AN ANALYSIS OF STUDENT PERFORMANCE ON UNIT TEST ITEMS NOT ADDRESSED BY STUDY QUESTIONS AS A FUNCTION OF THE PRIOR AVAILABILITY OF STUDY QUESTIONS OVER THE UNIT

An abstract of a Thesis by
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The problem. In what way does the availability of study questions affect student test performance and general comprehension of unit material?

Procedure. Students enrolled in an abnormal psychology class were either given study questions or not given study questions to help them prepare for each of their weekly tests. The two dependent variables were (1) performance on test items which had been addressed by the study guide (percent of students passing the test on the first attempt) and (2) performance on probe items over material which had not been addressed by the study guide. Correct answers to probe items did not improve a student's grade.

Findings. When study questions were provided, students consistently did better on the unit tests and worse on probe items than they did when study questions were not provided. These relationships were consistent at each of three criteria levels for passing the unit test (50%, 70%, and 90%).

Recommendations. Study questions could more effectively be used if they cover a large portion of the unit material. Construction of study questions could also require the synthesis of unit material rather than a discrete response from the student.

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Chapter 1

INTRODUCTION

The applied analysis of behavior deals with the contingencies which control "socially important" behavior (Baer, Risley & Wolf, 1968). Socially important behaviors are as diverse as toileting (Azrin & Foxx, 1971); depositing litter in trash barrels (Burgess, Clark, & Hendee, 1971); conserving energy (Palmer, Lloyd, & Lloyd, Note 1) and studying in college (Johnston & O'Neill, 1973). The applied analysis of student performance in college classes may be attributed to Keller (1968). Keller identified five components which might facilitate student academic performance: student pacing, unit perfection, lectures as reinforcers, an emphasis in written assignments and the use of student proctors. The effectiveness of the Keller method and subsequent variations of it compared to traditionally taught classes has been demonstrated. Twenty-one out of twenty-nine comparative studies found that the Keller method resulted in equal or better test performance (Lloyd, Note 2). Other research has evaluated the relative importance of the five components of the Keller method. Unit perfection, emphasis on written assignments and student proctors have been found to facilitate student performance (Lloyd, Note 2).

Typically, study guides have been the means used to emphasize written performance. A study guide is a list of

questions which direct the student's attention to the important areas in an assigned unit of reading material. After writing out the answers to the study questions, the student is usually required to take a unit test composed of questions selected from the study guide or similar questions.

Study guides have been shown to enhance test performance when test questions are related to study guide items (Semb, Hopkins, & Hursh, 1973). Semb et al. demonstrated that students passed more test items related to study questions (SQ) than test items not covered by study questions (Q). Furthermore, Semb et al. (1973) found that the number of questions on a study guide affected student performance. The number of questions on the study guides showed an effect on "probe" performance. Probes were questions that required the student to synthesize materials. Students showed a tendency to perform better on these probe items when longer study guides were used.

Although study questions may help students learn the material covered by the study guide and thereby enhance unit test performance, it is possible that they may hinder the learning of unit material not directly covered by the study questions. Some students, in courses using study guides, have reported to the author that they answer a portion of the questions on the study guide and share these answers with other students who have answered the remainder of the questions. It is therefore possible for a student to memorize

the study guide answers and pass the unit test without having read the assigned unit. Since there is no grade advantage to reading the text except for sections clearly related to the study questions, students may not do so and consequently may not understand the context supporting the facts they memorize.

Ordinarily, with the Keller method, students must pass the unit test without errors (unit perfection) before being permitted to proceed to the next unit. Some instructors, using variations of the Keller method, have not required 100% mastery and accept a lower mastery criterion. For example, if the mastery criterion for a particular test is 90%, students would pass that test if they answered 90% or more of the questions correctly. If the student did not correctly answer 90% of the test questions, he/she would be required to retake that test (or a similar test) until 90% mastery was reached or receive a score of zero. Semb (1974) and Johnston and O'Neill (1973) investigated the effects of different mastery criteria on the performance of undergraduate college students. In both cases the percent of test items answered correctly was directly related to the percent mastery required. The mastery criterion was also related to the mean number of attempts required to pass a unit test (Johnston & O'Neill, 1973). Therefore with high mastery criteria students will generally be retaking unit tests more frequently and passing with higher scores. The advantage of

