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The Effect of an Individualized Remediation Program on Comprehensive Final Examination Performance

Timothy N. Trainor
Western Michigan University

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THE EFFECT OF AN INDIVIDUALIZED REMEDIATION PROGRAM
ON COMPREHENSIVE FINAL EXAMINATION PERFORMANCE

by

Timothy N. Trainor

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

Western Michigan University
Kalamazoo, Michigan
August 1977
ACKNOWLEDGEMENTS

I would like to express my thanks to the faculty of the Psychology Department at Western Michigan University. In particular Dr. Richard Malott whose help and courses shaped my college experience, Dr. Jack Michael, Dr. Howard Farris and in the pinch Dr. Wayne Fuqua, for their special assistance with my thesis. Most of all, I would like to acknowledge my respect and thanks to two beautiful and intelligent ladies: Barb Fulton and Sandi Laham.

Timothy N. Trainor
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Western Michigan University, M.A., 1977
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INTRODUCTION

Psychologists have long recognized individual differences in the rate of acquiring new skills and concepts (Skinner, 1953, 1968). Though educators report recent systematic attempts to deal with the problem of individual differences in higher education (Johnson, 1976, Hursh, 1976), flaws still exist with course designs now employed in academic settings. There seems to be a need to reconsider teaching techniques and to revamp educational systems to help students make maximum use of their learning environments.

Keller (1968) describes an educational system that addresses this problem of individual acquisition rates. His course design contains five essential features: First, students pace their own progress through the course. This allows them to spend more time on difficult material, while freeing them to rapidly advance through easier units. Second, course contingencies require that each unit be mastered before students continue to the next. Failing a test does not free the student to progress on and they are required to remediate the material until they show adequate preparation. This represents an attempt to eliminate the problem of students continuing through a class without mastering the prerequisite skills needed for subsequent units.

The third feature of the Keller plan uses lectures and discussions as motivational tools not as a medium for conveying course material, underscoring the fourth aspect of the course format which emphasizes the written word for the presentation of pertinent
information. The fifth feature of the Keller system is to use students in course administration. Students having completed the course earn academic credit for grading quizzes and tutoring their currently enrolled peers.

Testing procedures evolve from one of two testing formats: either a mastery criterion or a one-trial test. Scriven (1967) termed the mastery criterion approach "formative" testing in that it is used as a diagnostic measure versus one-trial testing -- termed "sumative" testing -- which evaluates achievement. Instructors using evaluative testing procedures usually do not address the problem of developing a student's deficit areas. They seem to assume students will engage in outside work to generate the skills needed for coverage of new material.

Course structures using a mastery criterion allow students to remediate over those concepts that testing procedures indicate need additional clarifications. According to Keller "with this teaching method, students who are presumably inferior may show up better upon examination than superior students taught by more conventional procedures." This may be attributed to the fact that all students are required to master the material thus minimizing individual differences. The Keller plan represents one educational design that provides adequate material coverage and allowance for remediation when necessary.

Several studies have attempted to analyze course components in which students remediate poorly mastered material. In one study by Bostow and O'Connor (1973) students enrolled in an educational
psychology course were randomly assigned to one of two conditions. One group used an incentive to remediate system and the other an original score system. When students in the incentive to remediate group were unable to master a unit on the first attempt, they were able to attend a remedial component in order to raise the initial quiz score. Quizzes for the original score group were graded on a percentage basis and no remedial component was available. No significant differences were found in comparing the two groups initial weekly quiz scores and the authors reported no consistent trend toward better performance on the retakes by the remediation group. Nevertheless, the authors did find a statistically significant difference on the comprehensive final examination in favor of the remediation group.

The results appear contradictory since there were no differences in quiz scores but there was a significant difference on the examination scores. The authors concluded that differences in the difficulty of initial and remedial quizzes may have obscured a true difference; they hinted that the effect might have been due to repeated exposure to the course material.

In a later study Bostow and Blumenfeld (1975) documented the effectiveness of another retesting procedure. In a high-incentive-to-remediate condition, points were determined by a student's initial score with respect to a predetermined point range. These students could improve their point standing from the first quiz by adding points obtained from a remedial quiz. The control condition assigned percentage point values to quiz scores and allowed students to retake
the weekly quiz, but only the better of the two scores was used. Though students were not required to attend remedial lectures, those in the high-incentive group attended a larger number of remedial lectures and quizzes.

