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## The effects of different proctoring systems upon examination performance and preference in a contingency-managed course.

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THE EFFECTS OF DIFFERENT PROCTORING SYSTEMS  
UPON EXAMINATION PERFORMANCE  
AND PREFERENCE IN A CONTINGENCY-MANAGED COURSE

A Thesis Presented

by

Kent R. Johnson

Submitted to the Graduate School of the  
University of Massachusetts in partial  
fulfillment of the requirements for the degree of

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October, 1974

Major Subject: Psychology

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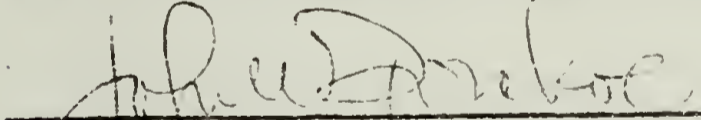
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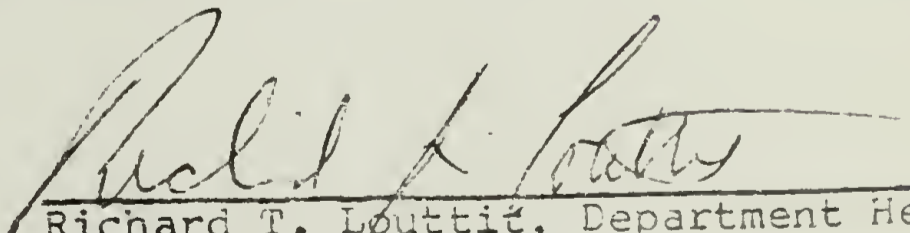
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October, 1974

## Abstract

The effects of using advanced undergraduate students (external), currently enrolled students (internal), constant, variable, and no proctor systems were compared in a course taught by Personalized Instruction methods. Using both between and within groups designs, the results indicated that regardless of proctor system there were no differences in student examination performance. Quiz retake frequency and withdrawal rate, however, were substantially larger among students in the no-proctor condition than among any of the proctor systems employed. Results also indicated that student performance and progress in the no-proctor condition was highly correlated with ability, while ability level was not a significant factor in determining student performance and progress when any type of proctor system was employed. Students generally preferred the proctor system to which they were exposed, although students exposed to more than one system preferred an internal to an external, and a variable to a constant proctor system. The use of intra-group and multiple baseline designs in research on behavioral instruction is discussed. Internal proctor systems are discussed in terms of benefits to instructor and student. A thorough review of research on the proctor component in Personalized Instruction (PSI) is also presented.

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The effectiveness of the Personalized System of Instruction (PSI) (Keller, 1968; Sherman, 1967) has been compared many times with the effectiveness of traditional forms of instruction in many disciplines (e.g., McMichael & Corey, 1969; Born, Gledhill & Davis, 1972; Green, 1971; Koen, 1971; Clark, 1973; Tietenberg, 1973). Kulik (1974), in a review of such comparative studies, has indicated that, in general, PSI produces superior examination performance and higher student ratings than the more traditional lecture-discussion format.

Recently, investigators have begun to isolate and evaluate the relative effectiveness of the component features of PSI, such as the mastery criterion (Semb, 1974; Johnston & O'Neill, 1973), unit size (Semb, 1974; Born, 1973) and motivational lectures (Minke & Carlson, 1973; Lloyd, Garlington, Lowry, Burgess, Euler & Knowlton, 1972). Another feature which has received some attention is the use of proctors.

Keller (1968) explained that the use of proctors

permits repeated testing, immediate scoring, almost unavoidable tutoring, and a marked personal-social enhancement of the educational process (p. 83).

#### The Role of the Proctor:

Since that time the role of the proctor has been discussed in great detail. The consensus has been that the proctor immediately scores and evaluates the student's

performance on successive quizzes over units of material throughout the semester, points out to the students relevant portions of material which have not been mastered, if any, explains any apparent difficulties which a student may have before or after he takes a quiz, suggests ways of improving student study behaviors, shapes appropriate examination skills, prompts consistent progress throughout the course, and adds greatly to the personalization of a college course (e.g., Keller, 1969, 1972; Born & Zlutnick, 1972; Born, Gledhill & Davis, 1972). Thus, the proctor staff in many ways determines the success or failure of a PSI course (Born & Zlutnick, 1972).

Many papers have discussed the selection of proctors. The most prevalent method of selection has been to obtain the services of "external" proctors who will serve the length of the entire course. This type of proctor is usually a graduate student or advanced undergraduate majoring in the course discipline. The PSI newsletter (June, 1974) recently reported that about 80% of all PSI courses presently offered follow these procedures. Keller (1968) originally advised that the proctor be,

an undergraduate who has been chosen for his mastery of the course content and orientation, for his maturity of judgement, for his understanding of the special problems that confront students as beginners, and for his willingness to assist (p. 81).

There have been many reports of the very successful

use of advanced undergraduates as proctors. Many cite undergraduates as the most valuable untapped resource available to the university or college today (e.g., Sheppard & MacDermot, 1970). Most have reported a division-of-labor proctor force in the classroom, where varying numbers of proctors participate in coordinating projects, testing, materials for the course, interviewing, and problem-solving (e.g., Edwards, 1972). Edwards (1972) makes the point clear

Thus the individual student is not ignored but attended by many different people who may be more capable of "teaching" than the teacher, since they are more capable of dispensing social reinforcers for learning.

#### The Proctor Contribution:

Two experiments attempted to directly assess the value of the proctor component within the Personalized System of Instruction. Calhoun (1973) performed an elemental analysis of the five distinguishing features of PSI (i.e., self-pacing, mastery, lectures as motivational devices, stress on the written word and unitization of course material, and immediate feedback through proctors, Keller, 1968) and found that the addition of each component to the package was effective in increasing scores on course exams and on a three-month follow-up retention test, between groups. The groups that included the proctoring component performed significantly better than groups that did not. However, the effectiveness of the proctoring component was somewhat diminished when other components were not present, specifically

self-pacing, and unitization of course material.

Of greatest significance is the study by Farmer, Lachter, Blaustein, & Cole (1972) which showed that the absence of proctors in Personalized instruction significantly decreased final examination scores and progress rates, and increased amount of quiz retaking necessary to master the course content, when compared to groups having varying proportions of their unit quizzes proctored.

Subjects in this experiment were randomly assigned to five groups which had either 0%, 25%, 50%, 75%, or 100% of their 20 unit quizzes proctored by an external proctor. Frequency of quiz-taking was maximized to one quiz per class session. Students in the no-proctor condition (0%) were informed that they had passed or failed a quiz by the end of the class session in which the quiz was taken, and the corrected answers, if any, were written in the quiz booklets and redistributed during the next class session. All students who had at least some proportion of their quizzes proctored required significantly fewer quizzes for unit mastery than those in the no-proctor condition. All comparisons between groups having the varying proportions of their quizzes proctored were nonsignificant. Each group with some proportion of their quizzes proctored showed significantly faster progress through the course when compared to the non-proctored group. Finally, final exam performance by all proctored students was significantly better than

non-proctored students, with, again, no differences in performance among the groups with varying amounts of their quizzes proctored. These results show that the proctoring component is necessary to improve a student's rate of progress through a course and retention of material, as measured by the final examination. With at least some amount of proctoring the student achieved a required level of mastery, in this case, 100%, with less exposure to quiz materials and in less time than when none of his quizzes were proctored. Farmer, et al (1972) conclude,

The greater achievement in a fixed time period, such as a semester, is clearly linked to the use of proctors. However, in cases where less definitive conditions are ostensibly responsible for progress, slow, and therefore less progress by a student during a fixed time is often interpreted as a chronic deficit in the student's ability or motivation. Since proctoring, as opposed to total lack of proctoring, can be clearly shown to affect rate of student's progress, arguments that attribute lack of progress to uncontrollable deficits on the part of the student may lose plausibility (p. 403).

#### Proctor Training:

Little consensus has been reached concerning the most appropriate training for proctors. Most PSI users indicate that detailed proctor answer sheets for the unit quizzes and weekly meetings designed to review course material and discuss difficulties are very helpful and are all that is really needed. Training of academic competence may not need to be aided by anything more than this, due to the

proctors previous mastery of the course material and relevant knowledge gained from other courses within the same subject matter. Born (1971) has written an excellent training manual for proctors based upon his experiences with the system. Born and Zlutnick (1972) suggest that the proctor be required to pass the mastery quizzes over each unit of material if he has not done so in a previous semester.

Proctor training has been studied experimentally by Weaver and Miller (1973). A training package was developed for student proctors focusing upon three desirable proctor behavioral constellations: (1) monitoring the course progress of the students assigned to him or her ("preparation behaviors"), (2) assisting the students with questions they have over the course material through explanation and prompting correct responses ("prompting behaviors"), and (3) scheduling reinforcing consequences following correct responses to increase the likelihood of developing the behavioral repertoire of the students ("praise behaviors"). Using a multiple baseline design, when each phase of the training package was instituted, it produced significant increases in the corresponding proctoring behaviors being trained, as measured during generalization proctoring sessions.

#### Proctor Evaluation:

The large majority of papers dealing with proctors have focused upon student evaluations of the use of proctors, and proctors' evaluations of their own experiences. Papers of

both types have been overwhelmingly favorable, without exception. For example, in two papers students gave highest ratings to proctors on qualities such as "competence", "encouraging independent thinking", "willing to assist when difficulties arose", "interesting", "willing to listen to students understanding of ideas and concepts", "stimulating work beyond actual course requirements", and "enthusiastic about their proctoring" (Hoberock, Koen, Roth and Wagner, 1972; Born & Herbert, 1971). Proctors also enjoy their duties as well. Hoberock, et al. (1972) note that whereas most of their graders in traditional courses in the past have found their work "tedious", more than half of the proctors in the four PSI engineering courses which they taught volunteered to serve without pay. In addition, several articles have been written by proctors who have been enthusiastic about PSI (e.g., Ensign, Edwards, and Powers, 1971; PSI Newsletter #8, 1973).

#### Benefits to Proctors:

Additional benefits to those who become proctors have been noted, particularly increased likelihood in (a) becoming a major in the discipline, (b) career-oriented goals in the discipline, (c) entering graduate programs in the discipline, and (d) significantly improving graduate record examination scores after the proctoring experience (Sheppard and MacDermot, 1970; Hoberock, et al., 1972; Nelson, 1970; Edwards, 1972). For example, Sheppard and MacDermot report

that of 12 proctors in their course, nine were seniors, eight of whom were accepted into graduate programs in the discipline. These statistics become especially meaningful when it is realized that prior to the proctoring experience, only three of the eight were even majors in the discipline, and only two of the three who were majors had planned before this experience to enter a graduate program. Nelson (1970) reports that students proctoring in the introductory psychology course at Kalamazoo College showed a mean increase of 150 points on the advanced psychology graduate record examination after the proctoring experience, while seniors not assisting in the course had average gains of only 27 points during the same period. Admittedly, these reports do not represent controlled experimentation, yet they cannot be ignored.

#### Internal Proctors:

Although several authors have noted the problems associated with organizing and coordinating advanced undergraduates as proctors (external proctors) e.g., (Gallup, 1971; Sherman, 1971a, 1971b; Edwards, 1972), few report on the use of students concurrently enrolled in the course as proctors (internal proctors). There seem to be three procedures that are undertaken with respect to this potential population of proctors. First, there is fairly widespread use of the student concurrently enrolled in the course as interviewer of his classmates. The oral interview technique (Ferster,

1968) employs the use of several oral interviews of approximately 10 minutes in duration preceeding each "unit" or chapter quiz. The student is usually required to give one interview for everyone he takes, making the position involuntary. Both student and faculty reactions are very favorable. Students have evaluated the interview technique as more effective in aiding mastery of material than lecture-examination methods, providing more effective interactions with other students in increasing learning, making them more actively involved in the course, and significantly improving study habits (Sheppard and MacDermot, 1970).

Three reports (Alba and Pennypacker, 1972; Edwards, 1972; Ensign, Edwards and Power, 1972) briefly describe a system of selecting proctors in which the student concurrently enrolled in the course voluntarily commits himself to the role for the entire semester. Edwards (1972) and Ensign, Edwards and Power (1972) report successful use of the procedure, but further assessment, especially at the logistical level, is warranted, since there could be problems in expecting a student to move through the units faster than the fastest students in the course. The procedure described above is a modified version of Sherman's (1971a, 1971b) rotating internal proctor system.

In Sherman's system, the first students of a given number who successfully pass the first unit may volunteer their services as proctors for that day. The students who

missed out on proctoring a given unit may become proctors by being among the first students of the given number to successfully pass the next unit, and so on. Thus, in this system virtually everyone has a chance to proctor by gaining the lead in progress through the units in the course. Slower students even get their chance, when the first wave of students complete the course.

Several advantages to this system have been noted. First, proctors are freshly acquainted with the material since they recently mastered the unit themselves. The problem of assuring that external proctors have adequately reviewed the material they are to proctor is eliminated. Second, procrastination problems appear to be reduced (Sherman, 1971), although no data are available to demonstrate this. Third, the problem of recompensation for external proctors is eliminated. Internal proctors have been successfully used on a voluntary basis, or given small amounts of points toward final examination scores. Fourth, proctor absenteeism is no longer a problem, since the students who are present and willing on any given day serve as the proctors. Fifth, the problem of proctor mini-lecturing and answer fabricating more typical of graduate students and, to a lesser extent, advanced undergraduates is more sharply reduced with internal proctors. Students who serve as internal proctors are more willing to say that they do not know an answer to a question, and will send their fellow classmates

to the assistant or instructor, thus giving those in charge more contact with the individual student and more control over answering special problems students may have (Edwards, 1972; Sherman, 1971a, 1971b). Finally, internal proctors are reported to obtain very high final examination scores, higher than those who do not proctor (Sherman, 1971a, 1971b). This is to be expected, since proctors are exposed to more questions based upon the course material, engage in repeated verbal exchange with the material, and are exposed to nearly every conceivable error, through diverse student contact. The instructor, however, must maintain more direct contact and close involvement with internal proctors due to their relative lack of sophistication in handling student difficulties with respect to the material.

One report on the use of internal proctors shows that their evaluations of their proctoring opportunities are consistently positive. They show significant shifts toward becoming a major in the discipline, report greater interest in the course, compared to their other courses, report a high likelihood of returning in a later semester to be an external proctor, and state that they will probably use these same procedures to teach their classes, if they become teachers. Apparently the student as teacher learns more and enjoys it more than the student as student alone. (Edwards, 1972).

Little experimental evidence pertaining to any of a variety of proctor use has been found. In one investigation, Hursh, Sheldon, Minkin, Sherman and Wolf (1973) compared two proctoring procedures. Either the proctor was allowed to discuss scored quiz results with students, enabling them to change their answers after verbal explanations, or proctors were not allowed to engage in such discussions. Using an intra-group replication design, they found no difference in first quiz attempt scores per unit between conditions, (after changes were made by the students when under discussion conditions), but found that significantly fewer retakes of quizzes were required by the students when in the discussion condition. Specifically, students had to retake 18% of their quizzes when no discussion was allowed, but only three percent when discussion was allowed to occur. Students accelerated their progress rates when under the discussion condition, but the general quality of initial quiz responses (before changes) was significantly poorer when they were allowed to verbally support their written responses, than when they were not allowed to engage in such verbal justifications. Specifically, if students when under "discussion" conditions had not had their initially incorrect responses changed to "correct" after discussion, they would have had to retake 35% of their quizzes. Thus, students were initially better prepared to provide correct answers to quiz questions when they were not given a chance to discuss them.

### Comparisons of Proctoring Conditions:

One study investigated the use of external vs. internal performance session managers in the Johnston and Pennypacker (1971) variant of behavioral instruction. In an effort to test whether demonstrated mastery of all of the course material is a vital prerequisite to successful proctoring, Gaynor and Wolking (1974) compared two systems of proctoring. One group was proctored by advanced (external) proctors, while the other group used a variant of Ferster's interview method wherein each student alternated as a listener and speaker. The latter group's performance was superior to the externally proctored group as measured by first trial performances in the performance sessions and by four instructor-administrated review tests. The authors also (statistically) ruled out the effects of "practice" received by students who listened to the performance of others before their own performance. The authors hypothesized that the superior performance of the students under the internal method was due to proctoring activities.

### The Proctor Component Summarized:

In summary, with respect to the proctor component much controlled research needs to be done. Most authors report student and teacher evaluations of the proctors and the proctoring component. It is generally agreed that proctors are of significant functional importance to the method. Two papers which report controlled experiments have verified

this (Calhoun, 1973; Farmer et al., 1972). Student and teacher evaluations are overwhelmingly favorable to the use of proctors in PSI. Although many important questions remain to be answered about the behaviors occurring in the proctoring sessions themselves (e.g., Quigley, 1973), among the more pressing, and fundamental questions are those related to the selection and effectiveness of proctors in general.

#### Purpose of Study:

Only one study was found that examined the effects of type of proctor upon academic performance (Gaynor and Wolking, 1974) but this was with respect to internal vs. external interviewing techniques and included performance evaluations by students who had not yet demonstrated mastery of the unit of material. Further, no research has been reported that examines differences between student performance under proctors who have specific students assigned to them and those who are available at random to any student in the course. Surely if no difference could be found, an internal non-assigned proctoring system would be logistically easier to use (Gallup, 1971) and would enable more professors to adopt behavioral instruction procedures in their classrooms (Sherman, 1971; Gaynor and Wolking, 1974). The present study was designed to assess the relative effectiveness of each of the different proctoring systems currently in use in Personalized Instruction courses. "Effectiveness" was

evaluated in terms of student examination performance and preference. The three types of proctors that were considered were (a) student currently enrolled in the course (internal proctor) (b) advanced undergraduate student who had previously demonstrated mastery of the course content in a previous semester and who had specific students assigned to him throughout the semester (constant external proctor), and (c) advanced undergraduate student who had previously demonstrated mastery of the course content in a previous semester and who could proctor any student who approached him throughout the semester (variable external proctor). The present study was also designed to replicate Farmer, Lachter, Blau-stein and Cole's (1972) findings that the proctor component in behavioral instruction significantly increases student examination performance and decreases the number of unit quiz retakes necessary to progress through the course units.