having study guides, from the student's perspective, might be that the number of unit test retakes is reduced. The disadvantage may be the effort involved in filling them out and the fact that there is little reinforcement for learning anything beyond material indicated on the study guide. However, students have not been asked whether or not they prefer study guides to no study guides. Student preference has been investigated for other aspects of the college classroom (Lockhart, Sexton, & Lea, 1974). Lockhart et al. demonstrated that student preference for a particular test format could be identified. However it was found that students did not do better on tests of the preferred format. It would seem likely that the established mastery criteria would influence preference for study guides or no study guides. That is, at a high mastery criterion students might prefer study guides since the number of retakes should be reduced if the students were aware of the population of questions from which the test was drawn. At a low mastery criterion, however, students might prefer to avoid having to fill out the study guide.

This study will investigate the effect of having study guides or not having study guides at three different mastery criteria (90%, 70%, 50%) on (1) unit test performance, as measured by the percent of students passing the unit tests on the initial attempt; (2) general understanding of the material, as determined by the percent of students passing

questions not included on the study guide and (3) preference, assessed by the percent of students choosing study guides at each mastery criterion.

Chapter 2

METHOD

Subjects

Subjects were fifty undergraduate college students initially enrolled in an abnormal psychology course. These students were randomly assigned to one of two groups within the class.

Class Structure

Students could earn 244 points. To earn an A, a student had to earn a minimum of 210 points; for a B, at least 175 points; a C, 140 points; a D, 120 points. Less than 119 points was considered failing. Students could stop participating in class when they were satisfied with their point total and were willing to accept the grade for that total.

The course was designed according to a modified personalized instruction format. Unit tests were given each Thursday. Students could retake a unit quiz as often as desired, up until the time the next unit quiz was offered.

Students could earn ten points on each of the fifteen unit quizzes and three points by answering questions over each of thirteen enrichment lectures. Additionally, students could earn up to five points by outlining and summarizing each of six selected articles. Finally, twenty-five points

could be earned by writing a paper integrating the previously mentioned articles with the novel One Flew Over the Cuckoo's Nest.

Study Guides

Study guides were sometimes available to students. The study guides used throughout this study, except for weeks ten through twelve, were developed at Washington State University. The study guides used during weeks ten through twelve were developed at Illinois Wesleyan University. There were twenty-four questions on each study guide. These questions were randomly selected from the longer, original study guides.

When students had study guides, they were required to turn in their completed study guides before they were permitted to take the unit test. These completed study guides were checked by proctors to insure that all questions had been answered and spot checks were made to determine the relevancy of their answers.

Probes

Students were also required to answer two probe questions before being permitted to take each unit test. Probe questions were quiz items which 90% of the previous class had passed. These items were removed from the study guides before they were distributed to the current class. Probe questions were non-credit except for the last three weeks of

the study.*

Procedure

Mastery criteria throughout this study was either 50%, 70%, or 90%. At each mastery level three conditions were imposed upon the two groups. (1) Study guides; under this condition students were given study guides and were required to fill them out before being permitted to take the unit test. (2) No study guides; under this condition, study guides were not given to students to assist them in studying. (3) Choice; in this final condition, students chose the format they preferred. The sequence of the presentation of these conditions was varied, as were the mastery criteria. This sequence is presented in Table 1.

In the final three-week phase of the study, the mastery criterion was held at 70% and points were given for probes.

RELIABILITY

Both the quiz and the probe items were graded in class immediately after students had completed them. Grading was done by two undergraduate proctors, the course instructor and the author. Students were informed at this time what their

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*No information on the number of students passing items later used on quizzes was available for the probes used for unit 12. Consequently probe items were selected arbitrarily.