The results indicate that initial, weekly-quiz performance was higher with students using the high-incentive system. Furthermore, the students in the high-incentive group had a higher distribution of scores on the final examination. The authors attribute these results to remedial attendance.

The results may also be due to different reinforcement schedules for academic performance. Students in the high-incentive group could avoid remedial quizzes by acceptable performance on the first quiz and the point structure for the high-incentive group was set up to improve on the initial quiz score through remedial attendance. This was not the case for students in the weak-incentive condition. They were working on a straight point scale and attendance to remedial quizzes could only improve their score by replacing it with a higher score from the remedial quiz. No additional points were received for remedial quiz attempts. These results indicate that an incentive program for remedial behaviors does increase remedial participation and seems to improve initial quiz and final examination performance. Therefore, the improved final examination performance could be a function of two factors: better initial quiz performance and/or increased remedial attendance.

Radiker (1975) attempted to separate the effects of written feedback from tutorial assistance in a modified Keller system.
Students received either written feedback covering specific objectives missed through initial quizzing or tutorial assistance over these objectives. They were systematically exposed to both conditions and the results indicate that by objective feedback alone resulted in the same mid-term and final examination performance as the tutorial help. A control group was not used to show that either remedial procedure was better than none.

Classes using contingency management usually rely on written objectives and frequent quizzes. Lectures and discussions are used as motivational tools for student participation. They differ from Keller type courses in that testing dates are usually determined by the instructor. Other components, such as student proctors and a mastery criterion for quizzes may be missing in the contingency-managed course structures.

In a study contrasting sections using the Keller approach to sections using a contingency-managed design without remediation sequences (Spencer, et al., 1975) the progress through course units of the contingency-managed students was slightly inferior to students using a Keller system with a 100 percent mastery criterion for unit progress. In a follow-up study (Phillips and Semb, 1975), remediation requirements found in the Keller sections were also available in the contingency-managed sections. But here the comparison yielded no statistically significant differences between the two teaching methods on any performance measure. These data suggest the need for further analysis of remediation procedures independently of the concurrent contingencies under which students operate.
In a contingency-managed course design using student proctors, a mastery criterion, and remediation procedures, Malott and Svinicki (1969) outlined a "Doomsday Contingency" which called for 100 percent mastery of each quiz or a failure in the class. The course structure provided nightly remedial lectures and quizzes for students not passing the daily quiz, though students had the alternative of taking remedial quizzes later in the week without attending a remedial lecture. The effectiveness of this design was measured by the fact that over 80 percent of the students received A's and only two percent failed. These studies highlight the fact that one difficulty with interpreting research on remediation is that these procedures are often part of a treatment package and not analyzed independently.

In an analysis of one treatment package for a contingency-managed course, Janczarek (1970) compared the examination performance of students taking daily quizzes with students taking only the mid-term and final examinations. Students in the daily quiz group had several opportunities to master each unit. During remediation a passing grade could only be obtained by correctly answering all remediation questions. Statistical significance between groups on examination performance was reported but the difference between the groups did not represent a practical significance in terms of final grades. The author also stated that a significant inverse relationship existed between both mid-term and final examination scores and the number of quizzes failed but later remediated. This would not be expected with completely effective remediation procedures because students failing the initial quiz but passing the remedial quiz
should have demonstrated comparable mastery in respect to those students who did not remediate. It was hypothesized that examination scores should not have been affected by remediation if the material had been mastered in the remediation phase. This inconsistency may be due to a practice effect which allowed students to eventually pass the remedial quiz due to repeated exposure to the testing format.

With a replication of Janczarek's thesis, Hubbard (1971) incorporated two major procedural differences in using review and remedial quizzes. Review quizzes entailed a systematic coverage of previously tested objectives and were spaced throughout the semester. Hubbard did not require the students to master each unit, instead, quiz items that more than ten percent of the students missed made up remedial quizzes given to all students. The results indicated that daily quizzes with additional review and remediation had statistical significance and practical effects in respect to final grades when examination performance was compared to an exam-only class. In effect the practical differences may be attributed to repeated exposure of all students to difficult material.