## Methods

### Subjects and Course Personnel:

Eighty-two students enrolled in an Introductory Educational Psychology course served as subjects. Groups were assigned at the very beginning of the semester. Therefore, many students were assigned to groups who did not actually start the course. Since only students who completed unit one are considered to have been active participants in the course, the numbers of students in each group turned out to be unequal. Although the class was larger, the data included in each of the following analyses were obtained from students who completed the entire course. Partial data obtained from students who withdrew from the course or who failed to take one of the Achievement tests, quizzes, or final exam for various personal reasons have been excluded from the following analyses (e.g., Born, Gledhill and Davis, 1972). Subject data is presented in Table 1.

Course personnel consisted of the instructor, 2 graduate teaching assistants, and 14 advanced undergraduates or external proctors chosen from a previous semester. Twenty-seven currently enrolled students voluntarily served as internal proctors from time to time as well.

### Materials:

The course assignments consisted of various chapters in The Psychology of Learning and Instruction: Educational Psychology, by John DeCecco, plus Classroom Behavior, by

TABLE 1

Number of students who were included and excluded from the data analysis is presented in this study.

	Groups						
	<u>I</u>	<u>II</u>	<u>III</u>	<u>IV</u>	<u>V</u>	<u>VI</u>	<u>Total</u>
Experimental Subjects	11	14	21	12	12	12	82
Mean ability score	21.8	20.07	21.7	20.8	19.08	20.75	--
Students with partial or no data:							
Pass/Fail option	0	2	5	4	5	4	20
Personal or other reasons	1	1	2	2	3	0	9
Withdrawals	11	6	3	5	5	7	37
Totals	23	23	31	23	25	23	148

Don Bushell, and Learning is Getting Easier, by S.R. Wilson and D. Tosti. The course material was divided into four major segments, each segment consisting of four units. A unit consisted of a 40-50 page reading assignment, with accompanying study guide, containing a brief introduction to the reading material, and 40-60 short-answer or fill-in study questions designed to emphasize major points in the readings and to help students integrate major concepts and ideas. In addition, three parallel forms of a ten item quiz designed to take approximately 15 minutes to complete and containing questions of a multiple-choice, fill-in and short-answer variety, accompanied each unit. Four Achievement Tests were administered. Each Achievement Test included three items based upon material in each unit, or 12 items from each four-unit segment of the course. Achievement Test items were based upon the same course material, of course, but were not identical from Achievement Test to Achievement Test. Finally, no items from the unit quizzes appeared on any Achievement Test.

Thus the implementation of the Achievement Test procedure differed from Semb (1974) and Miller and Weaver (1972) in that the items were different from one Achievement Test to another and no student had previously encountered any item on each Achievement Test. It was reasoned that if Achievement Tests were identical, a student could simply remember Achievement Test items from administration to

administration and make sure that he knew the answer to those specific questions prior to taking the test. Perhaps the term Generalization Achievement Test would be a more accurate description of testing material used in the present study.

In addition, students were given the ETS Wide Range Vocabulary Test (French, Ekstrom, and Price, 1963) from the kit of Reference Tests for Cognitive Factors, plus a pre-test (identical to Achievement Test IV) on the first day of the course. A Proctor Evaluation form which requested the students to rate their proctor(s) on many dimensions such as clarity, patience, knowledge, and helpfulness was also administered with the last unit before each Achievement Test. Other materials necessary in a PSI course included proctor answer sheets, proctor folders, and proctor instructions. Instructions describing the experimental procedures were also distributed on the first day of the course.

#### Setting:

The course operated in a large auditorium from 11 A.M. to 1 P.M. every Monday, Tuesday and Thursday for 14 weeks during the 1974 Spring Semester. The room was divided into sections for quiz-taking, studying, and proctoring.

#### General Procedures:

The procedures used in the course, described in detail elsewhere (e.g., Keller, 1966; 1968) will be briefly

described below.

#### PreMeasures and Quizzes:

On the first course day each student was given the pretest (Achievement Test IV) and the standardized test of verbal ability (French, et al., 1963). After completing a "readiness" quiz covering the course procedures and papers which introduce Personalized Instruction (Keller, 1968; Sherman, 1971), each student progressed at his own pace through the course, attaining mastery scores on 16 quizzes based upon the unit assignments. The mastery criterion was defined as achievement of 100% correct responses on the unit quizzes. Students were able to take each unit quiz as many times as necessary to meet the mastery criterion. Three parallel forms of each unit quiz were available to ensure an adequate supply of quizzes when retakes were necessary.

#### Achievement Tests:

After each four-unit segment of the course had been successfully completed the student was required to take an Achievement Test before proceeding to the next four-unit segment of the course. Students were told that failure to complete each Achievement Test at the appropriate time would result in invalidation of all unit quizzes taken after the Achievement Test was supposed to have been taken. All Achievement Tests were scored outside of class and no specific feedback was given to students about their performance on them. However, to assure that the student put some effort

into completing the Achievement Tests, he was told that unless he met the minimum performance standard required for each particular Achievement Test, he would have to retake it. Students were also told that "good" scores would result in two bonus points that would be added to their final examination score. However, each student received verification of earning the additional bonus points after he took an Achievement Test, as long as he made some response to each question (e.g., "Don't know" was legitimate). Thus, there was no actual "minimum standard" or "good score" criterion other than completion.

#### Final Examination:

When a student completed all 16 units and 4 Achievement Tests, in proper succession, he then took the comprehensive final examination. Though the minimum score on the final examination required for the student to earn an "A" in the course was 90%, the points awarded to each student upon completion of all Achievement Tests reduced the final exam requirement for an "A" grade to 82%.

#### Proctoring:

With the exception of the students in the no-proctor condition (described below), when a student completed a unit quiz, he took it to a proctor who scored it immediately. The proctor "graded" each item as either "correct", "unclear", or "incorrect", on the basis of how closely it matched the

answer provided on the proctor answer sheet. For all questions marked "unclear", the student could attempt to justify or explain. If the student's oral explanation satisfied the proctor, the student was requested to restate in writing his revised answer. On the basis of the new written response, the answer originally scored as "unclear" was rescored as "correct", with the revised answer attached to the quiz. In all cases the student had to submit any answer to be scored in writing. This was done (a) to counteract the tendency for students to be careless in their original formulation of an answer to a question, and rely upon the emission of otherwise vague verbal responses which the proctor could subjectively score as "correct" (e.g., Hursh et al., 1973) and (b) to enable accurate reliability checks to be made on the quizzes. If the student attained mastery on the unit quiz he was congratulated and allowed to study for the next unit. If he failed to achieve the criterion he was told which portions of the unit reading assignment and study questions needed review before attempting a retake on a parallel form of the unit quiz, and he could ask any and all questions about the unit in question.

#### Other Student Requirements and Activities:

The student was also asked to assess the amount of time he or she spent studying a given unit, and write this number, in hours, at the top of each quiz taken. In addition, the student was required to complete a number of special projects,

a discussion of which, however, is irrelevant to this experiment (but see course procedures, attached as an appendix). Lectures and group discussions occurred infrequently and were optional. They were designed strictly as reinforcing activities for completing a given number of units, and contained no material to be covered on either the unit quizzes, Achievement Tests, or final examination. The total course grade was determined by the number of units completed, projects submitted, and score on the final examination.

#### Experimental Design:

Each student was randomly assigned to one of six groups.

1. No Proctor Condition (NP). A student assigned to Group I, the No Proctor Condition (NP), turned in his quiz to the experimenter or one of the assistants and was informed by the end of the class period whether or not he passed or failed the unit quiz. The correct answers were then written on his answer sheet and returned during the next class period. This procedure is identical to the no proctor condition reported by Farmer, et al. (1972). Two advanced undergraduate proctors performed all quiz scoring functions for this group.

2. Constant External Proctor Condition (CEP). The students assigned to Group II, the Constant External Proctor Condition (CEP), were assigned to one of the advanced undergraduates selected from the previous semester who proctored his assigned students for the entire semester. In rare instances

of proctor absence, the student went to any available proctor.

3. Variable External Proctor Condition (VEP). The students assigned to Group III, the Variable External Proctor Condition (VEP), had their quizzes proctored by any one of the advanced undergraduates selected from the previous semester. They could have up to a maximum of four unit quizzes graded by any one of these proctors. This restriction was introduced to assure that all students in this condition in fact could be legitimately classified as belonging in a variable external proctor condition. The reason for not requiring that each student be proctored by each of the advanced undergraduate proctors participating in the course was to more closely simulate experiences that classrooms using variable external proctors generate. The maximum of four times, which was selected arbitrarily, is based upon the experimenter's casual observations in previous classes that he taught using variable proctors.

4. Internal Proctor Condition (IP). The students assigned to Group IV, the Internal Proctor Condition (IP), had their quizzes proctored by other students in this treatment group who were selected in the manner described by Sherman (1971a, 1971b). This task was strictly voluntary. The criterion for the number of units to be passed before a student was eligible to become an internal proctor was determined by the relative progress rates of other students in the group

on a given day. Internal proctors received one bonus point for their services, which were either added onto their final examination score, or, in units of ten, could replace one of the three required projects or activities. This allocation was determined by the student as he earned the points. The student had to proctor for at least one hour in order to receive the bonus point.

5. Rotating Proctor Conditions. The students assigned to Groups V and VI, the Rotating Proctor Conditions (RP), followed somewhat different procedures. The students in Group V were exposed to the internal proctor treatment (IP) for the first four-unit segment of the course. After taking the Achievement Test for segment one, they were rotated into the variable external proctor condition (VEP) for the second four-unit segment of the course (units five - eight). After the second Achievement Test they repeated this two-cycle process for segments three and four (i.e., units nine through 12 and 13 through 16). The students assigned to Group VI followed the same rotating procedure but in different order (i.e., VEP, IP, VEP, IP). Thus the order between groups was counterbalanced to control for possible differential difficulty between unit segments and quizzes. The above procedure made each manipulation part of a within-subject and within-group reversal design, or an intra-subject and intra-group replication (Sidman, 1960). Data on participation in the internal proctoring procedures for groups IV-VI is

presented in Table 2.

Dependent Measures:

Dependent measures for all groups were of five varieties.

Examination Performance. The effects of each condition were evaluated by comparing scores from the four Achievement Tests and the final examination. Specifically, the Achievement Test Scores were evaluated in 4 ways. First, the scores from the five administrations for each segment of the course were evaluated for each group as part of a multiple baseline design. This allowed measurement of performance on material that had recently been completed as well as on material that had previously been completed (retention), and on material that had not been completed (pre-training or baseline measures)<sup>3</sup> (Semb et al., 1973). The effects of different types of proctoring on several different measures of learning could then be compared between groups and within groups. Second, a change score comparison (percentage gain) was made by comparing the scores on the identical pretest and Achievement Test IV. This was calculated by subtracting the student's pretest performance on items from each major course segment from his corresponding achievement test IV performance. Mean percentage gains were calculated by summing individual student gains and dividing by the number of Ss within each group. The resulting "change score" provided

TABLE 2

Number of times each student volunteered to proctor when in the internal proctoring condition for Groups IV (IP), V (IEIE), and VI (EIEI).

Number of times each student volunteered to proctor:

0	1	2	3	4	5	6	7	8	9	10	11	12
9	11	5	3	2	0	0	1	0	0	3	0	2

...differential performance measure that minimized any discrepancy arising from sampling procedures and provided direct evidence of the actual increase in performance attained by students within a course. Consequently, evaluation and comparison of teaching methods, corrected for individual differences was possible. (Alba and Pennypacker, 1972).

Third, percentage gains for each student in Groups V and VI were calculated. As before, mean percentage gains were derived for each group for each course segment by subtracting each student's pretest performance from Achievement Test performance, summing the gains and dividing by the number within each group. In this case, however, the operation was carried out for Achievement Test performance on the segment that had just previously been trained. This was done to make possible a comparison of the effects of different proctor conditions both within and between groups.

Fourth, a comparison of increases between groups I through IV and Groups V and VI on successive Achievement Test scores was made.

As a final measure of examination performance, comparisons between groups were made with respect to final examination scores.

Attitude Measure. Each student was administered a proctor evaluation form with the last unit before each Achievement Test, upon which he was to rate the general quality of his proctored experiences, and his preferences between the various proctor systems being used in the course. This

repeated measure was used to control for the possible influence of high final grade achievement upon proctor evaluation. It was also used to compare the possible differing reports of the students in the reversal groups as well as among different ability levels in each condition. Finally, repeated attitude reports were implemented to account for differences in evaluation based upon time in semester and relative student progress rate in the course.

Retakes. Mean number of quiz attempts for all units combined were also calculated for each group. In addition, the mean number of attempts needed to attain mastery of each course segment was calculated for each group. Correlations between number of retakes and ability levels within each group were also computed.

Withdrawals. Number of student withdrawals for each group and for each ability level were compared for 2 reasons: First, to determine the appropriateness of an analysis of variance in addition to a graphical and descriptive presentation of the data, and second, to determine differential effects, if any, of proctor conditions upon withdrawal and ability level.

Reliability. Proctor and grader reliability was calculated by randomly rescoring 25% of all unit quizzes and 25% of all Achievement Tests for each student. Any discrepancy in grading or scoring an item as "correct" or "incorrect" was defined as a disagreement. The number of agreements

divided by the number of agreements plus disagreements was used as the reliability indices for unit quizzes, Achievement Tests, and final examination. All proctors, both internal and external, were notified that reliability would be assessed.

#### Rationale for Experimental Design:

A summary of the experimental procedures for each group is presented in Figure 1. The data from Groups I through IV were evaluated in the usual between-groups manner. However, the data from Groups V and VI were evaluated separately from the other groups. These groups were included in the present investigation for several reasons. First, several studies (Miller, Weaver, and Semb, 1974; Semb, Hopkins and Hursh, 1973; Semb, 1974; Semb, 1973; and Semb, Conyers<sup>2</sup>, Spencer and Sanchez-Sosa, 1973) have reported the successful application of the intra-group replication design (Sidman, 1960) in evaluating several aspects of Personalized Instruction, without including concurrent between-group or inter-group designs in their analyses. It may be that the short-term effects shown in data collected from intra-group replications lose their effects during the course of an entire semester, or lead to results which in some way differ from results obtained from data collected during the course of an entire semester. Thus, by including concurrent designs a further assessment could be made of the feasibility of employing intra-subject and intra-group replication designs in

## FACE PAGE FOR FIGURE 1

Figure 1. Flow-chart description of experimental procedures for each group. Standard borders indicate that proctors did not give immediate feedback for these performance measures. Heavy borders indicate that internal proctors gave immediate feedback for these measures. Dashed borders indicate that performance was evaluated by an external proctor.



evaluating different treatments used in Personalized Instruction. More importantly, the reversal design made it possible to answer questions concerning the possibility of differing individual needs and preferences between type of proctors used in PSI. Only those who are exposed to different procedures are in a position to validly judge preferences and make responsible choice behavior (Lockhart, Sexton, Lea, 1973; Findley, 1958). It should be noted that the authors had many such individual replications upon which to evaluate individual differences and preferences. Also, given what is known about the withdrawal rate in Personalized Instruction courses (Born, 1971; Born, Gledhill, and Davis, 1972; Born and Zlutnick, 1972) it was felt that the intra-subject replication procedures would determine whether type of proctor is functionally related to withdrawal from the course, particularly of low ability students.

Three points about the Achievement Tests should be made. First, as Miller and Weaver (1972) point out, although Personalized Instruction and other behavioral technology methods are enjoying increasing usage in the college classroom, there exist surprisingly few experimental analyses of effects of such systems. At present writing the literature contains mostly statistical comparisons of final examination scores of students enrolled in traditional sections and behaviorally based sections of college courses. Since most behavioral approaches to college teaching stress tactics of

continuous and direct recording of student behavior, it is puzzling that such an infrequent measure of evaluation as the final examination has been so heavily relied upon. To quote Alba and Pennypacker (1972),

Indeed, infrequent measurement is viewed by many investigators as being the major weakness of traditional teaching procedures; this is immediately rectified when one attempts to apply the principles of behavior analysis to the task of creating an effective educational technology.

Second, the introduction of the multiple baseline testing procedure via the Achievement Tests permits closer inspection and comparison of academic performance in each group, both in the intra-group and intergroup designs.

Third, the construction of the Achievement Tests used in this study is a modification of that originally described elsewhere (e.g., Miller and Weaver, 1972; Semb, 1973). The Achievement Tests differed in content from administration to administration. Although the items in the present study were similar across Achievement Tests, it was reasoned that if they contained identical items, a student could simply recall items from a previous administration, which would cue learning to specific answers in later units, and could lead to the study of specific answers prior to taking a later Achievement Test. It was felt that repeated questions would promote rote learning which the student would not necessarily be able to generalize to other questions and situations.

Repetition of identical Achievement Test items or quiz

or study guide items might tend to produce a ceiling effect, as students would learn to respond correctly to only those items. For this reason, none of the items contained on our Achievement Tests appeared on any quiz or study guide used in the course.

