The Effects of Remedial Quiz Procedures on College Student Performance

Lynette Kaye Chandler
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THE EFFECTS OF REMEDIAL QUIZ PROCEDURES ON
COLLEGE STUDENT PERFORMANCE

by

Lynette Kaye Chandler

A Thesis
Submitted to the
Faculty of The Graduate College
in partial fulfillment of the
requirements for the
Degree of Master of Arts
Department of Psychology

Western Michigan University
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Lynette Kaye Chandler
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Western Michigan University M.A. 1978

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# TABLE OF CONTENTS

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>INTRODUCTION</td>
<td>1</td>
</tr>
<tr>
<td>METHOD</td>
<td>9</td>
</tr>
<tr>
<td>Subjects and Setting</td>
<td>9</td>
</tr>
<tr>
<td>Procedure</td>
<td>10</td>
</tr>
<tr>
<td>RESULTS AND DISCUSSION</td>
<td>15</td>
</tr>
<tr>
<td>CONCLUSIONS AND RECOMMENDATIONS</td>
<td>30</td>
</tr>
<tr>
<td>REFERENCES</td>
<td>33</td>
</tr>
<tr>
<td>APPENDICES</td>
<td>35</td>
</tr>
<tr>
<td>A. Description of PSI Components</td>
<td>35</td>
</tr>
<tr>
<td>B. Students Centered Education Project Description</td>
<td>37</td>
</tr>
<tr>
<td>C. Sample Objectives</td>
<td>39</td>
</tr>
</tbody>
</table>

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INTRODUCTION

F. S. Keller introduced Personalized Systems of Instruction (PSI) or the "Keller Plan" as an alternative to traditional instruction and also as an alternative to individualized instruction systems that use automatic devices such as teaching machines (Keller, 1968). Since their introduction, PSI systems have gained in popularity with students and teachers (Keller, 1971), and research indicates that these systems produce superior performance when compared to alternative systems (McMichael & Corey, 1969; Sheppard & MacDermot, 1970; Malott & Svinicki, 1969). These studies show that students generally rate PSI courses more favorably and score higher on final exams than when alternative methods of instruction are used (see Appendix A for a description of PSI systems).

In recent years, much research has concentrated on validating the effectiveness of each component in the PSI system, rather than the system's effectiveness as a whole (Hursh, 1976; Calhoun, 1976; Williams, 1976). Research on different components is important because unnecessary components add to the cost and complexity of the PSI system and may reduce its effectiveness.

As one common area of study, many researchers have investigated the remedial quizzing component in terms of student performance, cost-effectiveness, and its reinforcing value.

In the "Keller Plan" (Keller, 1968) students had to retake each unit they did not initially master, with mastery defined as
100% correct responding. Students continued taking quizzes over a unit until they demonstrated mastery of that unit. Keller's studies did not report data specific to the remedial component but, they showed overall grade distributions higher than grade distributions from traditionally taught courses. In Keller's system, the majority of students received course grades of A (Keller, 1968, 1971).

Sundberg, Malott, Obar, & Wysocki (1978) compared Keller's remedial component, with mastery defined as 90% correct responding, to a system of optional remediation, and a system of no-remediation. She divided students into three groups, with each group experiencing all three experimental conditions in a counter-balanced order. Students then chose one of the three conditions to work under for the remainder of the semester. The remedial-mastery condition produced superior scores on daily quizzes. Results showed that the majority of students met the 90% criterion on quizzes. The optional remedial condition and the no-remedial condition produced daily quiz scores consistent with the course criterion for a grade of A, which was 85%. Sundberg et al. found no differences between groups in performance on review quizzes, and concluded that mastery and remediation were not necessary, because student performance tended to correlate with the course criterion for an A; so simply raising the criterion for an A should improve performance. She also indicated that mastery and remediation were not cost-effective procedures for a system that employs daily quizzes.

Results from the student's choice of a preferred condition indicated that all students chose the optional remedial system,
suggesting that remediation is reinforcing for students but that forced remediation with mastery is not.

Some problems with this study, may explain why Sundberg et al. failed to find differences between groups. The criterion for a course grade of A was only 85%, which all students met. If the criterion had been higher (as it typically is) there may have been a difference between systems, especially between the two remedial systems and the system of no-remediation. There were also "ceiling effects" due to the ease of course material rendering remediation unnecessary.