There are structural differences with various remediation procedures. Procedures that have students retake a quiz covering a different form of the same set of quiz questions is not the same as remediating specific deficit areas. Simple retesting systems send students back to the same material or select questions shown to give a majority of students problems. This system may have a shotgun-type effectiveness in that retesting students over a predetermined objective set postulates that they need to restudy the original
material with the assumption being that the text and associated lectures are sufficient. In other words, since instructors cannot spend the time and resources in determining specific problem areas for each student, classes as a whole are often sent back to a portion of the material that has already been covered. In this way it is hoped that each student will again cover deficit areas in remediating the larger predetermined objective set. Instructors sending the student back to the original material must assume the problem is related to a student's study behavior when they fail to master the material during initial coverage; for instance, they may not have read the material at all or at least not thoroughly enough. In fact this assumption could be invalid in that the failure to master concepts may be due to the difficulty of the original material for some students rather than an inadequacy in study behavior.

Remediation formats can be incorporated into course structures in at least two ways: they may be included in the ongoing development of course materials or left to the end of the course as review sessions. The introductory psychology classes at Western Michigan University used the latter of the two formats. New material was presented for the first eleven weeks and final grades assigned at the end of this period. Only those needing supplementary contact with the material would stay for the review sessions. This approach is contrasted with remedial systems integrated with daily course operations and can include two different types of remedial applications. One would have all students going back to the original material for restudy and then take another form of the same quiz. Variations of
this procedure were used in all of the previously cited remediation literature. Another procedure would entail individualized feedback outlining an objective set with which students have had problems as indicated through testing. Remediation would then cover only this special objective set and be geared specifically to individual students. But, this procedure can only be effective if testing conditions sample all essential course concepts.

The present study evaluated the effectiveness of one remedial system. Students were given feedback and remedial quizzes over specific concepts they failed to master. The empirical question to be answered was: Can final examination performance be increased by placing contingencies on reviewing text material insufficiently mastered during initial quizzing?
METHOD

Subjects

During the winter semester of 1976, 38 student volunteers participated in this study. They had enrolled in the Introductory Psychology course at Western Michigan University -- an introductory course for students not majoring or minoring in psychology. None of these students had prior knowledge of the experiment before enrolling in the course.

Setting

The course presented new material during the first 11 weeks. Students took quizzes over readings on Monday through Thursday and had the option of attending lectures on Friday. During this time they attended laboratory periods Monday through Wednesday. The final examination occurred at the end of 11 weeks.

Advanced students served as Teaching Apprentices in the introductory classes. Teaching Apprentices earned academic credit for managing one class section. Their in-class duties included administering quizzes and helping students with laboratory problems. Outside of class they graded laboratory assignments and ran daily reading and videotaped quizzes through an optical scanner for on-line computer grading. Paid student assistants monitored and graded the performance of the Teaching Apprentices.

During the first 11 weeks two texts, Developing Self-Control (Foster, 1974) and An Introduction to Behavior Modification (Malott, 1973), were used. The remedial program dealt only with quiz
results drawn from *An Introduction to Behavior Modification* reading quizzes. Specific reading assignments were outlined by the use of a student newsletter which specified the assignments for a week (see Appendix A). Daily quizzes used a multiple-choice format and each question from *An Introduction to Behavior Modification* tests material related to objectives found at the end of the chapters. Furthermore, each question was associated with a unique objective from the reading assignment. Objectives were not used with *Developing Self-Control* since it is a programmed text.

Each quiz contained all the major conceptual questions for a unit. These conceptual questions covered objectives which were primary course goals and did not test for specific textual examples (see Appendix B).

All students took a 50-item mid-term and final examination covering major conceptual questions and used a special pool of questions. The form of these questions differed from those on the daily quizzes in that both stems and distractors had been altered (see Appendix B). The same concept was tested in a novel format, thereby decreasing the possibility of a practice effect.

A student's in-class grade consisted of points from laboratory reports and daily quizzes. A grade "B" was the highest possible; consequently, 90 percent and above equaled a "B", 80 to 89 percent equaled a "C", and so on. The final examination scores raised a student's final grade. Therefore, students earned a final letter grade of "A" by having a minimum of 90 percent of the in-class points and correctly answering 90 percent of the examination.
questions (see Appendix C). Furthermore, the examination score raised the course grade a maximum of one letter, if the score was at least one letter grade higher than the in-class grade.

Procedure

Prior to participation in the study each student received information on the research guidelines and procedures following university policy on human subjects research (see Appendix D). They signed a written consent form and were randomly assigned to a remedial or no-remedial group.