## Results

### Multiple Baseline Generalization Achievement Tests:

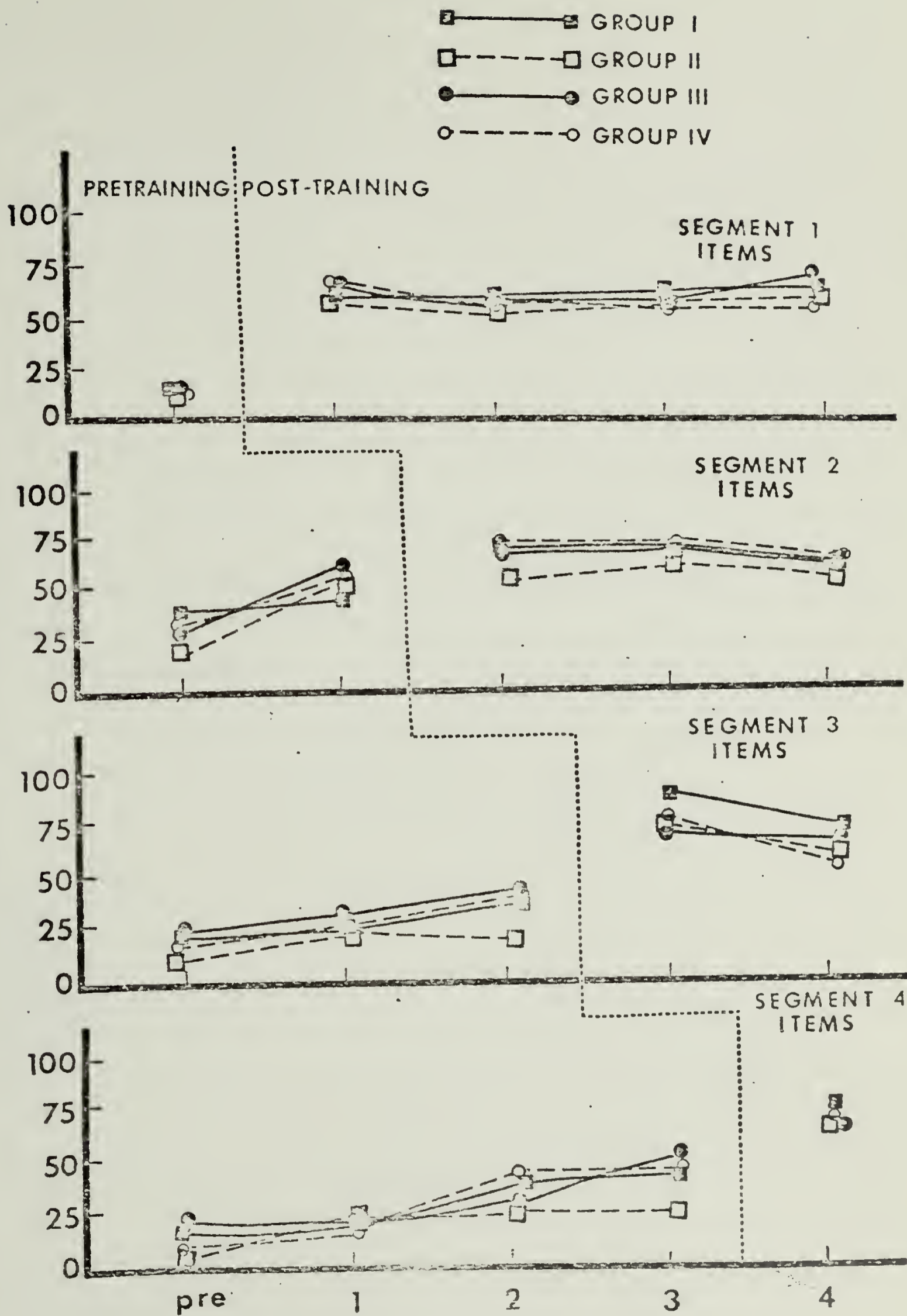
The Generalization Achievement Tests were evaluated for each group as part of a multiple baseline design for each major segment of the course, allowing for measurement of performance on material that had recently been completed as well as on material that had previously been completed (retention) and on material that had not been completed (pre-training or baseline measures). The results are presented in Figures 2 (Groups I-IV) and 3 (Groups V and VI). Mean percentage correct is plotted for the pretest (Achievement Test IV) and each of the 4 Achievement Tests for each group. The 4 course segments are plotted on separate ordinates and the pretest plus each of the 4 Achievement Tests are shown on the abscissa. Percentage correct was calculated by summing the total points earned by each student in each segment and dividing by the number of points possible for each segment. The mean for each group was then calculated.

Percentage correct on the pretest was low for each segment but gradually increased during successive testing of material before training for each group. For example, responses to the segment 3 items averaged 20% correct on the pretest for Group III, but rose to 26% correct on Achievement Test I, and 34% correct on Achievement Test II. Entering behavior for segment 2 items was higher than that for the

## FACE PAGE FOR FIGURE 2

Figure 2. Mean percent correct on items on the pretest and each of the 4 Achievement Tests. The 4 course segments are plotted on separate ordinates and the pretest and each of the 4 Achievement Tests are shown on the abscissa.

PERCENT CORRECT

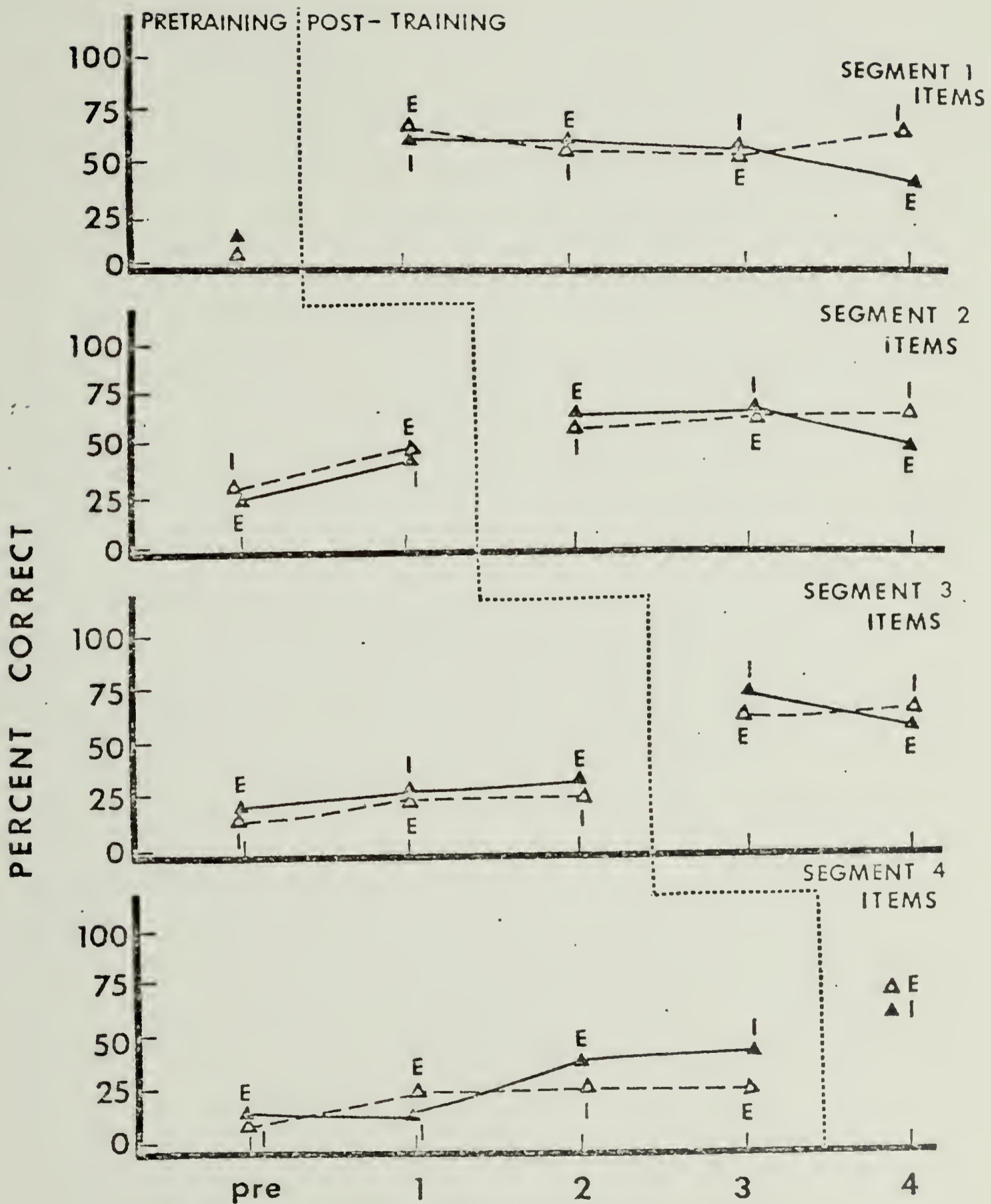


GENERALIZATION ACHIEVEMENT TESTS

FACE PAGE FOR FIGURE 3.

Figure 3. Mean percent correct on items on the pretest and each of the 4 Achievement Tests for Groups V and VI. The 4 course segments are plotted on separate ordinates and the pretest and each of the 4 Achievement Tests are shown on the abscissa.

—▲— GROUP V: IEIE  
 -△- GROUP VI: EIEI



other segments for each group. This will be reflected in all subsequent analyses of data discussed in terms of performance on course segments.

Substantial increases in percent correct for each segment occurred as a function of the introduction of the corresponding unit assignments included in the segment, for each group. For example, as previously mentioned, percent correct during pretraining levels for segment 3 items was low for group III on the Achievement Tests which followed exposure to segments 1 and 2 unit assignments, but rose to 72% correct on the Achievement Test which followed exposure to segment 3 unit assignments. At the same time percent correct remained low (33%) on segment 4 items which had not yet been trained. Similar results were obtained for each group.

Performance on items which had previously been trained remained fairly stable on successive Achievement Tests for all groups. Thus, retention did not decrease substantially. For example, percent correct on segment 3 items for Group III was 72% on the Achievement Test which immediately followed exposure to the unit assignments in segment 3, but decreased slightly to 66% on the Achievement Test which followed segment 4. Similar results were obtained for each group.

The results of the multiple baseline Generalization Achievement Test procedure indicate that each segment in the training package produced substantial increases in percent correct over pretraining levels. Those increases remained

fairly constant over time demonstrating substantial retention of the course material by all groups. Further, the increases obtained over baseline measures were similar for each student regardless of proctor condition.

The Generalization Achievement Tests were also corrected for individual differences in entering behavior by computing the mean percentage gains from pretest to identical Achievement IV (post) test levels. Figure 4 illustrates this change-score comparison for Groups I-IV. The course segments are plotted on the abscissa and percentage gain over pretest levels is plotted on the ordinate. Table 3 shows the actual range of gains in terms of raw scores and percentages on each segment upon which Figure 3 is based. For example, Group I (NP) scored a mean of 1.9 out of a total possible 12 points for segment one items on the pretest. Mean performance on the segment one items on the identical Achievement IV (post) test was 9.3 out of a total possible of 12. Thus, the difference between 1.9 and 9.3 (7.4) represents a percentage gain of 61% from pre- to posttest levels. The data from both sources clearly show that the different proctor conditions had the same effects on test performance for each group, when entering behavior is taken into account, although the mean percentage gains differ among segments. Again, the clearly lower percentage gain on segment 2 items reflects a ceiling effect produced by the higher entering behavior levels with respect to those items.

FACE PAGE FOR FIGURE 4

Figure 4. Mean percentage gains from pretest to Achievement Test IV test levels for each of the four segments of the course for Groups I-IV.

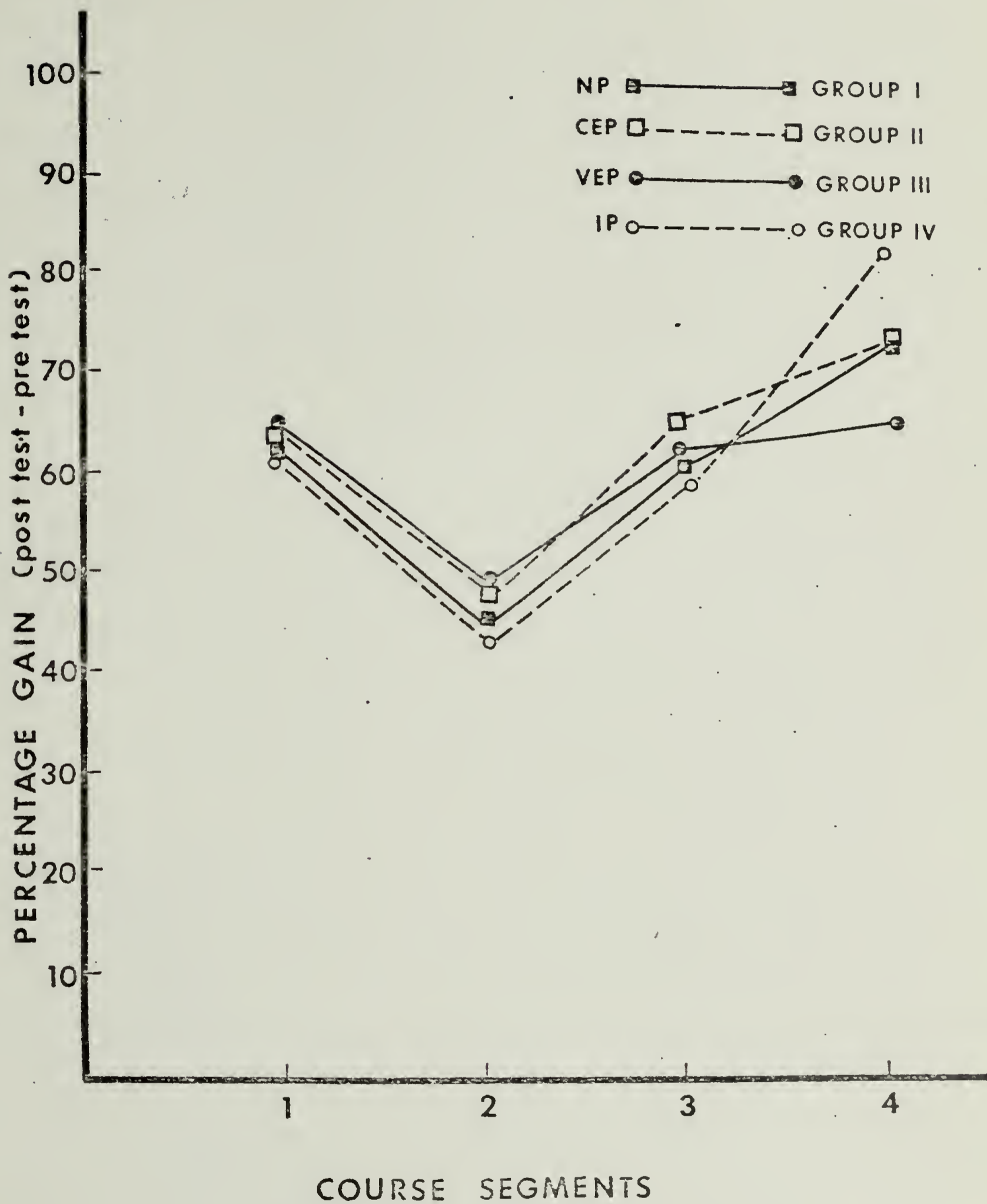


TABLE 3

Raw score data and percentage gains from pretest to identical Achievement IV (post) test levels for Groups I-IV. The numbers in the first 2 cells for each group represent raw scores out of a total possible of 12. The number in the third cell for each group refers to the percentage gain level from pretest to post (Achievement IV) test levels.

		GROUPS							
		I				II			
Course Segments		1	2	3	4	1	2	3	4
Pretest	1.9	3.6	2.3	1.5	1.4	2.6	1.4	0.6	
Posttest	9.3	9.0	9.6	10.2	9.1	8.3	9.3	9.3	
Percent gain	61%	45%	60%	73%	64%	48%	65%	73%	

		GROUPS							
		III				IV			
Course Segments		1	2	3	4	1	2	3	4
Pretest	1.8	3.4	2.4	1.6	1.6	3.7	2.2	0.1	
Posttest	9.6	9.2	9.8	9.4	8.8	8.8	9.3	10.1	
Percent gain	65%	48%	61%	65%	60%	43%	59%	84%	

Figure 5 represents mean percentage gains from pretest to identical Achievement IV (post) test levels for Groups V and VI. Table 4 shows the actual range of gains in terms of raw scores and percentages on each segment for these 2 groups. Although the groups differed substantially on segment one items, this fact can be explained by referring to Table 4 which shows (a) much lower entering behavior level of Group V on segment one items and (b) generally superior percentage gains of Group VI on the items in each and every segment. Thus, the differences cannot be explained as a function of proctor conditions, but are due to some other unknown source.

The mean percentage gains for Groups V and VI from pretest performance to Achievement Test performance on the course segment that had just previously been trained are presented in Figure 6. As a result of segment one training, Group V, under the internal proctoring condition (IP) gained 40% on segment one items, while Group VI, under the external proctor condition (VEP) gained 49% on segment one items. As a consequence of segment 2 training, Group V, which was now rotated to external proctoring conditions (VEP) gained 34% on segment 2 items, while Group VI, which was rotated to internal proctoring conditions (IP), gained an average of 25% on segment 2 items. As a function of segment 3 training, Group V, which was rotated back to internal proctoring conditions (IP) gained 55% on segment 3 items, while Group VI,

## FACE PAGE FOR FIGURE 5

Figure 5. Mean percentage gains from Pretest to Achievement Test IV test levels as a function of proctor conditions (I = internal, E = variable external).