Bostow and Blumenfeld (1972) used a remedial system in which students received little or no credit if they performed below 90% on initial weekly quizzes. They stated that this type of low point system (low points for initial quiz performance) provided a strong incentive for students to take a remedial quiz so that they did not retain an extremely low score. They compared this system to a system in which students received the raw score from initial weekly quizzes, but still had the opportunity to remediate. The group receiving low points on initial quizzes performed better on the final exam and on initial weekly quizzes. The students in this group also took more remedial quizzes per opportunity than students receiving raw scores on quizzes.

In a similar study Bostow and O'Connor (1973) compared the deferred point system with a system in which students received the raw score from an initial weekly quiz but did not have the opportunity to remediate. The remedial group performed better on the final exam, receiving at least one-half letter grade higher than the
no-remedial group. In contrast with the Bostow and Blumenfeld study (1972), the experimenters found neither differences on initial quiz scores between groups nor, consistent improvement on remedial quizzes.

Bostow and O'Connor stated that differences may have been obscured on initial quizzes because the remedial group took harder quizzes and were graded more stringently on initial quizzes; the scale for deferred point grading was not equivalent to the scale for raw score grading, it was lower. The authors also stated that students in the remedial group probably worked under an avoidance schedule, trying to avoid remediation because it was aversive. They also suggested that no improvement on remedial quizzes indicated that students did not study for these quizzes.

Trainor (1977) designed a system of individualized remediation to deal with specific problem areas for each student. Students took a weekly remedial quiz covering only those questions or concepts they missed on previous quizzes for that week. He compared this type of remedial system with a system that offered remediation during the final three weeks of the course, comparing initial quiz scores and final exam scores, before remediation occurred for the control group. Results showed no significant difference between groups on initial quizzes nor on the final exam. Trainor then examined the lower quartile of students in each group and found that the poorer students in the remedial group performed better than the poorer students in the control groups, suggesting that remediation helps low scoring students, and that results between groups may have been obscured because only part of the remedial group benefited from remediation.
In summary, research concerning remedial systems yields somewhat conflicting results. Sundberg et al. found no significant differences in favor of remediation. Bostow and Blumenfeld found that remediation yields higher final exam scores, higher initial quiz scores, and better remedial quiz scores; yet Bostow and O'Connor reported that remediation only helped improve final exam performance. Trainor found that remediation only helped the low scoring students. All of this research, however, with the exception of Sundberg et al., generally indicates that remedial procedures can help students, and research indicates that the opportunity to remediate is reinforcing for students (Sundberg et al. 1978; Malott & Svinicki, 1969). This suggests that some type of remedial system should be one of the components of a PSI system, yet it is difficult to design a remedial system that is effective -- to know what components actually increase the effectiveness of remediation. There tend to be several problems, some common to all remedial systems, some common to only a few remedial systems, that should be addresses before an effective remedial system can be designed and studied:

1. The student's rate of progression through quiz units is very slow because students take remedial quizzes before continuing to subsequent units (whether they are required to or not) or they don't take quizzes at all (Powers & Wald, 1974; Welsh, 1977). As a result, students take several quizzes at the end of the course which they typically score poorly on, or they do not complete some of the quizzes. This is a problem that many PSI courses encounter, however, remediation procedures tend to inflate it.
2. Some studies report that student performance on remedial quizzes often does not improve (Bostow & O'Connor, 1973; Sundberg et al. 1978). This may occur because there are no contingencies directly on study behavior between an initial quiz and a remedial quiz.

3. Some systems do not limit the number of remedial quizzes that students can take per unit. Students tend to take several remedial quizzes which contributes to problem one listed above, and students often receive a form of the quiz they have already had so that higher scores may be due to knowing which questions are on the quiz rather than improved mastery of the concepts being evaluated (Powers & Wald, 1974).

4. Students sometimes score poorly on initial quizzes when remediation is available (Trainor, 1977; Bostow & O'Connor, 1973). The opportunity to remediate may lessen the incentive to study for initial quizzes and to score well on initial quizzes, and the increased number of remedialed taken is not cost-effective for most systems.