No-Remedial Group

Students in the no-remedial group viewed videotaped presentations on Thursday. At this time they took a ten-point quiz covering material presented in the videotape in addition to the regularly scheduled reading quiz. After the final examination these students had a choice of taking the final grade earned after 11 weeks or attending a four-week review period during which they could raise their grade. The four-week review period covered the same material and sampled quiz items from the pool of questions used in the regular portion of the course.

Remedial Group

The remedial group was informed the weekly remedial program replaced the review period offered as normal course procedure during the last four weeks of class. In the remedial section students took weekly remedial quizzes. On every Tuesday these students received feedback sheets (see Appendix E) which listed the objectives
missed from the previous week that made up their Thursday remedial quiz.

Remedial quizzes covered only the material presented in *An Introduction to Behavior Modification*. Each question missed on the first reading quiz was placed on the weekly remedial quiz for that individual student (see Appendix F). These students then took the remedial quiz in addition to the regularly scheduled reading quiz.

The remedial quiz had a maximum value of ten points -- the same as the no-remedial group's ten-point videotape quiz. To determine a student's remedial quiz score, the number of questions wrong was subtracted from the possible ten points. However, the lowest score any student could receive was zero even though that student may have missed more than ten questions on the remedial quiz. In other words, if a student missed 12 questions during the previous week, all 12 questions would appear on the remedial quiz. The student's remedial quiz score was then determined by subtracting the number incorrect from ten; a score of zero was assigned if more than ten questions were missed. Students correctly answering all questions in any week automatically obtained the ten remedial quiz points.

**Statistical Analysis**

Nine questions were eliminated from the statistical analysis. Four questions proved to be worded awkwardly and material from *Developing Self-Control* made up the other five questions. The questions from *Developing Self-Control* were not surveyed because they were only used as a matching parameter. Consequently, the
experimental group was never exposed to the remediation program during the course coverage of these materials. The analysis of final examination scores only took into account 41 examination questions.
RESULTS

The statistical analysis followed a between-subject correlated sample design. Students in the remedial group were matched to students in the no-remedial group on the basis of the quiz score totals for the 16 daily quizzes covering Developing Self-Control. Two students dropped from the no-remedial group reducing the study to 17 matched pairs.

Figure 1 shows the frequency distribution for the final examination scores. The remedial group obtained a mean percent score of 80.34, while the no-remedial group obtained a mean percent score of 78.32. There was no statistically significant difference between the two groups on final examination performance (T=0.03, D.F.=16, p>0.05).

Figure 2 shows the frequency distribution of the cumulative totals for the initial daily quizzes. The remedial group's mean total was 89.14 percent of the possible points, in comparison to a mean total 87.90 percent of the points obtained by the no-remedial group. This did not represent a significant difference between the two groups cumulative daily quiz totals (T=0.053, D.F.=16, p>0.05).

Figure 3 shows the difference between matched students with respect to final examination performance. Nine students in the remedial group scored higher on the final examination than matched students in the no-remedial group. In turn, six students in the no-remedial group scored higher than their matched counterparts in the remedial group. Two matched groups of students showed no difference in final examination performance. A trend was established
in that the remedial program was more effective for students with low initial quiz scores. The data indicate that the remedial program had little effect on final examination scores for students with high initial quiz performance.

Table 1 shows a breakdown of mean examination scores for the upper and lower quartiles for both remedial and no-remedial groups. The mean final examination score for the upper quartile of the remedial group was 87.20 percent which represented 4.26 percent difference in favor of the no-remedial group's mean score of 91.46 percent. There was no trend towards superior final examination performance for either group.

However, the lower quartile of the remedial group had an average final examination score of 70.12 percent, which shows up as a 14.02 percent difference in favor of this group when compared to the no-remedial group's average score of 56.09 percent. Three out of four students showed substantial improvement in comparison to the matched student in the no-remedial group. This represented the practical difference of at least one letter grade for the final examination.