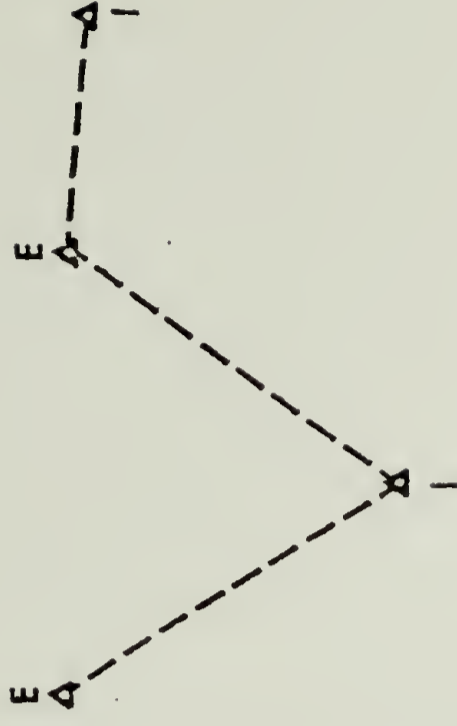
PERCENTAGE GAIN

100—  
75—  
50—  
25—



COURSE SEGMENTS  
GROUP V

100—  
75—  
50—  
25—



COURSE SEGMENTS  
GROUP VI

TABLE 4

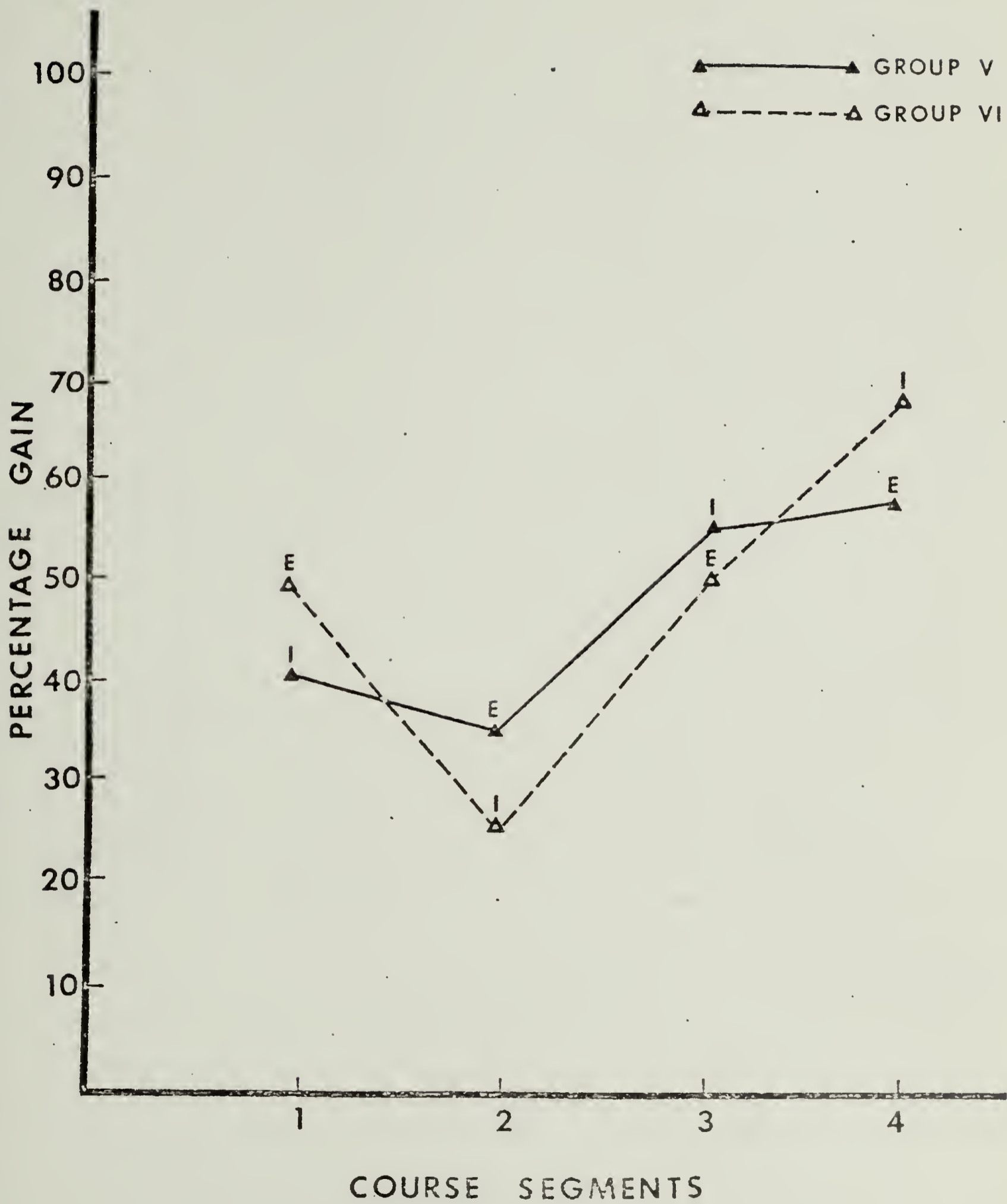
Raw score data and percentage gains from pretest to identical Achievement IV (post) test levels for Groups V and VI. The numbers in the first 2 cells for each group represent raw scores out of a possible total of 12. The number in the third cell for each group refers to the percentage gain level from pretest to post (Achievement IV) test levels. (I = internal proctor condition, E = variable external proctor condition).

## GROUPS

		V				VI			
Course Segments	1	2	3	4	1	2	3	4	
Proctor Condition	I	E	I	E	E	I	E	I	
Pretest	2.1	2.9	2.1	1.3	0.9	3.1	1.5	0.7	
Posttest	7.3	7.9	8.5	8.3	9.5	8.9	9.9	9.0	
Percent gain	43%	42%	53%	58%	72%	48%	79%	69%	

## FACE PAGE FOR FIGURE 6

Figure 6. Mean percentage gains over pretest levels for each of the 4 segments of the course for Groups V and VI, as a function of proctor condition.



which was rotated to external proctoring conditions (VEP) gained 50% on segment 3 items. Finally, as a consequence of segment 4 training, Group V, which had external proctoring conditions (VEP) reinstated, gained an average of 58% on segment 4 items, while Group VI, which had the internal proctoring conditions reinstated (IP) gained an average of 69% on segment 4 items. Table 5 shows the actual range of gains in terms of raw scores and percentages for each segment upon which Figure 6 is based. Again, the data clearly show that the different proctor conditions through which the groups rotated had very similar effects on test performance for each group, when entering behavior is taken into account, although the mean percentage gains differed among segments. Again, the clearly lower percentage gain on segment 2 items reflects a ceiling effect produced by the higher entering behavior levels with respect to those items.

Figure 7 represents the mean percentage gains over pre-test levels for each segment of the course in multiple baseline fashion for Groups V and VI. In contrast to Figures 2 and 3, entering behavior is taken into account. Again, differences are shown only in terms of increases in performance as a function of presentation of unit assignments (training), and these increases are similar for both groups, regardless of the differing sequence of proctoring conditions through which the groups were rotated.

TABLE 5

Raw score data and percentage gains from pretest levels to Achievement test levels for Groups V (IEIE) and VI (EIEI). The first 2 numbers in a cell represent raw scores out of a possible total of 12. The 3rd number in each cell refers to the percentage gain level from pretest to the Achievement Test indicated in the cell. Cells in black refer to gains from pretest to the segment of an Achievement test which included items which had just previously been trained (recent training levels of performance).

GROUPS								
V					VI			
Course Segments	1	2	3	4	1	2	3	4
Pretest	2.1	2.9	2.1	1.3	0.9	3.1	1.5	0.7
Ach. Test I	6.9	5.8	2.5	1.6	6.8	5.7	2.1	2.2
Percent Gain	40%	24%	03%	04%	49%	22%	05%	12%
Pretest	2.1	2.9	2.1	1.3	0.9	3.1	1.5	0.7
Ach. Test II	6.6	7.0	3.1	3.7	5.9	6.1	2.4	2.4
Percent Gain	38%	34%	08%	20%	42%	25%	08%	14%
Pretest	2.1	2.9	2.1	1.3	0.9	3.1	1.5	0.7
Ach. Test III	6.3	7.3	8.7	4.5	6.1	7.5	7.5	2.7
Percent Gain	35%	36%	55%	26%	43%	37%	50%	16%
Pretest	2.1	2.9	2.1	1.3	0.9	3.1	1.5	0.7
Ach. Test IV	7.3	7.9	8.5	8.3	9.5	8.9	9.9	9.0
Percent Gain	43%	42%	53%	58%	72%	48%	70%	69%

## FACE PAGE FOR FIGURE 7

Figure 7. Mean percentage gains over pretest levels for each of the 4 course segments for groups V and VI. Achievement Tests are plotted on separate ordinates and course segments are plotted on the abscissa.

GROUP V  
GROUP VI

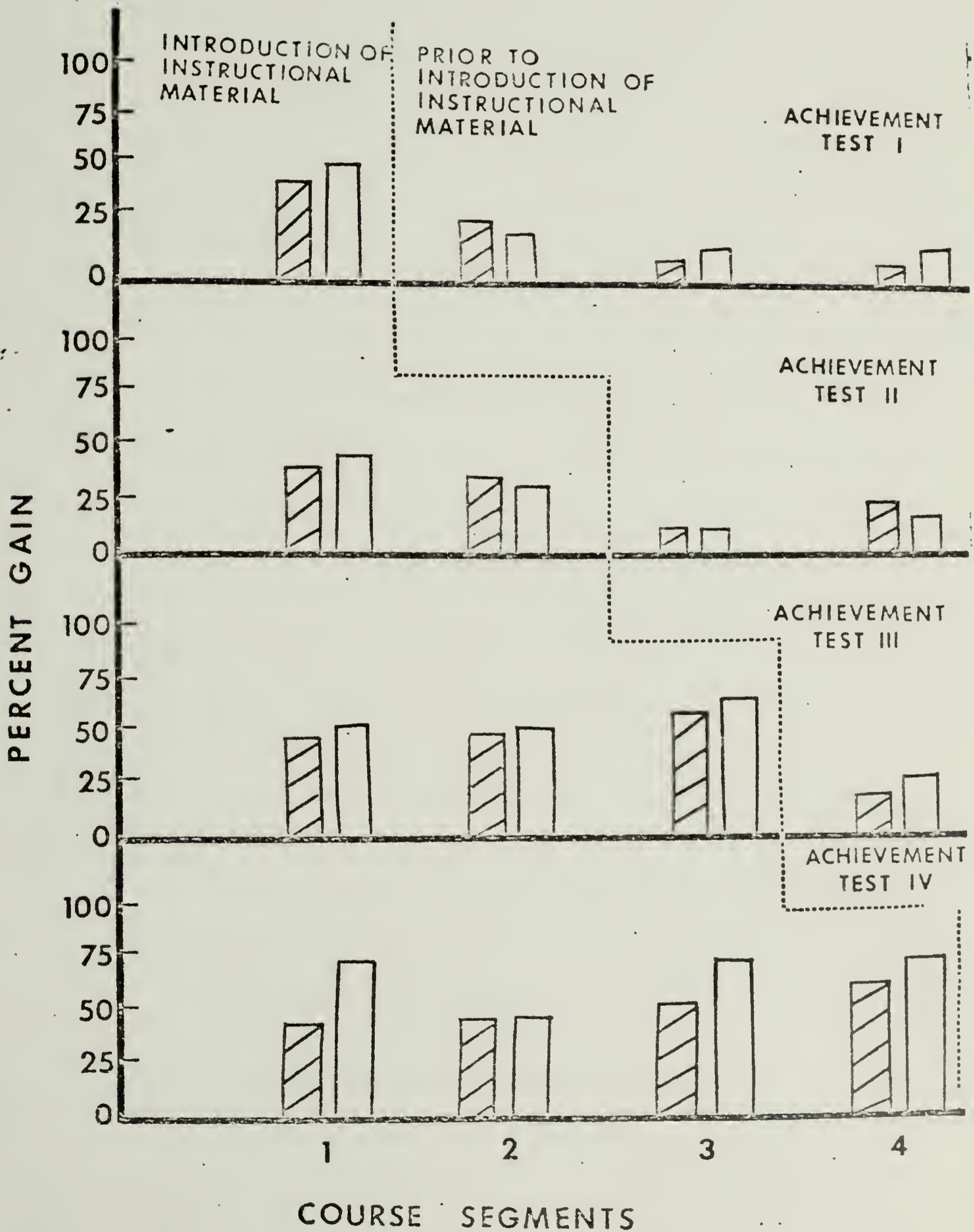


Figure 8 represents the mean percent correct on the pretest and each of the 4 Generalization Achievement Tests for each group. Regardless of proctor condition each group showed nearly identical increases in performance from Achievement Test to Achievement Test as a result of unit assignment training. For example, group I (NP) averaged 20.6 percent correct on the Achievement Test administered prior to behavioral instruction. The same (NP) averaged 40% correct on the Achievement Test (I) administered after the units in segment one had been mastered. Performance increased to 47% correct on the Achievement Test (II) administered after the units in segment 2 had been mastered. Performance further increased to 56% correct on the Achievement Test (III) administered after the units in segment 3 had been mastered. Finally, performance increased still further to 72% correct on the Achievement Test (IV) administered after the units in segment 4 had been mastered. Nearly identical results were obtained for Groups II-VI, regardless of proctor conditions.

#### Final Examination:

The results of the final exam are presented in Figure 9. These summative evaluations were high and nearly identical for each group, regardless of proctor conditions in effect during training.

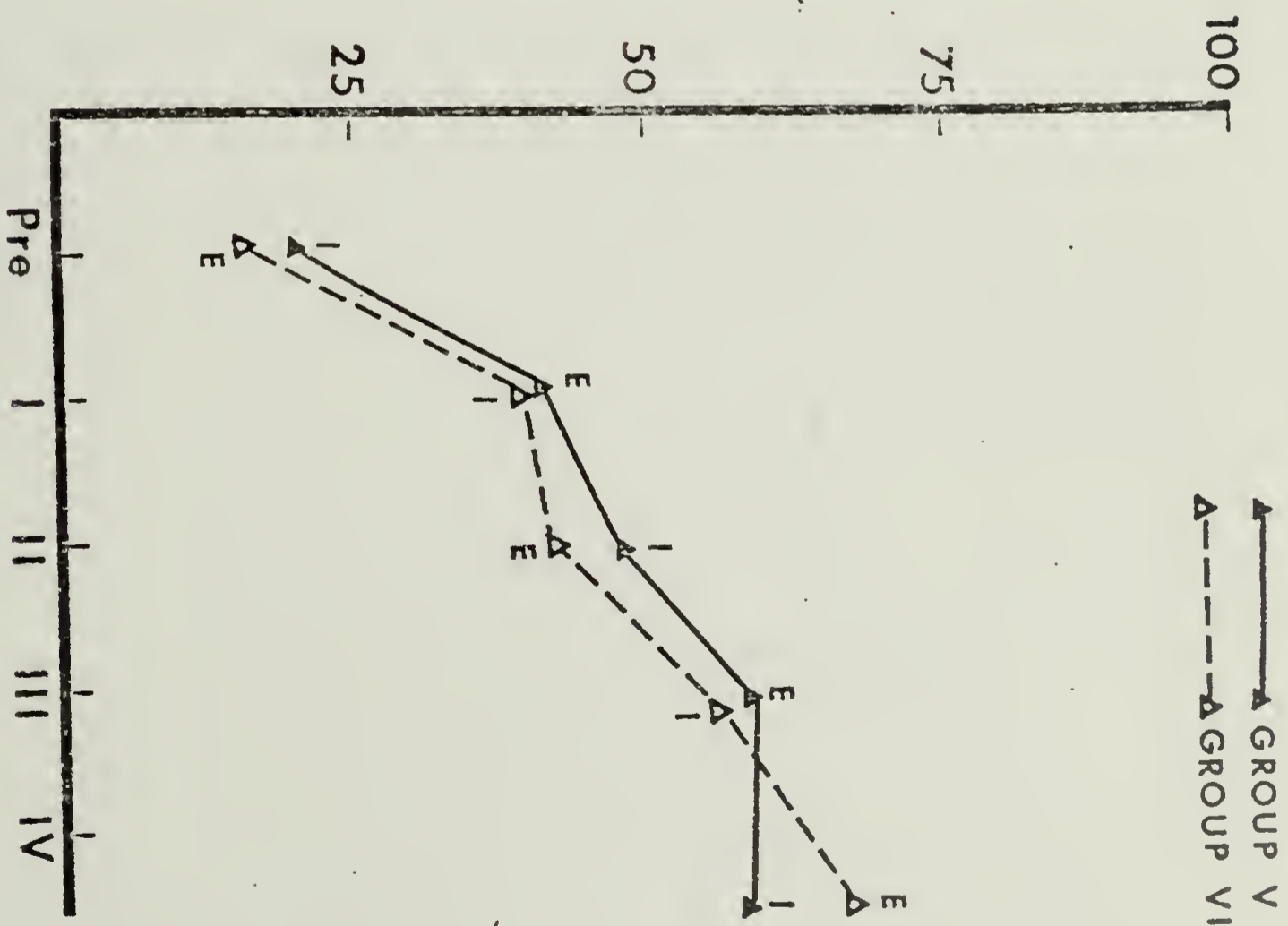
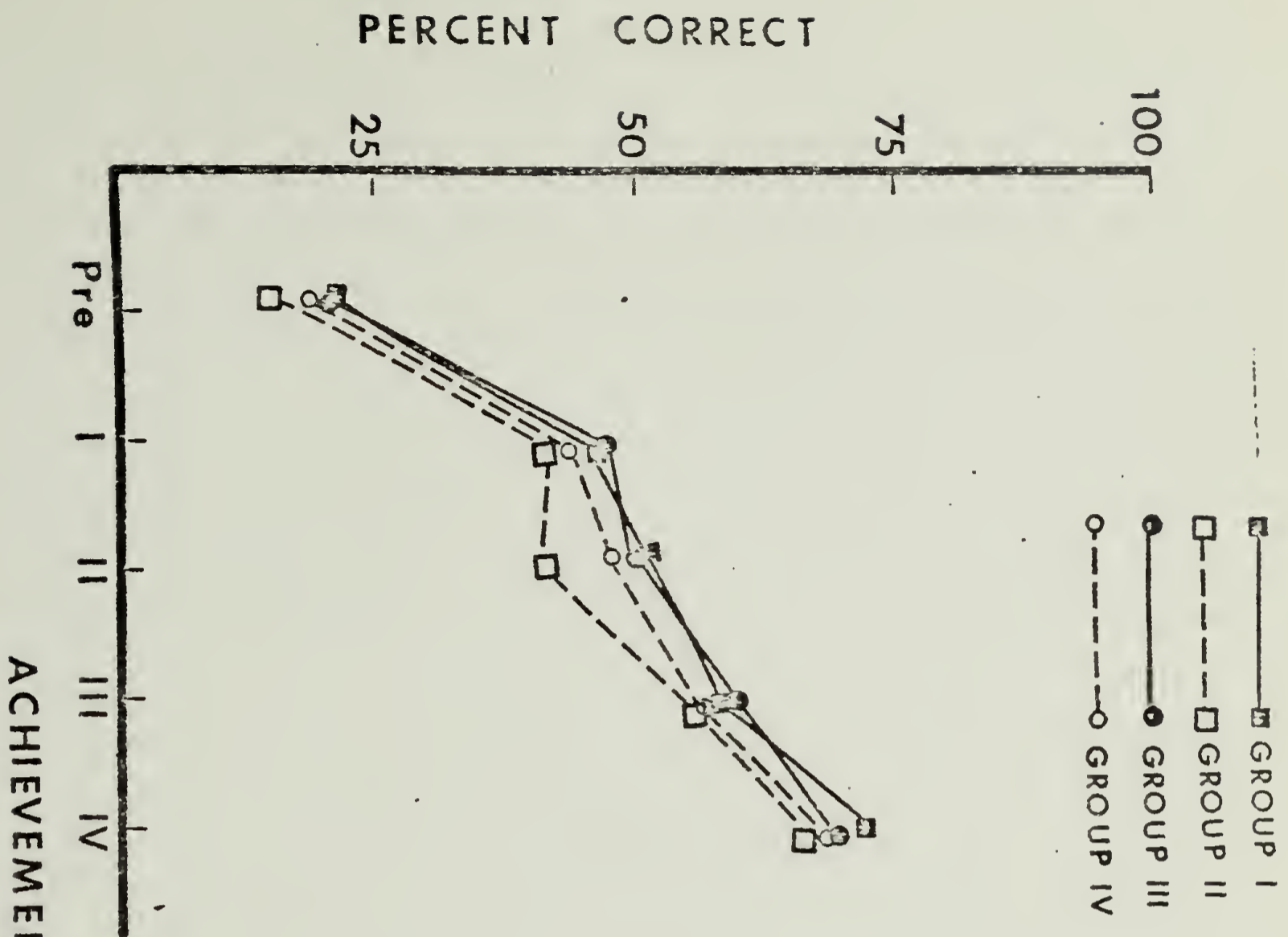
#### Quiz Attempts:

Figure 10 shows the total number of quizzes taken per

## FACE PAGE FOR FIGURE 8

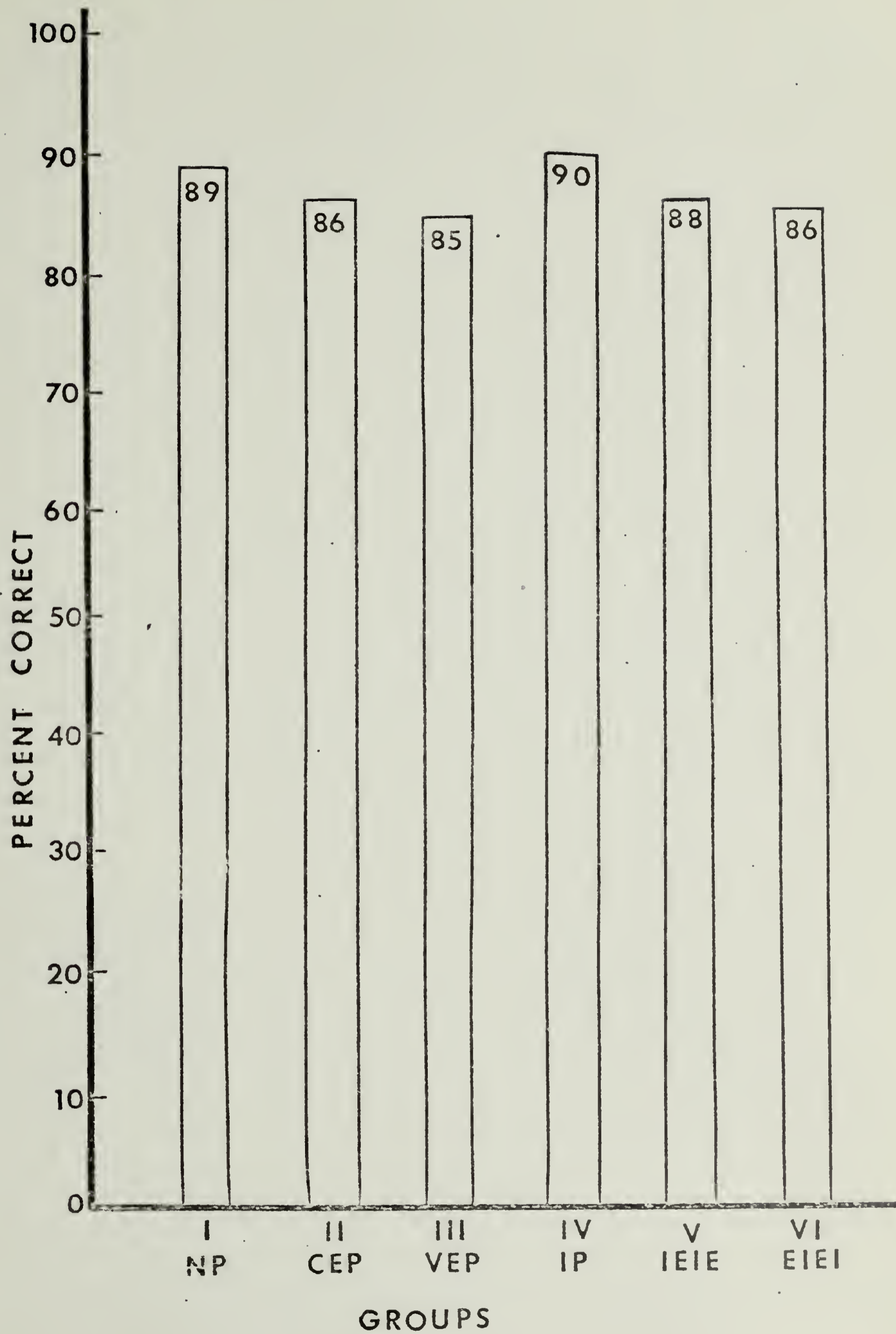
Figure 8. Mean percent correct on pretest and each of the four Achievement tests for each group. Groups I-IV are presented on the left and Groups V and VI are presented on the right.

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FACE PAGE FOR FIGURE 9

Figure 9. Final examination performance for each group.

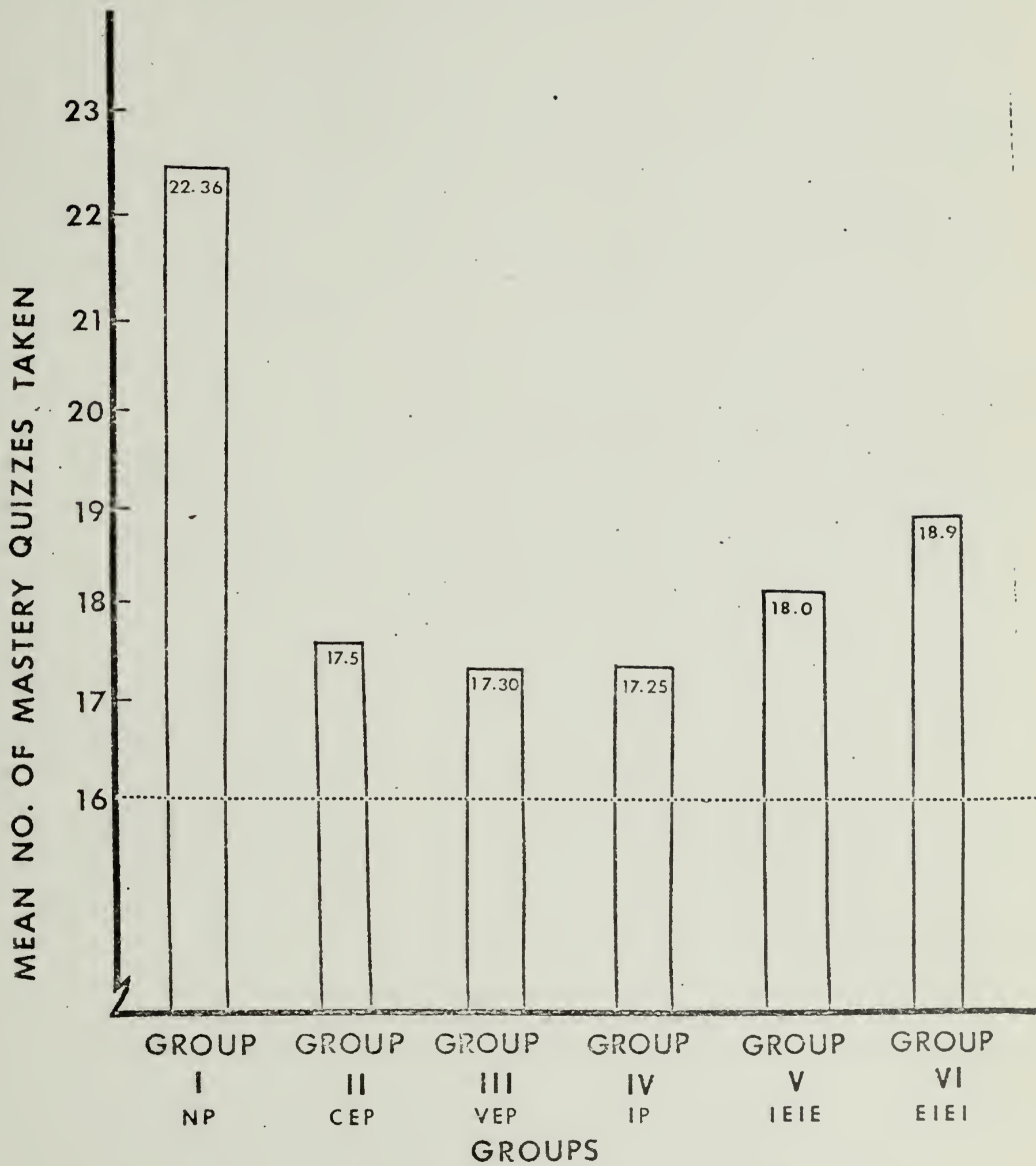


student to complete the course as a function of proctor condition. The minimum possible number of quizzes taken to complete the course was the number of units in the course, sixteen. The results clearly show that students in the no-proctor condition (Group I) needed to take many more quizzes to complete the course than students in the proctor conditions. There was also a slight tendency for the students in both rotating proctor conditions (Groups V and VI) to take more quizzes to complete the course than those groups which had consistent proctor conditions throughout the semester (Groups II, III, and IV), although this difference was not nearly as great as the differences between the no-proctor group (I) and the proctored groups (II-VI).

The mean number of quizzes retaken per group for each course segment are presented in Figures 11 (Groups I-IV) and 12 (Groups V-VI). Figure 11 shows that Group I (no-proctor) retook an average of 3.18 quizzes to master the 4 unit assignments contained in the first course segment. Group II (CEP) retook an average of 1.0 quizzes to master the same segment of material. Groups III (VEP) and IV (IP) retook an average of 0.6 quizzes to master this material. The number of retakes for Group I (no-proctor) in the second segment of the course decreased to a mean of 1.36, while quiz retaking in Groups II (CEP), III (VEP), and IV (IP) decreased to below 0.4 in the same segment. Retakes for the no-proctor group (I) decreased slightly in the third segment to a mean of

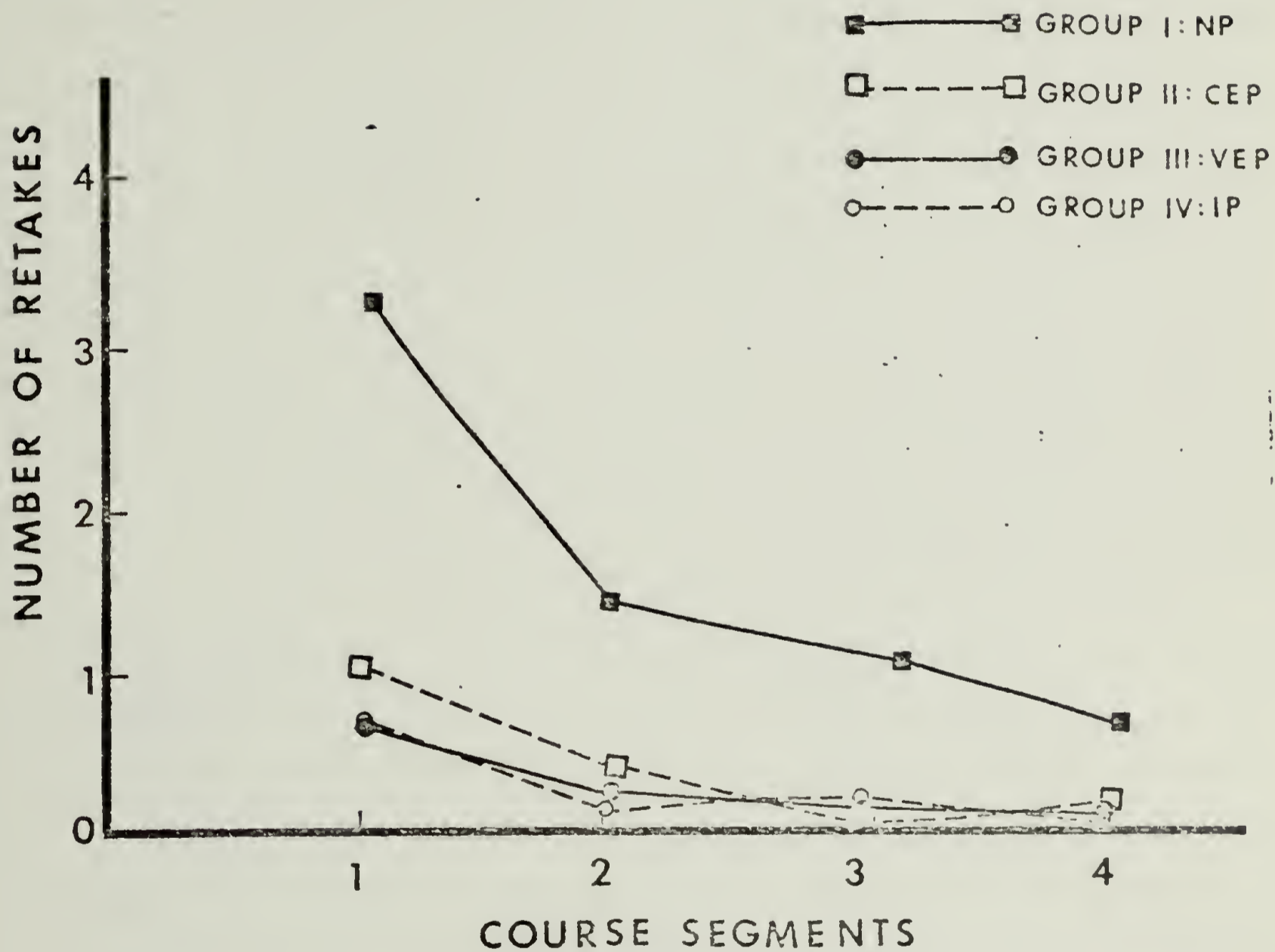
## FACE PAGE FOR FIGURE 10

Figure 10. Mean number of quizzes taken per student as a function of proctor condition. Minimum number of quizzes taken to complete the course was 16. The figures for standard deviation and median for each group are as follows: Group I, S.D. = 2.65, median = 22; Group II, S.D. = 1.34, median = 17.0; Group III, S.D. = 1.45, median = 17.0; Group IV, S.D. = 1.138, median = 18.0; Group V, S.D. = 2.0449, median = 17.5; Group VI, S.D. = 2.539, median = 18.0.



FACE PAGE FOR FIGURE 11

Figure 11. Mean number of quizzes retaken per student for each course segment.



1.18, while the mean number of retakes in Groups II (CEP), III, (VEP), and IV (IP) remained constant at below 0.4 in the same segment. Finally, the number of retakes for the no-proctor group (I) decreased to a mean of 0.63 in the fourth segment of the course, while the number of retakes for Groups II (CEP), III (VEP), and IV (IP) averaged less than 0.15 for the same segment.