5. Many remedial systems are not cost-effective in terms of the time spent on remedial activities. Teaching assistants spend valuable time grading several quizzes per student and recording scores for those quizzes, time that could be spent helping the students or on other valuable tasks. Students spend too much time taking remedial quizzes, time that should be spent studying for and taking initial quizzes. Many remedial systems are not cost-effective in improving performance and the relationship between staff time and student performance indicates that these systems need to be changed (Sundberg et al. 1978; Powers & Wald, 1974).
A partial solution to some of these problems involves the deletion of a stringent mastery criterion for progression through units of material. Johnston and O'Neill (1973) showed that students were able to meet the criteria defined for a course grade of A. They divided students into five groups and systematically altered the criterion for a grade of A for three of the five groups, with the criteria defined as 90%, 75%, or 60% for each group. Each group experienced the criteria in a counterbalanced order. Results indicated that students' performance equalled or surpassed the defined criteria, whether it was 90%, 75%, or 60%. A fourth group also experienced each criterion, they were told which criteria yielded a grade of A (90%), B (75%), or C (60%). Students again performed to meet the criterion for a grade of A. A fifth group was told that they would be graded on a normative scale. Students in this group performed significantly poorer than the other four groups.

Whitehurst and Grover (1975) investigated the role of free choice of grades versus forced excellence of grades. Students in the forced excellence group received an A or an F as course grades. If these students completed 12 quiz units they received an A, if they completed fewer than 12 units they received an F. A control group had the opportunity to work for whatever course grade they chose, with the grade defined by the number of quiz units they completed. Of the students in the forced excellence group, 86% received grades of A, and only 66% of the students in the control group received course grades of A. Both these studies and Sunderberg's et al. (1978) study suggest that a mastery criterion for progression is not a necessary component of a PSI package for
students to achieve a high level of performance and that a mastery criterion can be replaced with a different sort of criterion. Johnston and O'Neill (1973) suggested that professors define the minimal acceptable criterion for the highest grade possible only and define this criterion precisely in terms of student behavior. These suggestions could be incorporated into a remedial system. A minimal criterion can be defined which students must meet to qualify for a remedial quiz, dealing with the problem of students not performing well on initial quizzes and reinforcing initial study behavior by giving the opportunity to remediate. Criterion for the type of study behavior that occurs between initial and remedial quizzes can be specified with respect to student behavior which should yield improvement on remedial quizzes.

The present study attempted to design a remedial system to deal with the problems common to most remedial systems. This was done by (a) controlling the rate of progression through quiz units so that students' progression thru the course is well-placed, (b) placing contingencies on study behavior for remedial quizzes so that remedial quiz scores increase, (c) limiting the number of remedial quizzes available per unit thereby decreasing the costs of a remedial system and (d) defining minimal criteria for performance on initial quizzes in order to remediate and increase initial quiz performance.
METHOD

Subjects and Setting

The Student Centered Education Project (SCEP) is a contingency-managed program offered to undergraduate majors and minors in Psychology. This program incorporates many aspects of the "Keller Plan" as well as many components from Personalized Systems of Instruction such as frequent quizzing, pacing procedures, the use of teaching assistants, objectives for each quiz unit, and supplementary lectures or discussions (see Appendix B for a complete description of the SCEP program).

The Student Centered Education Project offers two undergraduate programs: an introductory program (SCEP 1) and an advanced program (SCEP 2). Each program offers two courses per semester at an accelerated pace, with each course lasting approximately half the semester.

The present study took place in the SCEP 1 program, which offers Introduction to Applied Behavior Analysis (Psychology 151) during the first 7½ weeks of the semester and Analysis of Child Behavior (Psychology 161) during the final 7½ weeks of the semester. This study occurred during the first course. The text was Introduction to the Analysis and Modification of Behavior, by Malott, Tillema, and Glenn (1977).
All seventeen students enrolled in the course signed consent forms volunteering to participate in this study on the first day of class. Ten students listed Psychology as their major area of study and seven listed it as their minor area of study. Five students were freshmen, five were sophomores, six were juniors, and one student was a senior.