Though the overall group differences were not significant, students in the remedial group with lower initial quiz scores demonstrated a trend towards better examination performance.
Figure 1. Frequency distribution for the winter 1976 final examination scores.
REMEDIALLY GROUP
MEAN 32.94

NO-REMEDIALLY GROUP
MEAN 32.11

FINAL EXAMINATION SCORES

NUMBER OF STUDENTS
Figure 2. Frequency distribution for the winter 1976 final daily quiz totals.
NUMBER OF DAILY QUIZ POINTS

REMEDIAL GROUP
MEAN 303.06

NO REMEDIAL GROUP
MEAN 298.88

NUMBER OF STUDENTS

0 1 2 3 4 5 6 7 8
219 229 239 249 259 269 279 289 299 309 319 329 339 349
Figure 3. Scatter diagram of differences between winter 1976 final examination scores for matched students in remedial and no-remedial groups.
TOTAL OF FIRST 16 DAILY QUIZZES FOR REMEDIAL STUDENTS
### TABLE 1

Distribution of Final Examination Scores for the Upper and Lower Quartiles

<table>
<thead>
<tr>
<th>Quartile</th>
<th>Remedial Group</th>
<th>No-Remedial Group</th>
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<tr>
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<td>First 16 Daily Quiz Total</td>
<td>Final Exam Score</td>
<td>First 16 Daily Quiz Total</td>
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<tr>
<td>Upper</td>
<td>152 34</td>
<td>149 40</td>
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<tr>
<td>Mean Score</td>
<td>28.75</td>
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DISCUSSION

In this study, I attempted to evaluate the effect of an individualized remedial system on final examination performance. It did not improve group performance on the final examination when contrasted to a no-remedial group that did not have a remedial program prior to the final examination. A breakdown of the student scores into the upper and lower quartiles indicates that the remedial program may have been beneficial to students with poor initial quiz performance.

In addition, the remedial group showed no signs of better initial quiz performance even though such improved performance was characteristic of other remediation studies. This may be attributed to the fact that in other studies time spent in remediation represented time lost to the student which could be avoided by satisfactory initial quiz performance. An avoidance contingency was not present in this study. Students who did not need to remediate still had to come to class to take a daily quiz.

Several factors could have confounded the overall group results of this study: First, students in the no-remedial group may have effectively remediated course material in studying for the final examination thereby negating the effect of the integrated remedial program used by the other group.

Second, sending average or above average students back to the text may not have been useful if they were unable to learn especially difficult concepts through repeated exposures to the text presentation. The text by itself may have been an inadequate resource.
Finally, the use of multiple-choice quiz items may not have been a sensitive procedure for determining what needed to be remediated.

Let us look at each of these three points in more detail: First, consider the issue of effective "cramming" for the final examination. It is expected that successful students who have worked effectively in other academic environments will continue to work in the same manner under current course contingencies. The fact that many classes place a great deal of emphasis on final examinations prompts students to learn a set of study behaviors to prepare themselves for these testing conditions. In support of this, Bostow and O'Connor (1973) found a positive correlation between entering GPA's and corresponding final examination scores for members of both experimental and control groups. This is not surprising if the GPA is considered an across course measure of how well a student works with typical course contingencies. The Bostow and O'Connor correlation data would suggest that study behaviors shaped up in response to these final examination deadlines might nullify the effects of special remediation programs. Any replication of the present study would need to eliminate this variable by using pre- and post-tests that were independent of course grading policies.

With respect to this, the comparison of mean examination scores for the upper and lower quartiles of both groups indicate that the remediation program had no affect in respect to skillful students. The program did, however, produce a higher distribution of final examination scores for less skillful remedial group students in comparison to the matched student in the no-remedial group. These
findings imply that integrated remediation components are only needed for students lacking basic prerequisite skills. The GPA or a two-week in-class baseline would be a convenient measure to separate students with different academic abilities into various remediation conditions. Students who can master a majority of the concepts during the first presentation should continue through a course unhindered by remediation programs geared for less skilled students. The final examination can then be used to indicate which students did not succeed in remediating problem areas while studying. These students can then be cycled into a review component while their more successful peers continue.

An important distinction can be made between students who lack basic academic skills and students who have those skills but are not using them. Students lacking basic skills would benefit from a remedial program. Other students have the necessary background but do not study enough. These students are many times under the influence of immediate social rewards associated with academic life, while the long term consequences of low grades have little effect on the amount of their studying. Therefore, for such students the answer to the problem does not lie in the development of remedial programs but in the establishment of course contingencies that will compete with the social environment.