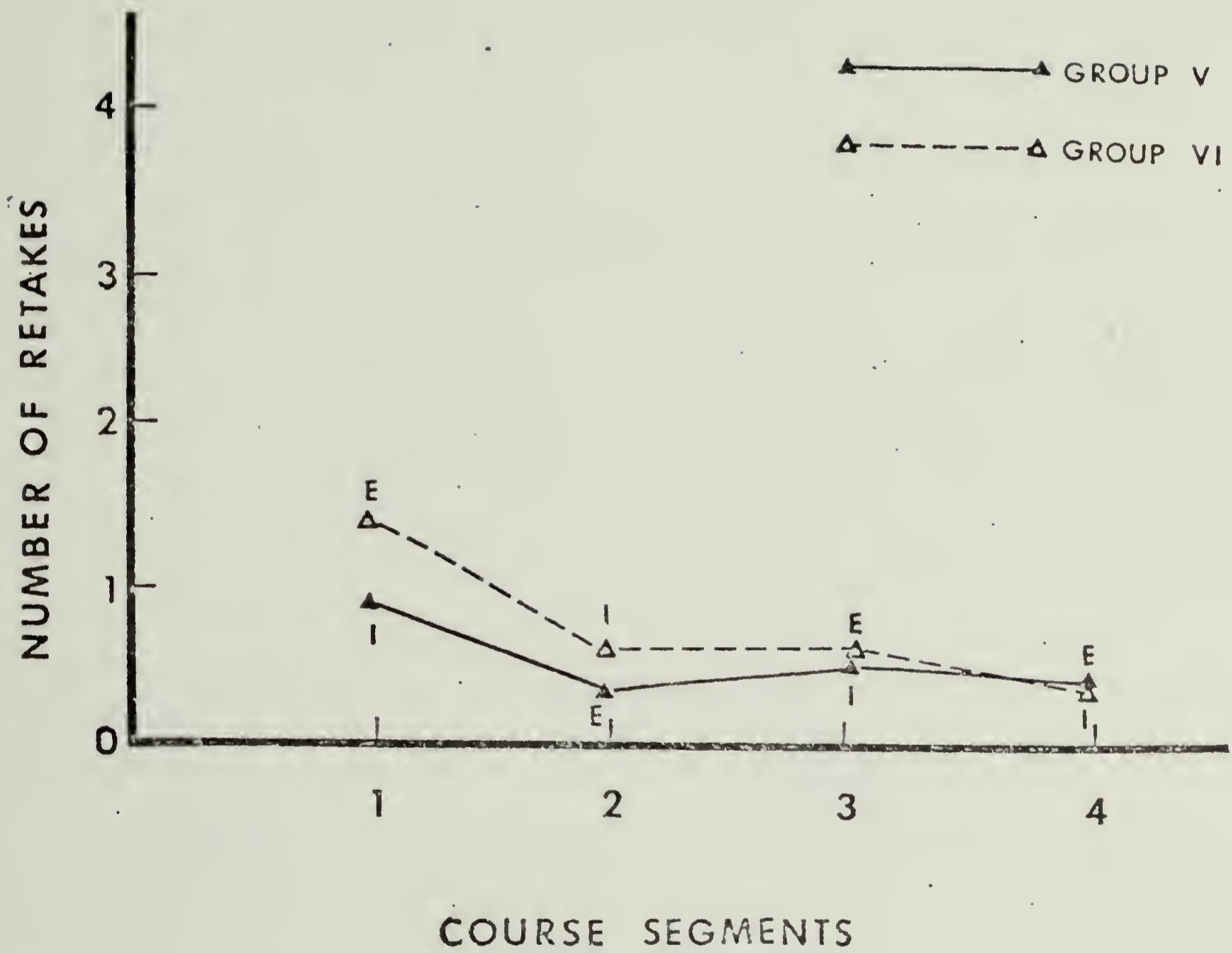
Figure 12 presents the same data for the rotating groups and systematically replicates the findings in Figure 11. Regardless of proctor condition the mean number of retakes per course segment remained low and fairly constant, although the number of retakes necessary to achieve mastery of the course material decreased slightly as students in both groups progressed through the course. Group V (IEIE) retook an average of 1.42 quizzes on the four units contained in segment 1; this frequency decreased to averages of 0.59, 0.59, and 0.33 over successive course segments. Group VI (EIEI) retook an average of 0.93 quizzes on the four units contained in segment 1, and decreased retaking to 0.33, 0.42, and 0.33 over successive course segments. At no time did their quiz re-taking frequency equal that of the no-proctor students (Group I).

#### Ability Measure:

As mentioned previously, each student took an ability test on the first day(s) of the course. Students were then

FACE PAGE FOR FIGURE 12

Figure 12. Mean number of quizzes retaken per student for each course segment.



rank-ordered on the basis of these scores irrespective of the condition to which they were assigned. The resultant distribution was then divided into thirds, representing "low", "medium", and "high" ability scores, and is presented in Table 6. When the frequencies at each level were compared among groups they were found to be nearly equal in proportions. Next, the effects of ability upon withdrawal were analyzed in a chi-square which was significant ( $\chi^2_2 = 8.34, p < .05$ ). Upon examination of the observed frequencies it was found that the "high ability" (scoring) student was less likely to withdraw from the course than the student of "lower ability" (scoring).

Table 7 presents the product-moment correlation between number of retakes necessary to master all of the course units, and ability, as measured by the ETS Wide Range Vocabulary Test. For those students in the no-proctor condition (Group I), the frequency of quiz re-takes necessary to finish the course depended heavily upon ability, while this variable did not appear to have any effect upon the performance of those quizzes proctored. The only exception to this rule was found in the group in which the student had his quizzes evaluated by the same proctor throughout the semester (Group II, CEP). For these students there was a tendency for those of higher ability to retake quizzes more often than those students of lower ability. Under all other

TABLE 6

Number of students who remained in and withdrew from the course. Each row represents an experimental condition (Groups I-VI) and each column represents an ability level (low, medium and high). Numbers in parentheses at the top of each column represent scores on the ability test which range from 1-36.

		Low (9-16)	Medium (17-21)	High (22-36)
I	Stayed	0	6	6
	Withdrew	7	2	2
II	Stayed	5	6	6
	Withdrew	3	3	0
III	Stayed	8	9	11
	Withdrew	2	1	0
IV	Stayed	8	4	6
	Withdrew	2	2	1
V	Stayed	7	9	4
	Withdrew	1	3	1
VI	Stayed	5	4	7
	Withdrew	2	3	2
TOTAL:				
	Stayed	33	38	40
	Withdrew	17	14	6

TABLE 7

Correlation between number of retakes and ability.

r =

-.52026	+.44221	-.04427	+.24432	-.01038	-.13950	+.03416
---------	---------	---------	---------	---------	---------	---------

No	Constant	Variable	Internal	Internal	External	Overall
Proctor	External	External	Proctor	External	Internal	
	Proctor	Proctor		Internal	External	
				External	Internal	

proctor conditions the relationship between ability and re-take frequency was near zero.

### Statistical Analyses:

The results of the experimental procedures were not subjected to further statistical analysis for two reasons. First, the results contained little variability, allowing for visual inspection, without the need for statistical control. Second, since the analyses were conducted on the basis of performance of those students who completed the course (e.g., Born, Gledhill, and Davis, 1972) a chi-square was performed on the relationship between experimental conditions and withdrawal from course and the results were significant ( $\chi^2_5 = 11.83, p < .05$ ). Thus, differential withdrawal occurred at least partly because of experimental (i.e., proctor or no proctor) conditions. An inspection of the observed frequencies showed that more students withdrew from the no-proctor condition than would be expected assuming random withdrawal.

### Student Preference:

While the results of the examination performance of students under different proctoring systems showed essentially no differences, the preference data did. The students in each group preferred the particular proctor arrangements under which their performance was evaluated to any other system proposed. For example, when asked to choose the proctoring system under which they would prefer to operate, the

constant external proctor group (II) generally preferred their system (64%) over a variable external proctor system (Group III, 26%) and an internal proctor system (Groups IV and V-VI, 10%). Similarly, the variable external proctor group (III) generally preferred their system (84%) to a constant external system (Group II, 5%) and an internal proctor system (Groups IV and V-VI, 11%).

Of the students in those groups which experienced both internal and external systems of proctoring (Groups V, VI, and, to a lesser extent, Group IV), 50% reported that a mixed system would be best, 32% preferred an internal proctoring system only, and 18% preferred an external proctoring system only. Thus 82% desired an internal proctor component in the course, while 68% desired an external proctoring component in the course. Of these same students, 18% would have preferred to have the same proctor all semester, while 82% reported that a variable arrangement would be ideal.

At the end of segment 1, the students in Groups V (IEIE) and VI (EIEI) initially chose the proctoring system under which they had been operating as the most desirable. For example, at the end of segment 1, the students in Group VI, who had been exposed to external proctors, rated this system higher than any other (87%), while the students in Group V rated a mixed (internal plus external) system highest (90%). After the reversal in segment 2, the data appeared

nearly identical to the figures reported earlier (i.e., 50% preferred a mixed system, 32% an internal system only, and 18% an external system only).

Regardless of relative progress rate, ability level, or time in semester, there were also no overall differences between proctor ratings from those who had external proctors, internal proctors, or a mixed system. All evaluations of the proctors used in each group were very high.

#### Reliability:

Twenty-five percent of the quizzes in each segment and 25% of the Achievement Tests were rescored independently, for reliability purposes. Reliability was high in each instance. The mean reliability index for segment one quizzes was 96%, for segment 2 quizzes was 95.4%, for segment 3 quizzes was 99.7%, and for segment 4 quizzes was 96.8%. The mean reliability index for quizzes taken in Group I was 95%, for Group II was 96.4%, for Group III quizzes was 97.3%, for Group IV quizzes was 96.8%, for Group V quizzes was 96.6% and for Group VI was 97.9%. The overall mean quiz reliability index was 96.975%. The mean reliability index for Achievement tests taken by Group I was 98%, for Group II was 98.8%, for Group III was 99.6%, for Group IV was 99.6%, for Group V was 98.7% and for Group VI was 99.2%. The overall mean Achievement test reliability index was 99%.

## Discussion

The results of the present study show that different proctoring conditions make no difference in student examination performance, as measured in the Generalization Achievement Tests and final examination, and unit quiz retake frequency. However, the elimination of student proctors from the instructional procedures described in this study leads to a substantial increase in quiz retake frequency. The absence of immediate feedback and proctor discussion of unit quizzes did not lead to lower summative evaluations as measured by the Generalization Achievement tests and final examination. In addition, student evaluations of the proctored quiz experience were very favorable. Students tended to prefer the proctoring system under which they operated to the other proctoring systems used in the course.

### The Proctoring Systems Compared:

The present writer agrees with Hohn (1973) that some research on instructional innovation should examine the commonalities that exist within different instructional formats. This point is particularly relevant to behavioral instruction, which has been implemented in many different ways in college classrooms across the country. In the present study, comparisons were made between proctoring systems currently in use in such college courses. Two dimensions

along which proctoring systems vary will be discussed.

The first dimension is the population from which proctors are selected. The results of this study indicate that student performance does not differ when an advanced undergraduate (external) proctor is replaced by a student currently enrolled in the course, who has recently mastered those units that he proctors (internal proctors). Indeed, Gaynor and Wolking (1974) found that students currently enrolled in a course who proctored performance sessions in the Johnston and Pennypacker system performed better than those who did not. This occurred despite the fact that their procedures included "internal proctors" who had not as yet demonstrated mastery of the particular units over which they proctored! Gaynor and Wolking (1974) point to the probable reason for this unexpected finding:

The argument can be made that the relationship between proctor expertise and student achievement is tenuous at best and is probably interactive with such factors as difficulty of course content, adequacy of study materials, and whether units are sequential and cumulative or relatively discrete. Given the complexity of the relationship the margin of expertise of previously trained over currently enrolled proctors may not be sufficient to influence student achievement significantly.

They further point out that error reductions on student test performance are due to many factors only one of which is the proctor himself. Given the restudying factor and the mechanical corrective feedback on printed answer sheets, the proctor himself may contribute little else to the academic

performance of other students in the course.

The argument for the use of internal proctors is further strengthened, however, when the internal proctor system is designed to assure that the internal proctor has mastered the units which he is proctoring, as Sherman's (1971) rotating internal proctor system does. In addition, this system systematically selects the "better" students which provides some assurance of "expertise".

Given the "no-difference" results in the academic performance of students who were evaluated by internal or external proctors, the decision between proctor systems must be based upon other criteria. A question raised by this study is, "do the internal proctors themselves academically benefit from internal proctoring?" The present writer agrees with Gaynor and Wolking (1974) that the currently enrolled student in his role as proctor may gain in performance and may very well want to because of the contingencies of the course. Such contingencies do not operate for the student who has already passed the course to mastery. The opportunity to engage in internal proctoring is directly related to the contingencies operating in the course, and students should be provided such opportunities if they prove to be of value. At the very least, both the preference data and the positive side effects of proctoring mentioned in the introduction contribute to the argument for the use of internal proctors.

The second dimension along which proctor systems used in college classrooms vary is consistency of the proctor-student interaction. The present study shows that student performance does not differ when the constant external proctor system (Keller, 1968) is replaced by a variable proctoring system. Given these "no-difference" results in exam performance, the decision between constant or variable proctor systems must be based upon other criteria. The obvious logistical advantages in the use of variable proctor systems (i.e., elimination of proctor absence problems, lines forming for a required proctor, etc., Gallup, 1971; Sherman, 1971) leads this writer to recommend this procedure.

#### Proctoring Vs. Non-Proctoring:

In the comparison between performance of students in the no-proctor vs. proctor groups, it is clear that although quiz retakes decreased as a function of reinforced practice under the mastery criterion in the course for all groups, groups that had proctors needed to retake quizzes less often in each segment than the students in the no-proctor group. These findings are in agreement with those reported by Farmer, et al., (1972) that, with proctoring, the student achieved the required level of mastery with less exposure to test materials and in less time than without proctoring. By dividing the course into segments, however, additional light can be shed upon the question of retakes. These results show that students who did not have their quizzes

proctored had to progress through more than 12 units (into the 4th segment) until their frequency of mastery performance on the first quiz attempt equalled that of proctored students in the first segment of the course. Also, even by the end of the course the frequency of 1st trial mastery performance by the no-proctor group was well below the frequency of first-trial mastery performance by all of the proctored groups in the 2nd, 3rd, and 4th segments of the course. In addition, regardless of the proctor system, there were essentially no differences in quiz retake frequency among the proctored groups in the course. The results also showed that the quiz retake frequency of the no-proctor group was correlated with the particular student's performance on the ability test. Specifically, the data indicate that the lower the unproctored student's ability, the greater the frequency of quiz retakes needed to master the course material. The ability factor was not important in the frequency of quiz retakes needed for any other group except group II (CEP). For these students the relationship between "ability" score and quiz retake frequency was positive, indicating that the higher the student's "ability" score, the greater the number of quiz retakes needed to master the course material. One possible explanation for the positive correlation is that since each constant external proctor got to know his students better, he may have demanded more from

his "brighter" students than from his "less able" students. It should be recalled however that retake frequency was quite low in all course segments for this group.

The present study, however, did not find differences in academic performance between proctored vs. no-proctored students. Contrary to the Farmer, et al. (1972) results, three possible explanations can be given. First, it was found that more students withdrew from the no-proctor section than would be expected assuming random withdrawal. This was not the case for any other group in the present study. In addition, all "low ability" students in the no-proctor condition withdrew from the course which was not the case for any other group, where withdrawal was more proportional across ability groups. When these facts are interpreted in light of the high quiz-retake frequency in this group, it can be hypothesized that those students who remained were quite persevering, highly motivated, and/or were of average higher ability than the other groups. This aptitude X treatment interaction led to examination performance which was comparable to the students in the other groups. Second, differences in instructional material may have led to differences between the results of the present study and Farmer's findings. The materials used in the present study may have been more interesting or easier, maintaining perseverance in the absence of proctors. Third, in theory,

once mastery is demonstrated, no matter how many quiz attempts are necessary, the student should "know" the material as well as any other student who has mastered the material (Bloom, 1968). Data supporting this theory exist, as well (e.g., Smith and Eaton, 1939; Carroll, 1963; Block, 1971). This may have also contributed to the "no-difference" findings which were obtained, although this is inconsistent with the results of Farmer, et al., (1972). A component analysis of the set of all behaviors associated with the proctor variable is needed to shed some light on these questions.

#### Rotating Proctor Conditions:

The use of the intra-group replication design in this study warrants discussion. These results clearly show that the short-term exposure generated by this procedure did not lead to results which differed from the results obtained from the inter-group (traditional between groups) design. Thus, the use of the intra-group replication design provided a systematic replication (Sidman, 1960) of the static-group design. However, this does not necessarily mean that under all circumstances this will be the case. The fact that there were no-differences in academic performance may be a significant factor in the successful replication of the static-group design. The comparison must still be made between the results of the static-group design and the intra-group design when differences are demonstrated from the

experimental manipulations. However, this writer must add that the traditional between-group design causes fewer procedural implementation problems in the classroom and at times confusion arises from the intra-group procedures which compete with the principle job at hand: to teach effectively.

One advantage of the reversal procedure was the light it shed upon the interpretation of the preference data. Although students generally preferred the proctor system under which they were evaluated to any other system, the rotation to a different procedure produced shifts in preference. The present author reiterates that the judgements of the students in the intra-group replication conditions may be more valid because only those who are exposed to different procedures are in a position to emit "responsible" choice-making behaviors (Findley, 1958; Lockhart, et al., 1973).

#### Withdrawals:

Most evaluations of PSI courses have been characterized by a larger number of student withdrawals than in more traditional courses (e.g., Keller, 1968, 1972; Born and Whalen, 1973). This phenomena also occurred in my course. Students reported to me that the course involved more work than traditional courses as has also been reported elsewhere (e.g., Born and Whalen, 1973; Nelson and Scott, 1972; Kulik, 1974). It is important that PSI instructors adjust their

course content according to the student population and the high mastery criterion employed: more realistic unit size and number, incorporation of shaping principles in unit sequencing (i.e., starting with short simple units and gradually and progressively increasing in size). Experience with the method in a particular institution has led to significant decreases in student withdrawals (e.g., Keller, 1968, 1972; Glick, 1973, 1974). The present writer can also report that withdrawals have been substantially reduced in subsequent semesters.