Two students, whose data were not included, dropped the course after the first week of the semester, leaving fifteen students to participate throughout the study.

Procedure

Remedial systems

The experimenter introduced two types of remedial systems and one system of no-remediation. The first remedial system, designated as Remedial 0 (with objectives) included the following three components:

1. Students were required to obtain a score of seven out of ten, or better, on each daily quiz, to qualify for a remedial quiz. This score was selected because in a previous semester 87% of the students received a score of seven or better on initial quizzes. If students received a score lower than seven, they could not remediate and the initial quiz score remained on record.

2. Students showed the teaching assistants their hand-written answers to the objectives for the unit they wished to remediate. Each unit included approximately 15 objectives which indicated important
concepts or information from the material (see Appendix C for sample objectives). The experimenter then checked the objectives for correct and incorrect answers and circled the incorrect answers, which the students then corrected before taking a remedial quiz.

3. The experimenter defined a minimum rate of progress for taking remedial quizzes; students were required to take remedial quizzes by specified dates. Students could take remedial quizzes ahead of these target dates, but not after the target date had passed. After the target date has passed, the score from the initial quiz remained on record. Students generally had two days after taking an initial quiz to take a remedial quiz.

The second remedial system, designated as Remedial WO (without objectives), included components one and three from the Remedial 0 system described above. Students were required to obtain a score of seven, or better, on an initial quiz, to qualify for a remedial quiz and, students followed defined target dates for taking remedial quizzes, but they did not show the teaching assistants hand-written answers to the objectives before taking a remedial quiz. Remedial quizzes were optional in both remedial systems and students could take only one remedial quiz per unit; the instructor used the best of the two scores (initial quiz or remedial quiz) when calculating final course grades.

The No-remedial system did not give students the opportunity to remediate quizzes. Students took only one quiz per unit and the score for that quiz remained on record.
Dependent variables

Three variables reflected student performance as a function of experimental conditions: (1) best attempt scores across conditions, (2) initial quiz scores and remedial quiz scores during remedial conditions, and (3) the distribution of quiz scores per condition.

The experimenter also examined correlations between students' entering grade point average (GPA) and percentage improvement of quizzes from no-remedial conditions to remedial conditions.

Student and staff in the program completed evaluations of each remedial system, comparing each system and choosing a preferred system.

Experimental design

Students were randomly assigned to three groups, with each group experiencing one type of remedial system as well as the system of No-remediation, with each condition lasting for six quiz units. Two groups experienced conditions in a reversed order and one group experienced conditions in a sequential order (A/B design), with no reversal of conditions (see Table 1).

The design used for these three groups was part of a larger counterbalanced design including six other groups. Data for those six groups were confounded by uncontrollable variables, and so are not reported.

Reliability measures

Taking reliability measures on quiz grading occurred as a regular part of the SCEP program. Graders wrote comments and point
Table 1
Order of Condition Presentation for all Groups

<table>
<thead>
<tr>
<th>Group</th>
<th>Condition One</th>
<th>Condition Two</th>
<th>Condition Three</th>
</tr>
</thead>
<tbody>
<tr>
<td>One</td>
<td>No-remedial</td>
<td>Remedial with Objectives</td>
<td>No-remedial</td>
</tr>
<tr>
<td>Two</td>
<td>No-remedial</td>
<td>No-remedial</td>
<td>Remedial with Objectives</td>
</tr>
<tr>
<td>Three</td>
<td>No-remedial</td>
<td>Remedial without Objectives</td>
<td>No-remedial</td>
</tr>
</tbody>
</table>
values on blank quiz forms rather than on the students' quiz. Advanced teaching apprentices (ATA) then graded the students' quizzes and compared the two grades for accuracy, scoring an agreement when both graders (the TA and ATA) scored the same point value for each quiz question on a graded quiz. The ATA scored a disagreement when different point values were assigned per quiz question. The experimenter used a type-two reliability, 
\[
\frac{\text{agreements}}{\text{agreements} + \text{disagreements}} \times 100
\]
to assess the accuracy of quiz grading, using approximately five quizzes for each TA a week. The reliability for quiz grading was 79%.