The second point is that some students in this study may have had problems with the original text presentation and having them go back to the same material could have been ineffective. The use of supplementary materials to clarify text presentations could be the
additional variable needed to produce an effective remediation program. In respect to this, Radiker (1975) concluded that "some form of remediation which goes beyond referring the student back to the original written material appears to be necessary." One common denominator in all remediation systems is that students are expected to review the material used in the original presentation. The assumption is that a student has not properly used the original material when concepts are not mastered during initial testing. Since this may not be the case with all students, educational technologists should re-evaluate instructional material if unexpected results are obtained.

Therefore, a follow-up to the present study should allow for additional clarifications of the concepts in a different format and possibly a new presentation medium. This could entail the development of other presentation formats beyond the text and even the creation of videotape and audio-cassette coverage of the same material. Instead of having a student review material that may have been insufficient, a new approach could be used to present the concepts not mastered.

Point three is that the use of multiple-choice quiz items may not have been a sensitive procedure for determining what is needed to be remediated. The use of this type of discriminative testing format allows students to "beat the odds" by correctly guessing an answer. Therefore, remedial programs cannot be effective if testing procedures fail to pinpoint a student's areas of difficulty.
One way of accurately determining concepts students are having problems with would be to reduce the effect of guessing by repeatedly exposing them to difficult objectives. This could be initiated by multiple testing over objectives shown statistically to be giving students problems, thus greatly reducing the probability of students accidently passing over objectives they have not mastered.
CONCLUSION

Students involved with a selective remedial program did not score significantly higher on a final examination when compared to a group not involved with a remedial system. The data indicate that the remedial program did help poorer students and went on to suggest that other contingencies were in effect for the better students. Students in the no-remedial group may have been under the strong influence of contingencies associated with final examinations. This could have neutralized the effect of the remedial program as measured by final examination performance. The problem could be eliminated by using evaluative measures unrelated to standard grading criteria.

In future studies the use of review questions and the clarification of reading material might help locate and correct problems. Furthermore, it may be advantageous to only initiate remedial components with students who have demonstrated serious problems with the course material. Though there is little literature in this area, there is a definite need for effective remedial programs that help students make the maximum use of their learning environments.
FOR THE WEEK OF FEBRUARY 4 - 8

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<th>Objectives</th>
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<td>Monday, February 2nd</td>
<td>BeMod Chap 4</td>
<td>In Book, p. 4-17</td>
</tr>
<tr>
<td>Tuesday, February 3rd</td>
<td>BeMod Chap 5</td>
<td>In Book, p. 5-8</td>
</tr>
<tr>
<td>Wednesday, February 4th</td>
<td>BeMod Chap 6</td>
<td>In Book, p. 6-17</td>
</tr>
<tr>
<td>Thursday, February 5th</td>
<td>BeMod Chap 7</td>
<td>Throughout Chapter</td>
</tr>
<tr>
<td>Friday, February 6th</td>
<td>Slide Show - Room 156</td>
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</table>

**Psych 150 Hotline!!!!!!**

This Friday -- February 6th -- we will be bringing you an exciting extravaganza at 9:00, 10:00, 11:00 and noon in 156 Wood Hall. "Harry the Wolfman" will thrill and chill you, so come on down.

Don't forget that materials cards must be to your Teaching Apprentices no later than Thursday -- February 25th.

Appendix A
SAMPLE QUESTIONS FROM DAILY AND FINAL EXAMINATION
QUESTION POOLS

Study objective as found in text: Even scientists' research behaviors are primarily controlled by ________ reinforcers.

1. BEMO-02-07 Experimental psychologists find it aversive that their most noble scientific behavior is controlled by social and material reinforcers outside the scientific realm. (a) True (b) False

Study objective as found in text: What is the variable manipulated by the experimenters called?

2. BEMO-26-02 An independent variable may be defined as: (a) that variable which is manipulated by the experimenter, (b) that variable which is manipulated by the control group, (c) that variable that is directly related to the experimenter, (d) that variable that exists independently of all other variables, (e) that variable to be examined and measured.

3. EXBM-26II-02 The independent variable is (a) hidden in uncontrolled studies, (b) the event or behavior to be studied and measured, (c) the functional variable, (d) studied separately from all variables, (e) manipulated by the experimenter.

1. question for a specific text example
2. question represents a conceptual question from the daily quiz question pool
3. question represents a conceptual question drawn from the pool of questions used only for examinations and is drawn from the same objective as Example 2.