#### Achievement Tests:

The multiple baseline Generalization Achievement Test procedure demonstrated the effectiveness of the instructional assignments by showing substantial improvement in performance from baseline to training levels. By providing the means for a continuous and direct assessment of each student's academic behavior, this procedure can be used to increase the quality of instructional management. In addition, such a procedure can be used to improve or otherwise modify an instructional package in more detail than was formerly possible.

Possibly, the modifications in Achievement Test construction in the present study partially account for the somewhat lower performance gains observed from pre- to post-training levels in this study than in other previous studies which

incorporated the Achievement Test procedure (e.g., Miller and Weaver, 1972; Semb, 1974).

Another possible reason for the lower Achievement Test scores in this study can be inferred from the differences obtained between post training levels on the Achievement Tests and final examination performance (tests that were essentially parallel). Although all groups substantially increased academic performance from pre- to post-training levels on the Achievement Tests, performance on the final examination was of a much higher quality than that observed on the Achievement Tests. This can probably be explained by the differences in Achievement Test contingencies (2 points per test) vs. the contingency which existed between grade in course and final examination performance (25% of the grade). In the course used in the present study, 29 students failed to complete all of their Achievement Tests. It is important to assure that motivational level is high for Achievement Test performance as well, in order to maximize experimental control when using these procedures.

#### Pretest of Entering Behavior:

The present study also shows the importance of measuring student entering behaviors to the interpretation of results (Campbell and Stanley, 1963; Woodarski & Buckholdt, 1973). Without entering behavior data, experimental findings may be obscured or misinterpreted. In the present case, without

a measure of entering behavior, alternative explanations for the discrepancies between percent correct across course segments could have been given (Figure 3). In addition, entering behavior levels helped to account for the otherwise unexplainable discrepancies between reversal groups in percentage gains on segment 1 items (Figure 4). Thus, the correction for individual repertoires provides more suggestive evidence that actual increases in academic performance are attributable to the experimental manipulations.

Conclusion:

In summary, the results of this study show that the type of proctoring system the instructor uses in a contingency-managed classroom makes little difference as long as some system which provides immediate feedback (i.e., groups II-VI) is used. Besides the increased efficiency in quiz taking (i.e., retakes), the provision of proctors decreases the withdrawal rate, especially of "lower ability" students, and adds greatly to the personalization of a behaviorally taught course. All other considerations equal, the use of a variable internal proctoring system should be incorporated into at least some portion of the proctoring system that the instructor uses.

## References

- Alba, E., and Pennypacker, H.S. Multiple change score comparison of traditional and behavioral college teaching procedures. Journal of Applied Behavior Analysis, 1972, 5, 121-124.
- Block, James H. (Editor) Mastery Learning: Theory and Practice. New York: Holt, Rinehart, & Winston, Inc., 1971.
- Bloom, B.S. Learning for mastery. Evaluation Comment, 1968, 1. (Published by the Center for the Study of Evaluation of Instructional Programs, University of California, at Los Angeles.)
- Born, D.G. Proctor Manual. Center to Improve Learning and Instruction, University of Utah, 1971.
- Born, D.G. Exam performance and study behavior as a function of study unit size in a PSI course. Paper presented at the Conference on Behavior Research and Technology in Higher Education, Georgia State University, October 1973.
- Born, D.G., Gledhill, S.M. and Davis, M.L. Examination performance in lecture-discussion and personalized instruction courses. Journal of Applied Behavior Analysis, 1972, 5, 33-43.
- Born, D.G. and Herbert, E. A further study of personalized instruction in large university classes. Journal of Experimental Education, 1971, 40, 6-11.

- Born, D.G. and Whelan, P. Some descriptive characteristics of student performance in PSI and lecture courses. The Psychological Record, 1973, 23, 145-152.
- Born, D.G. and Zlutnick, S. Personalized instruction. Educational Technology, 1972, 7, 4.
- Bushell, Don. Classroom Behavior. New Jersey: Prentice-Hall, 1972.
- Calhoun, J.F. Elemental Analysis of the Keller Method of instruction. State University of New York, Stony Brook. Paper Presented at the Annual Meeting of the American Psychological Association, Montreal, August 1973.
- Campbell, D.T. and Stanley, J.C. Experimental and Quasi-experimental designs for research. In: N.L. Gage, (Ed.) Handbook of Research on Teaching. Chicago: Rand McNally and Co., 1963.<sup>2</sup>
- Carroll, John B. Programmed instruction and student ability. Journal of Programmed Instruction, 1963, 2, 7-11.
- Clark, S.G. An innovation for introductory sociology: Personalized System of Instruction. Paper presented at the Conference on Behavior Research and Technology in Higher Education, Georgia State University, October 1973.
- DeCecco, John. The Science of Learning and Instruction: Educational Psychology, New Jersey: Prentice-Hall, 1968.

- Edwards, K.A. Student as Teacher. Paper presented at the Annual Meeting of the Rocky Mountain Psychological Association, Albuquerque, New Mexico, 1972.
- Ensign, J.M., Edwards, K.A. and Powers, R.B. Personalized instruction from the viewpoint of a proctor. Paper presented at the meeting of the Utah Academy of Sciences, Arts, and Letters, Logan, Utah, September 1971.
- Farmer, J., Lachter, G., Blaustein, J.J. and Cole, B.K. The role of proctoring in personalized instruction. Journal of Applied Behavior Analysis, 1972, 5, 401-404.
- Ferster, C.B. Individualized instruction in a large introductory psychology course. Psychological Record, 1968, 18, 521-532.
- Findley, J.D. Preference and switching under concurrent scheduling. Journal of the Experimental Analysis of Behavior, 1958, 1, 123-144.
- French, J.W., Ekstrom, R.B., and Price, L.A. ETS Wide Range Vocabulary Test, from the Kit of References for Cognitive Factors, New Jersey, 1963.
- Gallup, H.F. Problems in the implementation of a course in personalized instruction (1971). In: J.G. Sherman (Ed.) PSI: 41 Germinal Papers, 1974.
- Gayner, J.F., and Wolking, W.D. The effectiveness of currently enrolled student proctors in an undergraduate special education course. Journal of Applied Behavior Analysis, 1974, 1, 263-270.

- Glick, D.M. PSI - One semester later. Unpublished report, North Country Community College, Saranac Lake, New York, 1973.
- Glick, D.M. PSI - Two semesters later. Unpublished report, North Country Community College, Saranac Lake, New York 1974.
- Green, B.A. Physics teaching by the Keller Plan at M.I.T. American Journal of Physics, 1971, 39, 764-775.
- Hoberock, L.L., Koen, B.V., Roth, C.H., and Wagner, G.R. Theory of PSI evaluated for engineering education. IEEE Transactions on Education, 1972, E-15, 25-29.
- Hohn, R.L. Effectiveness of innovations in the teaching of psychology: A critique. Paper presented at the annual meeting of the American Psychological Association, Montreal, August 1973.
- Hursh, D.E., Sheldon, J., Minkin, N., Sherman, J.A. and Wolf, M. Proctor's behavior and student's performance in a self-paced (PSI) undergraduate course. Paper presented at the Conference on Behavior Research and Technology, Georgia State University, October 1973.
- Johnston, J.M. and O'Neill, G. The analysis of performance criteria defining college grades as a determinate of college student academic performance. Journal of Applied Behavior Analysis, 1973, 6, 261-268.
- Johnston, J.M. and Pennypacker, H.S. A behavioral approach to college teaching. American Psychologist, 1971, 26, 219-244.

- 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.
- Keller, F.S. Neglected rewards in the educational process. In: S.R. Wilson and D.T. Tosti (Eds.), Learning is Getting Easier, 1972.
- Keller, F.S. A personal course in psychology (1966). In: J.G. Sherman (Ed.), PSI: 41 Germinal Papers, 1974.
- Koen, B.V. Self-paced instruction in engineering -- A case study. IEEE Transactions on Education, 1971, E-14, 13-20.
- Kulik, J.A., Kulik, Chen-Lin and Carmichael, K. The Keller Plan in Science Teaching. Science, 1974, 18, 379-383.
- Lloyd, K.E., Garlington, W.K., Lowry, D., Burgess, H., Euler, H.A. and Knowlton, W.R. A note on some reinforcing properties of university lectures. Journal of Applied Behavior Analysis, 1972, 5, 151-156.
- Lockhart, K.A., Sexton, J. and Lea, C. The Findley Procedure: A method for examining choice-making behavior in academic settings. Paper presented at the Conference on Behavior Research and Technology in Higher Education, Georgia State University, October 1973.
- McMichael, J., and Corey, J.R. Contingency management in an introductory psychology course produces better learning. Journal of Applied Behavior Analysis, 1969, 2, 79-83.

- Miller, L.K. and Weaver, F.H. A multiple baseline achievement test. In: G. Semb, (Ed.) Behavior Analysis and Education, Lawrence, Kansas, 1972.
- Miller, L.K., Weaver, F.H. and Semb, G. A procedure for maintaining student progress in a personalized university course. Journal of Applied Behavior Analysis, 1974, 7, 87-92.
- Minke, K.A. and Carlson, J.G. A comparison of two lecture systems in unit mastery instruction. Paper presented at the annual meeting of the American Psychological Association, Montreal, August 1973.
- Nelson, Terry F. Teaching and learning at Kalamazoo College; Report to the faculty Development Committee, Kalamazoo College, Kalamazoo, Michigan, June 1970.
- Nelson, T.F. and Scott, D.W. Personalized instruction in educational psychology. Michigan Academician, 1972, 4, 3.
- PSI Newsletter, Center for Personalized Instruction, Georgetown University, Washington, D.C., 1971-1974.
- Quigley, P.A. An analysis of student manager-student interactions during performance sessions. Paper presented at the Conference on Behavior Research and Technology in Higher Education, Georgia State University, October 1973.

- Semb, G. An analysis of the effects of hour exams and student answered study questions on test performance in a course taught by Personalized Instruction. Paper presented at the Conference on Behavior Research and Technology in Higher Education, Georgia State University, October, 1973.
- Semb, G. The effects of mastery criteria and assignment length on college student test performance. Journal of Applied Behavior Analysis, 1974, 7, 61-70.
- Semb, G., Conyers, D., Spencer, R., and Sanchez-Sosa, J.J. An experimental comparison of four pacing contingencies in a personalized instruction course. Paper presented at the Conference on Behavior Research and Technology in Higher Education, Georgia State University, October 1973.
- Semb, G., Hopkins, B.L. and Hursh, D.E. The effects of study questions and grades on student test-performance in a college course. Journal of Applied Behavior Analysis, 1973, 6, 631.
- Sheppard, W.C. and MacDermott, H.G. Design and evaluation of a programmed course in introductory psychology. Journal of Applied Behavior Analysis, 1970, 3, 5-11.
- Sherman, J.G. Application of reinforcement principles to a college course. (1967) In: J.G. Sherman, (Ed.) PSI: 41 Germinal Papers, 1974.
- Sherman, J.G. A permutation on an innovation -- A new role for proctors. (1971a) In: J.G. Sherman, (Ed.) PSI: 41

Germinal Papers, 1974.

Sherman, J.G. PSI -- An historical perspective. (1971b).

In: J.G. Sherman (Ed.), PSI: 41 Germinal Papers, 1974.

Sidman, M. Tactics of Scientific Research. New York:

Basic Books, Inc., 1960.

Smith, H.L. and Eaton, M.T. The relation of retention to speed of learning. Bulletin of the School of Education, Indiana University, 1939, 15, 3.

Tietenberg, T.H. Teaching microeconomics at Williams using the personalized system of instruction: An evaluation. Williams College. Paper presented at the conference on Behavior Research and Technology in Higher Education, Georgia State University, October 1973.

Weaver, F.H. and Miller, L.K. The effects of a proctor training package on university students' proctoring behaviors in a personalized system of instruction setting. Paper presented at the Conference on Behavior Research and Technology in Higher Education, Georgia State University, October 1973.

Wilson, S.R. and Tosti, D.T. Learning is Getting Easier.

Individual Learning Systems, Inc., San Rafael, Calif., 1972.

Wodarski, J.S. and Buckholdt, D. Personalized instruction in college classrooms: A review of methodological procedures. Paper presented at the Conference on Behavior Research and Technology in Higher Education, Georgia State University, October 1973.

## APPENDIX A

Group Definitions:

A Handout to Students

Group I:

You have been selected for this group on the basis of your pretest scores. We are attempting to assess whether written or oral explanations of quiz performance produces better learning. When you complete a quiz you are asked to return it to the front desk. Some time before the end of the class session your quiz will be scored and you will be told whether or not you have passed to mastery criterion. You are not to go to a proctor yourself for your name will not appear on any proctor authorization list. The next class day your quiz will be returned with the corrected answers, if any, noted. Because the one day delay of results may hold up your progress in relation to the other students in the class you will be excused from one of the three required projects or activities. Feel free to take a quiz on the next unit in the sequence in the same day if you are told that you passed the first one. Also feel free to re-take a unit quiz on the very next class day.

You are now ready to proceed. Don't forget to take the quiz on the course procedures and the Keller article in the bookstore before starting the units. Good luck, and keep up a good pace!

Group II: A Word about Proctors

Today you will be assigned a proctor for the semester. Your proctor has been chosen for his/her demonstrated mastery of the course material in a previous semester. He/she will be available to answer any questions you may have, to score your unit quizzes, to suggest better ways for you to study, if you need them, and generally to give you the personal attention you deserve, despite a course of this size. Feel free to count on your proctor for advice or counsel on any aspect of this course. He or she will be available at the hours that you arrange to come to class. Your only restriction is that you not seek assistance or have your quizzes scored by any other proctor this semester. Your name will not appear on the authorization list of any other proctor except the one to whom you have been assigned. Be sure to give your proctor a general idea of the times you will be available to come to this class.

You are now ready to proceed. Don't forget to take the quiz on the course procedures and the Keller article in the bookstore before starting the units. Good luck, and keep up a good pace!

Group III: A Word About Proctors

You may seek assistance or have your quizzes scored by any one of the several proctors which are available at the times you have chosen to come to class. These proctors have been chosen for their demonstrated mastery of the course material in a previous semester. They will be available to answer any questions you may have, to score your quizzes, to suggest better ways to study if you need them, and generally to give you the personal attention you deserve despite a course of this size. Feel free to count on them for advice or counsel on any aspect of the course. Your only restriction, however, is that you do not have your unit quizzes scored by any single individual proctor more than four times during the course of the semester. Each proctor will have a handy record of the amount of quizzes he or she has scored for you.

You are now ready to proceed. Don't forget to take the quiz on the course procedures and the Keller article in the bookstore before starting the units. Good luck, and keep up a good pace!

#### Group IV: The Selection of Proctors

The proctors for this section of the course will be chosen from among yourselves. No one must be a proctor if he does not wish to be. The first ten people passing a unit without error may work as a proctor. (We will grade the first few quizzes on each new unit). There are disadvantages to being a proctor, or rather one disadvantage -- you must remain in the class session for the entire period to correct the quizzes of your classmates, while the other students may leave when they are finished with their unit quizzes. However, there are four main advantages to being a proctor. First, by explaining the material to others you will learn it better yourself. In the past those who have been proctors even for part of the semester have done better on the final -- considerably better. Secondly, as a proctor you have the opportunity to work with more forms of the unit quizzes, to review, and again, to be better prepared for the final exam. Third, we get to know the proctors better. This, for some, is useful for letters of recommendation. For several proctors, it will lead to the position of assistant for the course next semester. Finally, each proctor receives one point per session proctored. These points may be used as safety points which can be added to your final examination score, or, in units of ten, may replace one of the three required special projects or activities.

The first ten people who pass unit one without error

and choose to do so will become proctors. Some of these same people may be among the first ten to pass unit two -- and so they may stay on as proctors if they choose. Those not originally selected may become proctors by passing unit two among the first ten people to do so and thus replace one of the proctors originally chosen. Anyone may get to be a proctor by getting ahead of the class at any point. We hope this rotating system will provide the opportunity for many of you to work as a proctor sometime during the semester. There seems to be something to the comment that you don't really understand something until you try to teach it. What better thing to do in a course in educational psychology than to take a crack at doing a little teaching?!?

One final comment -- you are advised to be fair with your fellow students when you proctor them -- quizzes will be rechecked for grading accuracy. (This also lets you off the hook if you are feeling pressured by any of your classmates, too!)

You are now ready to proceed. Don't forget to take the quiz on the course procedures before starting the units. In addition to the article by Keller in the bookstore (Goodbye, Teacher . . .), you are asked to read one other paper by J.G. Sherman (A Permutation on an Innovation) which will be handed out today. That gives you three items for the first quiz: the course procedures, the Keller article, and the Sherman article. Good luck, and keep up a good pace!

Group V: A Word About Proctors

You have been selected for this group on the basis of your pretest scores. We are relying on you to make some decisions regarding the type of proctoring arrangement you like best. Therefore, in order to be able to make such decisions, we will ask you to experience two different proctoring procedures. For the first four units in the course, you will be asked to follow the procedures explained below.

The proctors for this section of the course will be chosen from among yourselves. No one must be a proctor if he does not wish to be. The first ten people passing a unit without error may work as a proctor. (We will grade the first few quizzes on each new unit). There are disadvantages to being a proctor, or rather one disadvantage -- you must remain in the class session for the entire period to correct the quizzes of your classmates, while the other students may leave when they are finished with their unit quizzes. However, there are four main advantages to being a proctor. First, by explaining the material to others you will learn it better yourself. In the past those who have been proctors even for part of the semester have done better on the final -- considerably better. Secondly, as a proctor you have the opportunity to work with more forms of the unit quizzes, to review, and again, to be better prepared for the

final exam. Third, we get to know the proctors better. This, for some, is useful for letters of recommendation. For several proctors, it will lead to the position of assistant for the course next semester. Finally, each proctor receives one point per session proctored. These points may be used as safety points which can be added to your final examination score, or, in units of ten, may replace one of the three required special projects or activities.