The experimenter calculated reliability on the transfer of quiz scores from the graded quiz to cumulative score cards used for final grade calculation by randomly selecting five quizzes for each condition and scoring agreements or disagreements with the recorded score. Type-one reliability was used to assess reliability, which was 100%.
RESULTS AND DISCUSSION

Students' performance improved during remedial conditions, especially the performance of low scoring students, and the opportunity to remediate was reinforcing for students.

Quiz performance as a function of conditions

Figure 1 shows individual students' mean quiz score (out of six quizzes) per condition (the best attempt score during remedial conditions was used to calculate means). Fourteen of the 15 students performed better during a remedial condition than during the first No-remedial condition, with the percentage improvement ranging from 2.5-20%. The data from both No-remedial conditions for Group Two were combined after obtaining non-significant differences between these two conditions. One student did not improve during remediation, but that student's quiz scores were always above 90%, so they never took a remedial quiz.

Nine of the 15 students performed better during a remedial condition than during both No-remedial conditions, but six students performed better during the second No-remedial condition. Four of these six students were members of Group One and their increase in performance may be explained by the contingencies of the Remedial-with-Objectives system; during this condition students in Group One completed hand-written answers to unit objectives before taking a
Figure 1

Individual Students mean quiz score for six quizzes per condition
STUDENTS IN GROUP 1

STUDENTS IN GROUP 2

STUDENTS IN GROUP 3

Quizzes Points

NR
RO
RWO

1 2 3 4 5

1 2 3 4 5

1 2 3 4 5

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remedial quiz. Their verbal reports indicated that they continued to complete unit objectives during the second No-remedial condition. Students in Group Three, experiencing the Remedial-without-Objectives system, were not required to complete written objectives before taking a remedial quiz and their verbal reports indicated that they did not consistently complete objectives during the second No-remedial condition. This may explain why members of Group One continued to improve but members of Group Two did not.

The group means for the data in Figure 1 are presented in Figure 2 and the group effects reflect individual data. Figure 2 also presents the mean for initial quiz scores during remediation for each group, showing that the remedial systems served to increase the first attempt scores during remediation (compared to scores in the No-remedial conditions) and to further increase second attempt scores or remedial scores when students took remedial quizzes. There was a significant difference between the No-remedial scores and the best attempt scores during remediation Groups Two and Three only, \( t(4) = 2.99, p < .05; 3.88, p < .05 \), respectively.

**Correlation between GPA and performance**

The experimenter examined the correlation between students' entering grade point average and the mean percentage improvement on quizzes between the first No-remedial condition and remedial conditions. Figure 3 shows that this percentage improvement was negatively correlated with GPA, \( r = -.7018, p < .0075 \), with the lower GPA students benefiting most from remediation.
Figure 2
Mean quiz score per group per condition
Figure 3

Percentage improvement from No-remediation to Remediation correlated with grade point average
Figure 4 presents individual students' mean quiz scores for the first No-remedial condition and the remedial conditions as a function of GPA. The students with low GPAs scored lower on quizzes during the No-remedial condition than students with a high GPA, resulting in an upward trend of scores. This trend is lost during the remedial conditions with low scoring students now scoring nearly as well as the higher scoring students. Figures 3 and 4 indicate that remediation can be more beneficial to the poor performing student or the low GPA student, supporting Trainor (1977) and Bostow and O'Connor (1973). Further research may determine whether or not the lack of improvement for high scoring students is due to ceiling effects (i.e., these students could not improve their scores because they reached the highest criterion during all conditions).

**Distribution of quiz scores per condition**

Table 2 shows the distribution of quiz scores for each group for all conditions. High scores (90 and 100%) increased during remediation, with the entire distribution of scores shifting to meet or surpass the minimal 70% criterion of initial quizzes. This indicates that students were working to meet the 70% criterion; working for the opportunity to remediate.