Table 1

Summary table of student performance on unit tests and probe questions as a function of class format and mastery criteria

	Group I				Group II			
Unit Test	Condition	Percent Mastery Criteria	Percent Passing Unit Test	Percent Probe Items Passed	Condition	Percent Mastery Criteria	Percent Passing Unit Test	Percent Probe Items Passed
1	Study Guide	90	76	56	Study Guide	90	65	48
2	No Study Guide	90	55	52	No Study Guide	90	44	42
3	Choice	90	95	16	Choice	90	88	16
4	No Study Guide	70	64	54	No Study Guide	50	96	54
5	Study Guide	70	100	4	Study Guide	50	100	6
6	Choice	70	86	20	Choice	50	100	20
7	No Study Guide	50	95	50	No Study Guide	70	83	36
8	Study Guide	50	100	32	Study Guide	70	100	30
9	Study Guide	90	63	20	Study Guide	90	62	28
10	Study Guide	70	87	4	Study Guide	70	94	4
11	No Study Guide	70	67	32	No Study Guide	70	85	32
12	Choice	70	95	24	Choice	70	100	48
13	Study Guide	70	94	34	Study Guide	70	100	18
14	Study Guide	70	100	46	Study Guide	70	100	42
15	Study Guide	70	100	8	Study Guide	70	90	8

grade for that unit was and if they would be required to take a make-up test based upon the mastery criterion for that week.

To assess inter-grader reliability, all tests were collected and each grader received five randomly selected tests and five randomly selected sets of probe items to regrade. The test cover sheet had been removed so the identity of the student, original grader and the original grade could not be ascertained. The averaged reliability for all four graders on probe items, calculated by dividing the number of agreements by the number of agreements plus the number of disagreements X 100 was 88.5%. Reliability on test items was 94%.

Chapter 3

RESULTS

Figure 1 shows the difference between the percent of students passing each unit test on the first attempt, when study guides were available and when they were not available, at each mastery criterion. The percent of students passing the unit test on the first attempt was higher, within each mastery level, when study guides were available. The 90% mastery criterion produced the highest number of test retakes whether study guides were provided or withheld. The 50% mastery criterion produced the fewest test retakes when study guides were not available. There were minimal differences in the number of retakes at the 50% and the 70% mastery levels when study guides were available. In addition, the 50% mastery criterion produced only slight differences in student performance, with or without study guides. However, the 70% and 90% mastery criteria produced greater differences in performance as a function of the availability of study questions. The actual percentages are presented in Table 1.

Figure 2 shows the number of students passing specific numbers of probe questions. Sixteen probe questions were given when study guides were available, eight were given when they were not. Several students passed relatively few probe questions (1, 2 or 3) when study guides were available,

