (Ed.), Behavior research and technology in higher education. Springfield, Ill.: Charles C. Thomas, 1975.
- Taylor, K. E. Increasing course completion in a personalized system of instruction. In R. S. Ruskin & S. F. Bono (Eds.), Personalized instruction in higher education: Proceedings of the First National Conference. Washington, D.C.: Center for Personalized Instruction, Georgetown University, 1975.

- Tosti, D. Extending personalized instruction into elementary and secondary education. In B. A. Green (Ed.), Personalized instruction in higher education: Proceedings of the Second National Conference. Washington, D.C.: Center for Personalized Instruction, Georgetown University, 1976.
- Weisman, R. A., & Shapiro, D. M. PSI for medical school biochemistry. Journal of Medical Education, 1973, 48, 934-938.
- Werner, T., & Bono, S. F. The application of PSI to a second grade classroom, or, the lone arranger rides again. Educational Technology, 1977, 20-24.
- Williams, R. S., & McMillian, J. Personalized system of skill instruction: Golf, tennis, bowling, exercise. Houston, Tex.: Health and Physical Education Department, North Harris College, 1975.
- Wilson, S. R., & Tosti, D. T. Learning is getting easier. San Raphael, Calif.: Individual Learning Systems, 1972.