When remedials were available, as happened on 29 occasions, only 72% of them were taken. This may imply several things. First, remediation may be aversive and students were working to avoid taking a remedial quiz, even though they worked for the opportunity. Second, it might be that preparing for and taking remedial quizzes.
Figure 4

Students' mean quiz scores as a function of grade point average
Table 2
Distribution of Quizzes per Condition

<table>
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<th>Group Two</th>
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<td>No Remedial</td>
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<td>9, 10</td>
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<td>21</td>
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<table>
<thead>
<tr>
<th>Score</th>
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<td></td>
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<td>Remedial WO</td>
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<tr>
<td>9, 10</td>
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<td>4 &amp; below</td>
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competes with preparation for and taking initial quizzes. Third, in a system employing daily quizzes one low score is not as crucial as it might be in a course with fewer quizzes. It is fairly easy with only a few scores of seven or eight to maintain a 90% score average, so it is not necessary to remediate all scores when the opportunity is available.

Remedial evaluation

All students and staff indicated that remediation should continue as part of the course (Figure 5).

The students were asked which remedial system they would prefer to work under for the remainder of the semester, though students had previously experienced only one type of remedial system.

Nine students out of thirteen preferred the Remedial with Objectives System. Seven of these nine students had experienced the Remedial with Objectives System while two of them had experienced the Remedial without Objectives System.

Three students preferred the Remedial without Objectives System, the system they had experienced. One student stated no preference after experiencing the Remedial with Objectives System.
Figure 5

Remedial Evaluation
CONCLUSIONS AND RECOMMENDATIONS

A modified remedial system, designed to deal with problems common to remedial systems can be a critical and useful component of a PSI package. Students performed better on quizzes given the opportunity to remediate than they did without the opportunity to remediate.

The results also support Trainor (1977) and Bostow and O'Connor (1973) as low scoring students benefited from remediation more than high scoring students. They also supported Bostow and Blumenfeld (1972) by showing an increase in performance for initial quizzes and better performance on remedial quizzes. The data are consistent with Johnston and O'Neill (1973) and Sundberg et al. (1978) since students' performance tended to correspond with defined performance criteria.

These remedial systems add some novel solutions to many of the problems with typical remedial systems. They reward high first attempt scores by making the opportunity to remediate contingent on them. They specify target dates for taking remedial quizzes; dates designed to give students time to study for both initial and remedial quizzes, and to control the rate of progress through the course.

The Remedial with Objectives system is the most preferred system. It seems to be the better system because it specifies and requires study behavior between quizzes; behavior that students indicate is useful and behavior that seems to result in better per-
formance on quizzes. Writing answers to objectives may improve performance for two reasons: (1) it may cause students to contact the material twice; they read it and then contact it again by writing the answers to objectives, (2) it may also cause students to study, in cases where they would not normally read the book or complete objectives before quizzes.

The Remedial with Objectives system is a desirable system in terms of student and staff time and the goals of the Student Centered Education Project and the performance it yields. The time that students spend writing objectives (between \( \frac{1}{2} \) and one hour per unit), while long, is beneficial because it is related to course work and seems to increase scores on remedial quizzes and, may help pinpoint areas of deficiency for the students. When the system is in effect, teaching assistants would grade objectives rather than the experimenter, which takes about ten minutes per student (teaching assistants have the answers to the objectives available when grading). This is desirable because a main duty for teaching assistants is to help students by interacting with them; grading objectives insures that this is done with minimal effort and that the interactions are beneficial for the students. A more thorough analysis of costs and benefits would determine if the systems were cost-effective.

Of the remedial systems examined the author recommends that instructors adopt the Remedial with Objectives system, recognizing, however, that more research is needed in the remedial area and within this particular system; as indicated by the following questions that still need to be addressed:
1. Is it necessary for students to complete the objectives for a unit before taking a remedial quiz or could the system be more effective if students completed objectives before the first quiz attempt?

2. Could the minimal criterion be raised or lowered and still yield the same effects?

3. Could the minimal criterion be set only for the course grades and remediation eliminated?

4. Could the system be more cost-effective — could the frequency of remediation be changed; could the type of required study behavior between quizzes be different?

5. Should students be allowed or forced to remediate; should they be able to remediate all quiz scores?
REFERENCES


Williams, R. L. Personalized systems of instruction: Where it has been and where it needs to go. Unpublished manuscript, University of Kansas, Lawrence, Kansas, 1976.
APPENDIX A

Description of PSI Components

Instructors using a PSI format often modify the basic package, although several components are common to almost every PSI system.