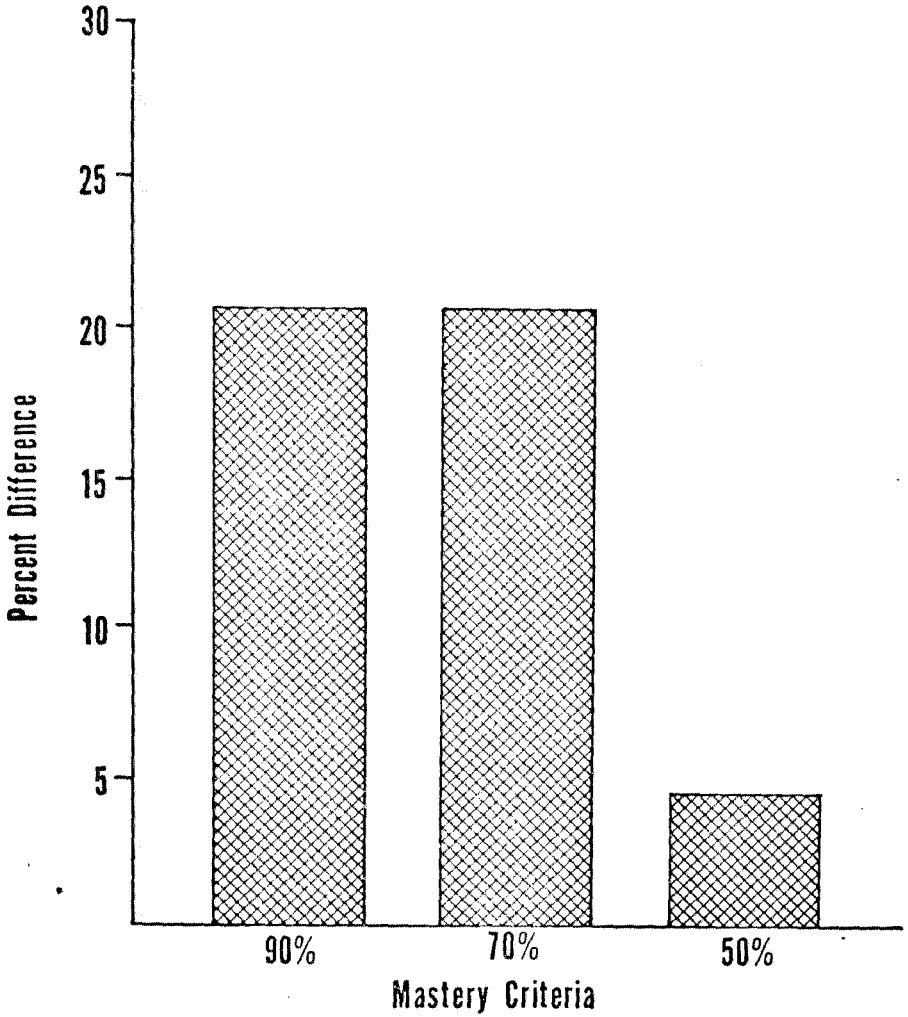

Fig. 1 Differences between the percent of students passing unit tests with study guides available and the percent of students passing unit tests without study guides, as a function of varying mastery criteria