The first ten people who pass unit one without error and choose to do so will become proctors. Some of these same people may be among the first ten to pass unit two -- and so they may stay on as proctors if they choose. Those not originally selected may become proctors by passing unit two among the first ten people to do so and then replace one of the proctors originally chosen. Anyone may get to be a proctor by getting ahead of the class at any point. We hope this rotating system will provide the opportunity for many of you to work as a proctor sometime during the semester. There seems to be something to the comment that you don't really understand something until you have to teach it. What better thing to do in a course in educational psychology than to take a crack at doing a little teaching?!? One final comment -- you are advised to be fair with your fellow students when you proctor them -- quizzes will be rechecked for grading accuracy. (This also lets you off the hook if you are feeling pressured by any of your classmates, too!)

After you have taken the Achievement Test which follows the first four units, you will be asked to follow the procedures explained below, for units five through eight.

You may seek assistance or have your quizzes scored by any one of the several proctors which are available at the times you have chosen to come to class. These proctors have been chosen for their demonstrated mastery of the course material in a previous semester. They will be available to answer any questions you may have, to score your quizzes, to suggest better ways to study if you need them, and generally to give you the personal attention you deserve despite a course of this size. Feel free to count on them for advice or counsel on any aspect of the course. Your only restriction, however, is that you do not have your unit quizzes scored by any single individual proctor more than four times during the course of the semester. Each proctor will have a handy record of the amount of quizzes he or she has scored for you.

After you have followed the procedures for the second four-unit segment of the course (units 5-8) and have taken the second achievement test, you will be asked to repeat the procedures you followed for the first four unit segment, as you take units 9-12.

After you have taken the Achievement Test which follows the third four-unit segment of the course (units 9-12), you will be asked to repeat the procedures you followed for the

second four-unit segment of the course (units 5-8), as you take units 13-16.

A summary of your procedures:

1. Quiz over course outline, Keller article, Sherman article
2. Units 1-4, which will be proctored by your fellow classmates.
3. Achievement Test I
4. Units 5-8, which will be proctored by various external proctors chosen from a previous semester
5. Achievement Test II
6. Units 9-12, which will be proctored by your fellow classmates, again
7. Achievement Test III
8. Units 13-16, which will be proctored by various external proctors chosen from a previous semester, again
9. Achievement Test IV
10. Final Exam
11. An "A" in the course!

You are now ready to proceed. Don't forget to take the quiz on the course procedures before starting the units. One more thing: in addition to the article by Fred Keller (Goodbye, Teacher . . .) which will appear on the course procedure quiz, we will ask you to read the article by Sherman that we will hand out.

Group VI: A Word About Proctors

You have been selected for this group on the basis of your pretest scores. We are relying on you to make some decisions regarding the type of proctoring you like best. Therefore, in order for you to be able to make such decisions, we will ask you to experience two different proctoring procedures. For the first four units in the course, you will be asked to follow the procedures explained below.

You may seek assistance or have your quizzes scored by any one of the several proctors which are available at the times you have chosen to come to class. These proctors have been chosen for their demonstrated mastery of the course material in a previous semester. They will be available to answer any questions you may have, to score your quizzes, to suggest better ways to study if you need them, and generally to give you the personal attention you deserve despite a course of this size. Feel free to count on them for advice or counsel on any aspect of the course. Your only restriction, however, is that you do not have your unit quizzes scored by any single individual proctor more than four times during the course of the semester. Each proctor will have a handy record of the amount of quizzes he or she has scored for you.

After you have taken the Achievement Test which follows the first four units, you will be asked to follow the procedures explained below for units 5-8.

The proctors for this section of the course will be chosen from among yourselves. No one must be a proctor if he does not wish to be. The first ten people passing a unit without error may work as a proctor. (We will grade the first few quizzes on each new unit.) There are disadvantages to being a proctor, or rather one disadvantage -- you must remain in the class session for the entire period to correct the quizzes of your classmates, while the other students may leave when they are finished with their unit quizzes. However, there are four main advantages to being a proctor. First, by explaining the material to others you will learn it better yourself. In the past those who have been proctors even for part of the semester have done better on the final -- considerably better. Secondly, as a proctor you have the opportunity to work with more forms of the unit quizzes, to review, and again, to be better prepared for the final exam. Third, we get to know the proctors better. This, for some, is useful for letters of recommendation. For several proctors, it will lead to the position of assistant for the course next semester. Finally, each proctor receives one point per session proctored. These points may be used as safety points which can be added to your final examination score, or, in units of ten, may replace one of the three required special projects or activities.

The first ten people who pass unit one without error

and choose to do so will become proctors. Some of these same people may be among the first ten to pass unit two -- and so they may stay on as proctors if they choose. Those not originally selected may become proctors by passing unit two among the first ten people to do so and then replace one of the proctors originally chosen. Anyone may get to be a proctor by getting ahead of the class at any point. We hope this rotating system will provide the opportunity for many of you to work as a proctor sometime during the semester. There seems to be something to the comment that you don't really understand something until you try to teach it. What better thing to do in a course in educational psychology than to take a crack at doing a little teaching?!? One final comment -- you are advised to be fair with your fellow students when you proctor them -- quizzes will be rechecked for grading accuracy. (This also lets you off the hook if you are feeling pressured by any of your classmates, too!)

After you have followed the proctoring procedures for the second four-unit segment of the course (units 5-8), and have taken the second Achievement test, you will be asked to repeat the procedures you followed for the first four-unit segment (units 1-4), as you take units nine through twelve.

After you have taken the Achievement Test which follows the third four-unit segment of the course (units 9-12), you will be asked to repeat the procedures you followed for the

second four-unit segment of the course (units 5-8), as you take units 13-16.

A summary of your procedures:

1. Quiz over course procedures, and Keller article
2. Units 1-4, which will be proctored by various external proctors chosen from a previous semester
3. Achievement Test I
4. Units 5-8, which will be proctored by your fellow classmates
5. Achievement Test II
6. Units 9-12, which will be proctored by various external proctors chosen from a previous semester, again
7. Achievement Test III
8. Units 13-16, which will be proctored by your fellow classmates, again
9. Achievement Test IV
10. Final Exam
11. An "A" in the course!

You are now ready to proceed. Don't forget to take the quiz on the course procedures and the Keller article in the bookstore before starting the units. Good luck, and keep up a good pace!

## APPENDIX B

Course Description -- a Handout

P S I Educational Psychology

Psychology 301A

Beth Sulzer-Azaroff  
Office: Tobin 513  
Hours: TBA

Kent Johnson  
Office: Tobin 538  
Hours: TBA

General Information:

This is a self-paced course in Educational Psychology implementing the Personalized System of Instruction (PSI). It is designed to give you personal attention, to allow you to move ahead at your own speed, and to be sure that you gain a thorough mastery of the basic concepts of Educational Psychology. It is also designed so that the grade is not a secret, you are not risking all on a final, and there is little room for luck and/or cramming. You can come close to an accurate estimate of your grade most of the way. The route to an "A" grade is as clear as we can make it, but it requires work. In fact, a large number of students report that such courses are more work than more traditional courses -- but also less anxiety producing, more fun, and more profitable because more is learned. I hope these comments will prove to be similar to your thoughts about the course this semester.

Course Construction:

The course will consist of several parts. The first, and major, portion will consist of sixteen units based upon the reading material in the texts. For each unit you will

be expected to follow the study procedures outlined below, and come in to take a brief quiz and have an interview with a proctor.

There are 14 weeks to the semester. Those who are wise will use the self-paced feature to advantage, doing 2 units a week, finishing early, and freeing their time to work on other courses during the pre-finals rush in May.

Each quiz in this course will have 10 questions, a combination of multiple-choice, fill-in a missing word, complete the sentence, and short essays. If you get all of them correct, then both you and we know that you have mastered the material and you can safely and with confidence proceed to the next unit. To give us some feedback on the length of time it takes you to master a unit, we will also ask you to estimate the amount of time you studied for a given unit, at the top of your answer sheet.

Before proceeding, however, there will be one more hopefully rewarding task to engage in. At the front of the room will be a continuous progress chart which contains a record of each student's progress to date. When you successfully master a unit you should indicate this on the chart. The chart will serve as a visible record of your progress to date, showing how much remains for you to complete, and what progress your fellow classmates are making in relation to yours.

A proctor will score each answer you make on a quiz as

either "correct", "unclear", or "incorrect". You will be required to clarify all answers marked "unclear", verbally. If the proctor is satisfied that you know the answer to these questions, he or she will request that you write out those clarified answers. All clarified answers will then be attached to your quiz. Any quiz that does not contain these clarifications, if any are required, will not count.

If you make only one error you will also be allowed to defend it. There are many times that a quiz question will appear perfectly clear to us but totally ambiguous to you. If your defense is a valid one, we will also allow you to write out the correct answer, after you have been "enlightened" as to the meaning of the question.

If you make more than one error we will point out where the problems seem to be, ask you to review the appropriate parts of the unit and try again. If you make more than one error this time, there is a third form of the quiz which you can take! We will ask you not to try more than once in any given session, although you may pass successfully more than one unit on any given day. If two quiz attempts prove unsuccessful, more extensive review is probably necessary. When you make more than one error we urge you to take the need for review seriously. It is tempting to take another quiz without restudying, hoping for "better luck". To go ahead trusting to luck may work that day, but your luck will probably run out on later units or the final. An error means

that there is some part of the material you have not learned. These quizzes are designed primarily to detect your misunderstandings, and show you what to do to correct them before they lead you to serious trouble.

The system is designed to be fair. If you treat it honestly and give it a fair chance you will find that you learn everything and will be rewarded for it. You will not be graded on "the curve". Proctors will not be doing you a favor by letting you pass a unit when you have not earned it and are instructed not to do so. All quizzes turned in will be spot checked again by one of the course assistants. Since you are not penalized for any errors you make, you are better off to work them out before facing the final where errors do count against you.

After you have successfully mastered four units you will be asked to take an Achievement Test. These Achievement Tests will be administered to you after each four-unit section in the course -- a total of 4 Achievement Tests in all. These tests will be graded outside of the class sessions and are included to help us assess your ability to retain and integrate the material. You are urged to study for these tests for you will be required to attain a minimal standard of performance on them. It is only fair to tell you that you will not be expected to answer all of the questions appearing on an Achievement Test correctly, since varying amounts of

the items will cover information to which you will not yet have been exposed. You must make some written response to each question, however (e.g., "Don't know", will be, in many cases, appropriate). A good score will also be rewarded by giving you two bonus points which may be added to your final exam score. They will take about one hour to complete. If you take any quizzes in the following four-unit segment of the course before taking the appropriate Achievement Test, these quizzes will not count, and you will be required to redo them.

#### General Study Procedures:

1. Before reading the unit assignment, read over the objectives presented at the beginning of the DeCecco chapters assigned, as well as the topic headings throughout the chapter. For the Bushell and Wilson/Tosti books you should read over the study questions provided. This should give you a preview and an overview of what the assignment is all about, and will also make the study guide questions more meaningful, to you as you answer them.
2. Read the unit assignment, from beginning to end, without a break.
3. Begin again at the beginning of the text assignment, with study guides in hand, and fill in the completions and questions with your answers. Much of the benefit of the study guide questions occurs only when you actually make the written responses called for. It is tempting just to read along,

either "mentally noting" or underlining in the text the answers to the study questions. If you take that route, you will not learn as much, as well, or, in the long run, as quickly. It is also to your benefit to understand, rather than memorize, the material because quiz questions will be presented in form and wording different than the study questions. Furthermore, the final will be an exceptionally difficult study endeavor if you have memorized the early units. All quiz questions will be directly related to the questions and objectives presented in the study guides. Thus, no quiz question will be asked which you would not have already answered, albeit in another form, had you completed the study guide prior to test-taking. It is our belief and experience that errors and retakes of quizzes will be substantially reduced through written response to the study questions. You may think of your study guide as a replacement of the material which would be presented in lectures related to the material in the text, giving points of emphasis and deemphasis, as well as establishing relationships between specific information, both within and between chapters of text.

4. It has also been our experience that students who follow the above suggested procedures have a much better idea of what areas of a given unit they have and have not mastered prior to quiz taking. If you have any questions or doubts about your understanding of any particular objective or idea

in a unit assignment as a result of completing the above procedures, do not hesitate to consult or confront us with these before you take the unit test. That way you will waste less of your time and our time by failing to attain the required mastery criterion score for the unit quiz.

The second part of the course will consist of activities and projects which further amplify the material covered in the units and are intended to give you experience in addition to reading. There will be a variety of activities and projects suggested, from which you will be required to select three. Each project or activity will be accompanied by a worksheet which you will fill out. The projects will also be evaluated along mastery criteria; i.e., either your work will be judged as "A" quality work, or you will be asked to improve upon it some more until it is worth an "A". At least one project or activity must be turned in by the time you have completed five units of reading material. Each of the other two projects should also follow a five unit segment; i.e., after unit 15 has been completed you should hand in your final project.

The third part of the course consists of one big project which will be continuously assembled throughout the semester, the details of which will be described in each unit assignment study guide.

Again, you may proceed through the course at your own pace, finishing early or using the full semester, as you

choose. However, you are cautioned now that there are a great many units. It is dangerous to fall behind and all too easy to do so. The results from past semesters show that those who work quickly and finish early get the best grades on the final. We urge each and every one of you to work as rapidly as possible and finish early. When you finish all 16 units, 4 Achievement tests, and three activities, you may take the final and free the end of the semester to concentrate on other courses. At a minimum to keep on schedule you should pass one unit every 2 1/2 class days. The progress chart displayed in the front of the room will also have suggested rates for early and normal completion of the course. Again, there is no penalty for errors on the quizzes. You may take and need three tries to learn a unit; once learned that is all that counts. After three tries we will ask you to have a chat with us about what it is that you have been answering incorrectly. Your passing the unit will then be contingent upon a short essay paper pertaining to the errors you have been making.

#### How Do I Get An "A" in This Course?

An "A" for the course will be awarded when the following conditions have been met:

1. Mastery of all 16 units of reading assignments
2. Completion of all four Achievement Tests which follow each four-unit segment of the course.
3. Completion of three "A" quality projects or activities

4. Achieving 90% or greater on the final examination.

With respect to requirement #4, remember, two bonus points for good scores on the Achievement tests will be added to your final examination score. Thus, good scores on all four Achievement tests will result in a total of eight points added to your final exam, thus reducing the percentage you will need to attain to get an "A" to 82%.

Because of the characteristics of the format described above, each of you can easily observe at any point in the semester exactly how many units remain for you to complete, exactly where you stand currently, compared to other students taking the course, and at what pace you should progress to earn an "A" by the end of the semester. There is no reason why any of you cannot earn an "A", and, although other grades will be given, if earned, we will neither define or discuss any grade other than "A". Indeed, we feel there is no reason to help a student get a lower grade by telling him how to earn it!!

There will be two early finals given for those who finish early -- the dates of the early finals will be announced later. Even if you have not finished all the units and projects you must take the final during its scheduled time in the exam period to receive a grade. The final will cover the sixteen units of reading material. As an added incentive for working quickly we allow those who have finished early

enough to take one of the two early finals, to retake the final once more, if their grade on an early final was not satisfactory enough for them. The decision to retake the final is entirely up to you: be sure to pace yourself so that you can take advantage of this opportunity if you need it.

There will be several scheduled lectures by guests and those who are teaching the course, group discussions, and other activities which you will be able to attend upon completion of a certain number of units. They will be announced several weeks in advance so that you can pace your work and be able to attend.

#### Daily Procedure for the Course:

On all class days you may come in when ready and take a quiz. You may also come in to study in the classroom if you wish and are urged to do so. Many students in the past have found the classroom an effective environment in which to study, and there are people available to answer questions, should you have any. If you come in to use the classroom as a study hall please keep the room quiet -- others are working and you are not required to be there. When you are ready to take a quiz, come up to the front desk and sign out for the particular unit you are working on. Once you have taken a quiz have it corrected by a proctor, then pick up the next unit assignment or review for another unit quiz, if you are

taking more than one that day. Leave your written answer sheet with your proctor and return the quiz to the front desk. Tests and folders should never be taken from the classroom. Because there is some clerical work for the proctors after class, you should come early in the testing sessions -- at least early enough to be finished by 12:30 P.M. Tests will not be given out after 12:45 P.M. If you are prepared for an Achievement Test be sure to leave at least an hour in which to take it. You must also sign out for these, and turn them in to the front desk when finished. These will not be graded by the proctors in class. We will tell you whether or not you earned the bonus points on the Achievement Tests during the next class period.

When we are not busy with logistical work, we welcome your questions, comments and the chance to talk with you. Part of the reason for this method of teaching is our belief that individual communication and instruction is more to the point, successful, and more effective than a lecture to a large heterogeneous group. Please feel free to chat with us. That is why we are there.

We honestly believe that we are following a system that is fair, effective, and not punishing. If you do the work that is asked for, be as fair with the system as it is with you, and avoid falling behind, a happy result is all but guaranteed. As our part of the bargain, we hope that the proposed method (1) will give us a chance to give you more

personal attention, (2) allows you to take advantage of your personal learning rate, taking into account your other course work this semester, and (3) assures you that you gain a solid background and understanding of the basic concepts of educational psychology. By the end of the course you should be able to judge for yourself whether or not we have met our objectives!

At the next class meeting you will be told more about the proctoring methods we are going to use. If you have any questions about the methods we are using in this course, please ask them now before you begin the course. To assure yourselves that you do in fact understand them we will ask that you begin the course by taking a brief quiz over the procedures outlined in this handout plus the article by Fred S. Keller entitled, "Goodbye, Teacher ..." which is available in the bookstore, and which describes the basic rationale for the methods we are using in the course.