Appendix B
FINAL GRADING SCALES

POINT SCALE FOR IN-CLASS GRADES

90 - 100% = B
80 - 89%  = C
70 - 79%  = D
69% and below = E

POINT SCALE FOR FINAL EXAMINATION GRADES

90 - 100% = A
80 - 89%  = B
70 - 79%  = C
60 - 69%  = D
59% and below = E
RESEARCH PERMISSION FORM

I, ________________________, give my permission for the data collected from my participation in the computer feedback evaluation. I understand that the data will never be presented in a manner that will disclose my individual performance. I also understand that assignment to one of the two procedural variations will be performed on a random basis and I will accept my assignment to any of these procedures. I understand that I may not change procedures once I have been assigned to one. Finally I reserve the right to withdraw my participation in the study at any time during its course and understand that once I withdraw I may not re-enter the study.

I have read, I understand, and I agree to all of the conditions as stated above.

Date: ___________ Student: ____________________________

ATT: TA: ____________________________

Course Assistant: ____________________________

I, ________________________, choose not to participate in the computer feedback evaluation. I understand that I may not enter (or re-enter) the study at a later date.

I have read, I understand, and I agree to all of the conditions as stated above.

Date: ___________ Student: ____________________________

ATT: TA: ____________________________

Course Assistant: ____________________________

Appendix D
THURSDAY REMEDIAL REVIEW SHEET

Student: ____________________________

Objective missed: Chapter 11 Part 2 # 4
Objective missed: Chapter 11 Part 2 # 15
Objective missed: Chapter 12 Part 1 # 1
Objective missed: Chapter 12 Part 2 # 16

THURSDAY QUIZ DATE: 2-28-76

APPENDIX E
THURSDAY REMEDIAL QUIZ

BEMO-11-04  
Part II  
What is a negative reinforcement (escape) contingency?  
(a) The behavior is followed by the presentation of a negative reinforcer.  (b) The behavior is not con­  queated.  (c) The behavior is followed by the termination of a negative reinforcer.  (d) The behavior is followed by an aversive stimulus.  (e) The behavior is punished.

BEMO-11-15  
Part II  
How does attention become a powerful conditioned rein­  forcer?  (a) Due to association with a wide range of discriminative stimuli.  (b) Due to continued associ­  ation with various primary reinforcers.  (c) Because attention is also an unconditioned reinforcer, and it is often paired with itself.  (d) Through accidental condition­  ing.  (e) By never being associated with punishers.

BEMO-12-16  
Part II  
What occurs during Phase 5 of systems analysis?  
(a) analysis of the existing behavioral system,  (b) designing the system,  (c) implementation of the system,  (d) evaluation of the system,  (e) recycling through the phases of systems analysis

BEMO-12-01  
Part I  
What is involved in the specification phase of contin­  gency management?  (a) Delivery of the reinforcing and punishing consequences, (b) establishment of a rein­  forcement contingency, (c) specification of the behavior, the consequences, and the contingency between behavior and the consequences, (d) specification of the behaviors which will not be subject to a modification procedure, (e) observation of the behavior to check if the proce­  dure is as effective as it should be.

Student: ______________________________________

Remedial quiz associated with the feedback sheet presented in Appendix D.

Appendix F
DESIGN AND DEVELOPMENT CONSIDERATIONS
FOR REMEDIAL PROGRAMS

Future studies should be concerned with the following factors in developing remedial programs: First, an unannounced pre- and post-test should be used as the major dependent variable. Final examination performance is not a sensitive enough measure in that other contingencies interplay with a remedial program's effect on student performance.

Second, remedial programs should provide supplementary presentations during remedial phases instead of relying on the original text presentation.

Third, in the remedial phase, students should be repeatedly exposed to difficult concepts. This could be achieved by systematically giving all students alternative questions covering difficult material. This procedure would strengthen the remedial program by eliminating the possibilities of correctly guessing an answer on the original quiz presentation.

Fourth, more emphasis should be placed on a remedial program's effect on students with various academic skills. It may be advantageous to separate students according to demonstrated competency in order to establish the effectiveness of a remedial program. Further research may only involve students with demonstrated problems with the course material.

Fifth, questions missed on the post-test should be examined in order to determine if they were previously remediated or correctly

Appendix G
answered during initial quizzing. These data would verify the effectiveness of the original testing procedures in pinpointing a student's problem areas.
REFERENCES