1. Instructors divide course material into small units (20-25 pages) and students take frequent quizzes over these units, with most systems employing either daily or weekly quizzes.

2. Instructors provide objectives for each unit, which refer to important information and concepts in the material and ask questions over the material.

3. A mastery criterion (usually 85-100%) defines minimal criteria for progression to the next units. Many systems require students to master each quiz before taking the next unit quiz.

4. Remedial quizzing allows students the opportunity to retake quizzes over units that they did not initially master.

5. A self-pacing component allows students to take quizzes at a self-determined rate of progress. An alternative to self-pacing is instructor-pacing, in which the instructor defines a minimum rate of progress for taking quizzes, permitting students to take quizzes faster than the defined rate, but not slower than this rate.

6. Students receive immediate written or vocal feedback on quiz performance and continual feedback on cumulative performance.

7. Written materials convey the most critical information rather than lectures. Lectures and discussions supplement material, acting as a source of motivation.
8. Student proctors or teaching assistants aid the instructor by administering and grading quizzes and tutoring students. Proctors are students who have taken the course or students who have demonstrated knowledge of the course material.

Instructors using a PSI format may use all of the components listed above, part of them, or slight variations of the components.
APPENDIX B

SCEP Program Description

Students take daily quizzes over short units of material (approximately 15-20 pages). Daily quizzes are a mixture of multiple choice, true/false, fill-in-th-blank, and short essay questions. Each quiz contains between five and ten questions and is worth ten points. Students receive study questions over the material to help prepare for quizzes.

The instructors define a minimum rate of progress for taking daily quizzes. Students may take quizzes ahead of this defined date, but may not take quizzes after the target date has passed, those quizzes not taken by a target date are scored as zero points earned.

Students play a major role in the programming and administration of SCEP. Graduate assistants define course policies, course procedures, and supervise undergraduate students who have completed the program and serve as teaching assistants (TAs). Teaching assistants administer quizzes, grade quizzes, and teach students who want help with the material. In addition, each TA serves as a monitor for approximately three students. As a monitor, the TA graphs the students' cumulative rate of progress, the percentage score for quizzes, and meets weekly with the student to monitor the graphs or discuss problems that arise.

Weekly lecture and discussion seminars are a part of the SCEP program. Students earn points for attendance and participation at
these seminars. During seminars students listen to guest lecturers, discuss assigned reading material, take quizzes over the material, and meet with their monitor.

Students attend a daily lab where they complete four experiments using rats and four lab reports describing the experiments and results. The experiments demonstrate many of the concepts from the material.

Course grades for the Psychology 151 course come from four sources: quizzes, seminars, lab scores, and final exam scores. Quizzes, seminars, and lab scores combine to make a composite percentage for an in-class score. Quiz scores constitute 50% of the in-class score with seminars and lab scores each constituting 25% of the in-class score. The grade scale for this cumulative in-class percentage is as follows:

- 90-100% of total possible points = B
- 80-89% of total possible points = C
- 70-79% of total possible points = D
- Below 70% of total possible points = F

This in-class grade can be raised one letter grade by receiving an equal or higher percentage score on the final exam, for example, if a student had 90% of total possible in-class points and received 90% on the final exam, that student would receive a course grade of A, and likewise for in-class grades of C, D, or F. A final exam functions only to raise an in-class grade, never to lower it.
APPENDIX C

Sample Objectives

There are generally two types of objectives in the book, Introduction to the Analysis and Modification of Behavior (1977), knowledge and conceptual objectives. Knowledge objectives ask students to reproduce what was presented in the book. Conceptual objectives ask students to reproduce what was presented, but students must also "understand" what was presented, so that they can paraphrase or give original examples of the concept (Vargas, 1972).

These objectives correspond closely to questions or unit quizzes so that completing objectives between quizzes should increase performance on remedial quizzes.

Sample knowledge and conceptual level objectives are presented below:

**Knowledge level**

1. What is inter-rater reliability?
2. Define validity.
3. When do you take baseline data? What do they show?
4. What three things are included on the consent form?

**Conceptual level**

1. Give an instance of a true rule.
2. Give an instance of a rule where the conditions under which the act occurs aren't stated.

3. Explain what we mean when we say rules can gain "conceptual control" over acts.