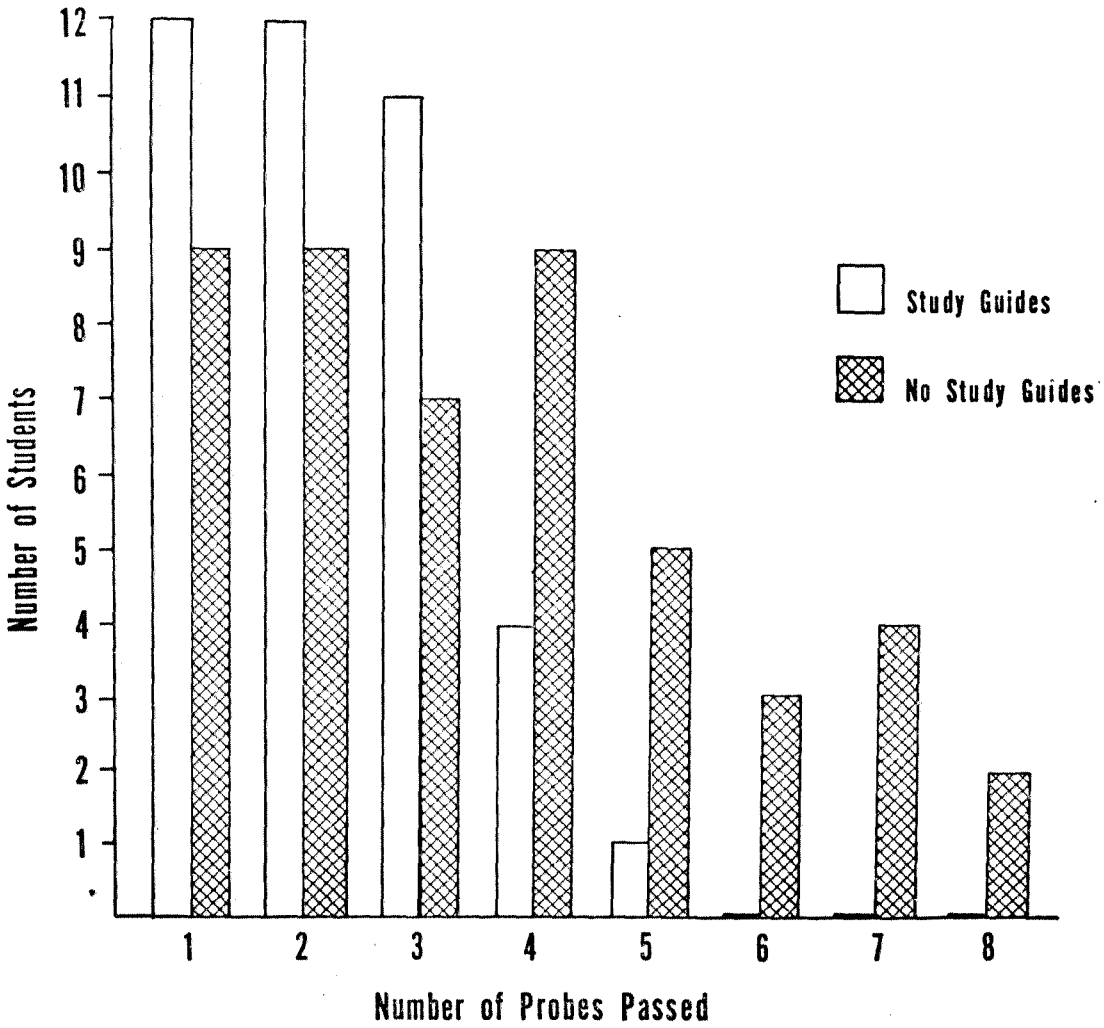

Fig. 2 The number of students passing a specific number of probe items when study guides were and were not available

however, not having study guides facilitated student performance on more (4-8) probe questions.

Students may have known the probe material but answered the questions carelessly because answering the probe correctly did not effect the course grade. For this reason, one of the probe items was included on the study guide during the eighth week. Including the probe item on the study guide did enhance student performance on that item. However, the effect was not as dramatic as anticipated. With the probe items included, student performance on that item would be expected to be comparable to performance on the test item. Performance on this probe item was below the corresponding performance on test items but above related probe performance with study guides available.

There was not sufficient data available from previous classes to equate probe items for difficulty on week 12. Probe items for this unit were therefore arbitrarily selected from the study guide item pool.

During the remainder of the study (weeks 13, 14 and 15), points were given contingent upon each correct probe response. On week 13 students could earn one point for each correct probe response. On the fourteenth week, each correct probe response was worth five points. Finally, students could again earn one point for each correct probe response on week 15. Study guides were always provided during these last three weeks. The effect of the contingent points is

shown under percent probe items passed in Table 1.

When students were given the option of having study guides or not having them, all but two students (at different times) chose to have study guides.

Chapter 4

DISCUSSION

The results of this study suggest that while the use of study guides may facilitate learning specific materials by directing the student's attention to these areas of the text, their use may hinder learning of other textual materials. Areas not covered by the study questions are apparently just scanned or neglected entirely.

Since students received no credit for probes at the beginning of the study, it was possible that they would not respond correctly even if they knew the answer. To test this possibility, a probe item was included on the students' study guides during the eighth week. Students should have performed as well on this item as on test items. As can be seen in Figure 2, probe performance did increase, but not as much as expected. It is likely that students were careless in answering probe items. However, it is the relative difference between probe performance with study guides and without study guides that is of concern.

As the study progressed, it became apparent that a few students had acquired study guides used during the previous semester. Those students may have used these previous study guides to study for the unit test when the class was in a no study guide condition. Since questions used as probes in this study were taken from these study

guides, students might have studied the probe questions, which would then account for higher probe performance during no study guide conditions. Consequently, study guides which had not been used on campus before were used for weeks ten through twelve. Probe items were removed from these study guides before they were distributed to the students. This replication of the early phases of the study supports the conclusion that having no study guides produced improved probe performance and that this effect was not due to the availability of the previous study guides.

It seems important that students should be familiar with the material in its entirety, rather than facts taken out of context. In an attempt to increase probe performance when study guides were available, points were sometimes given for correct probe answers.

It is possible that giving points for probe performance would have produced a more dramatic effect if this contingency had been imposed earlier in the study. By the twelfth week many students had attained or were close to the point total they would accept for their final grade. It would be the slower students who could benefit most from the point contingency so late in the course.

The utility of study questions has been demonstrated frequently (Semb et al., 1973; Semb, 1974). However, both test and probe data indicate that students were studying for unit tests from their completed study guides rather than the

text. In a questionnaire given at the end of the course, 85% of the students indicated that they had read the study questions first and then attempted to find the answers in the text, as opposed to reading the entire unit (or some part) and then answering the study questions. Study guides were designed to complement other written materials, however, students apparently use study questions in place of the text rather than to guide their study habits.

Instructors who wish to use study guides to direct student attention to important points in the text might consider two strategies which would encourage students to read all the assigned textual materials carefully. Students could be informed that the unit tests would include questions not related to study guide items. This technique was moderately successful in increasing probe performance in the present study. An alternative would be to construct the study questions in such a manner that students would have to synthesize information from the unit to be able to answer the question.

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